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The spatial monopolies of supermarket chains in Hungary[1]

The need to regulate supermarket chain store location to prevent spatial monopoly first came to attention in 2000 in the UK and a few years later in the Netherlands. More often than not, customers live close to one supermarket chain store and far from others—if they have to travel too far at too high a cost to access them, customers will opt for the most convenient. This weakens the market and inter-company competition, damaging customer interests through restricted access to product variety and high costs. To protect customers, governments have to regulate and control the supermarket chains—an issue as valid in Hungary as elsewhere. To inform government action and facilitate further investigation into potential abuse of market power, this article analyses the spatial monopolies of supermarket chains in Hungary.

The survey at the core of this article is based on Hotelling's (1929) representation of space as a line segment made of uniformly distributed points representing inhabitants / consumers. In this imaginary city, under given prices, two different companies located at two different points can reach a range of consumers. If we consider company A in isolation from company B, inhabitants willing to pay the product prices of company A—and bear the eventual travel costs, including the cost of spending time travelling—are potential consumers. As this statement suggests and Figure 1 (p. 154) illustrates, such potential consumers may or may not live in company A's immediate vicinity. Low product prices and low travel costs—or favourable product price–travel cost ratios—attract consumers between A_b and A_j, the points where consumers' reservation prices[2] equal or exceed the sum totals of product price and travel cost.

However, the situation is much more complex if we consider both companies together. If sufficiently far from each other, companies A and B do not affect each other. If sufficiently close to each other, some consumers will be willing to buy from both stores and will opt for the store which affects their reservation price least. Because the sum totals of product prices and travel costs are identical,

[1] This article is based on ongoing PhD research—for his invaluable help and suggestions throughout, the author wishes to thank his supervisor, Dr. Gábor Benedek, Assistant Professor at the Department of Mathematical Economics and Economic Analysis at Corvinus University of Budapest.

[2] In microeconomics, the highest prices buyers are willing to pay for goods or services.

buying from either A or B makes no difference for the neutral consumer M. M divides consumers into two groups—those to the left will buy from A and those to the right from B. This assumption simplifies complex consumer behaviour and facilitates analysis in line with Hotelling (1929).

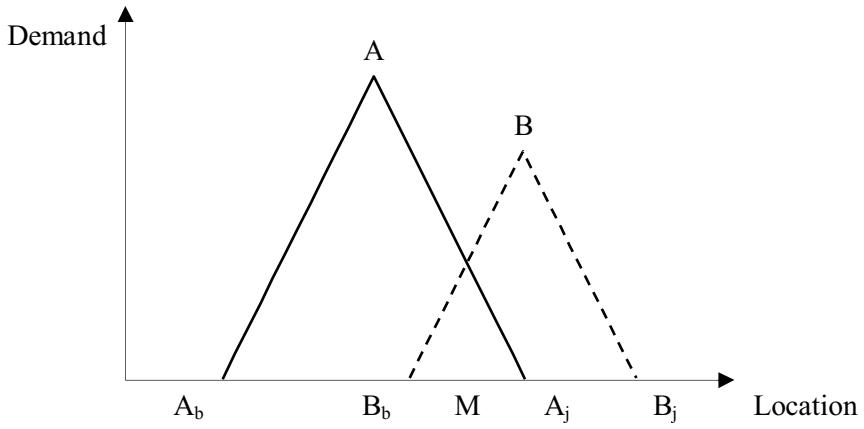

Figure 1: Supermarket chain store location and demand

Social welfare is obviously maximised when a supermarket chain is not narrowly confined to a particular geographical area but uniformly spread in space—not too far from rival supermarket chains, so that they are forced into competition with one another, and the chances of spatial monopoly are minimal.

The spatial monopolies of supermarket chains were first discussed in the UK, where Tesco's market power seemed too strong for comfort (Competition Commission 2000), and in the Netherlands, where Albert Heijn seemed to acquire spatial monopoly status (Stelder 2012). While various official inquiries cleared UK supermarket chains of outright monopolistic wrongdoing, some chain stores reportedly abused their market power and obstructed market competition (Competition Commission 2000). Hughes, Clarke, and Hallsworth (2009) wrote about Tesco Towns[3] and the potential of regulatory policies.

This article is divided into six sections. Following this introduction, the second section presents a brief historical overview and focuses on Hotelling's (1929) classic model and issues of generalisation, especially in the form of multi-store models. A company with more than just one outlet has to consider the locations of its own outlets as well as those of the competition. The third section presents a

[3] Geographical areas dominated by one retailer with large market share.

brief account of supermarket chains in Hungary. The fourth section introduces the data and methods of data collection, particularly geocoding and calculating distance. The fifth section presents the spatial structure of supermarket chains in Hungary. The final, sixth section summarises the results and suggests further research.

Brief historical overview

The Hotelling (1929) model provides a general theoretical framework for analysing various types of consumers who can choose between two alternatives. It is not just a geographical model—Hotelling himself saw its application as a political voting scheme, for instance, with political parties positioning themselves between leftwing and rightwing to attract as many votes as possible. According to the Hotteling model, two companies have to decide where to position themselves in space to maximise their profits—this is a two-stage game with backward induction. During the first stage, the companies decide their product prices under fixed location. During the second stage, they search for maximal-profit locations, the model assuming linear transport costs. To maximise potential market size, which is the same for both, the two companies will seek to locate as close to each other as possible—in the same point, in fact, in the middle of the city, in a seeming illustration of the principle of minimum differentiation.

Fifty years after it was first suggested, d'Aspremont, Gabszewicz, and Thisse (1979) argued against this model—profit is not a continuous function and the relevant results generated by the model are erroneous, rendering the principal of minimum differentiation invalid. The two companies will not tend towards the middle point. Because it was analytically more tractable, d'Aspremont, Gabszewicz, and Thisse (1979) suggested using quadratic transport costs instead of linear transport costs, in a seeming illustration of the principle of maximum differentiation.

The same year, Salop (1979) suggested a model where space takes the shape of a circle and determines the optimal number of firms.

Anderson and Neven (1991) combined two models—Hotelling and Cournot (1838)[4]—and argued for the new model's applicability to companies that sell products that cannot be reallocated flexibly among different markets. Whether just two or as many as n, the companies will all be located in the middle of the

[4] According to the Cournot model, two companies take each other's decisions into account, when trying to maximise profit—a game where both companies decide simultaneously their respective output quantities.

imaginary city, according to this model, in a seeming illustration of the principle of minimum differentiation.

Gupta, Pal, and Sarkar (1997) built upon Anderson and Neven (1991) and discarded the uniform space assumption—a point can locate more than just one inhabitant. They analysed various space scenarios, with various results—in certain cases, for example, the principle of maximum differentiation could explain equilibrium.

The framework proposed by the Hotteling model contained many new aspects—such as product differentiation, for example, at the expense of the homogeneity assumption. The various model generalisations took different directions.

Gannon (1977) showed that two firms will locate in the middle of the space. Fraja and Norman (1993) arrived at similar results using three different pricing mechanisms.

Tabuchi (1994) extended the analysis—and the quadratic transportation cost hypothesis—from the one-dimensional space to the two-dimensional space to prove the existence of equilibrium. If the space is a rectangle, then the two companies will locate in the middle of two opposite sides.

More recently, the methodology has described space as a graph. Sarkar, Gupta, and Pal (1997) proved the existence of equilibrium in the assumption of a Cournot competition.

Soetevent (2010) examined under-price competition and showed that equilibrium is not guaranteed.

Pálvölgyi (2011) used tree graphs and revealed the existence of equilibrium for relatively low numbers of companies.

Teitz (1968) generalised Hotelling's model and argued its applicability to companies—such as supermarket chains, for example—with more than just one shop. He started by considering two companies—one with one shop, the other with two. Equilibrium should be theoretically impossible, given this situation's divergence from the one-one model. However, if they are to achieve equilibrium in the long run, Teitz (1968) reckoned that companies need to achieve market share proportional with the number of their shops.

Martinez-Giralt and Neven (1988) concluded that—faced with price competition—companies do not open supplementary outlets in either a line segment space or in a circle space. Consequently, multi-store companies do not occur. The Martinez-Giralt and Neven model makes an important assumption—consumers' reservation price for the product is so high that they are willing to buy the product at any shop.

Martinez-Giralt and Neven (1988) were contradicted by Janssen, Karamychev, and Reeve (2005), who proposed a three-stage model where companies seek to

maximise in number first, in location second, and in price third—and achieve equilibrium through shops located separately.

Pal and Sarkar (2002) considered quantity competition instead of price competition and obtained some important results. The subgame perfect Nash equilibrium[5] ensures equilibrium—companies choose their monopoly location, which minimises transportation costs, and the outlets of a given company locate separately in space. Nevertheless, the stores of two different supermarket chains can locate at one point.

Iida and Matsubayashi (2011) used Stackelberg's (1934) model to take into account the market power of the company and determine endogenously the store number of multi-store companies under financial constraints.

The ultimate aim is to ensure equilibrium. However, even a brief historical overview such as this is sufficient to conclude that—although the models have become increasingly complex, with time—their analytical solutions could not always be guaranteed. The relevance of computational models could be strengthened by simulating theoretical micro-level decisions first and observing real macro-level mechanisms second. By enhancing understanding of multi-store companies, this article seeks to support empirically the development of this body of literature.

Supermarket chains in Hungary

The end in 1989 of the communist supremacy in Hungary resulted in an open market and an economy attractive to foreign investors. Hungarian food stores illustrate the ensuing competition most clearly, as well as its dual—national and international—character.

The Hungarian store structure changed, after 1989. Most of the old shops vanished altogether or were amalgamated into new chain stores. At least in part, CBA and Coop—two Hungarian-owned companies—could be originated from such shops. Profi—a foreign-owned chain belonging to the Louis Delhaize Group—opened its first store in Hungary very early on, in 1989. The Dutch Spar entered the Hungarian market shortly afterwards, in 1991. The second half of the 1990s saw the arrival of other foreign supermarket chains—Penny Market, Tesco, and Auchan. In the 2000s, Lidl and Aldi arrived—not only with foreign expertise, but also with cheap, own-brand products—and the domestic market became fiercely competitive.

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[5] Firms decide output quantities first and locations second.

The following paragraphs introduce briefly the supermarket chains operating in Hungary and serve only as background to the subsequent discussion—they are based on the supermarket chain websites and Wikipedia[6] articles.

- Aldi—This supermarket chain originated in Germany with brothers Theo and Karl Albrecht. The enterprise flourished, after World War II, and began to expand across Europe. Nowadays, Aldi's European operations are separated into two networks, Aldi Nord and Aldi Süd, depending on the geographical location of the stores—Hungary joined Aldi Süd in 2008. This supermarket chain aims to high quality through low-price own-brand products.

- Auchan—The first Auchan store was erected in 1961 in the French city of Roubaix. Six years later, in 1967, the first Auchan hypermarket opened in Roncq. Gérard Mulliez, the founder of this enterprise, continues to be its majority shareholder. Auchan's international expansion began in the 1980s, with the supermarket chain entering Hungary in 1998. The company has a large business portfolio, including real estate and banking besides retail. On 27 April 2012, Auchan purchased Cora, but the data used in this article was collected prior to that date—consequently, the two supermarket chains appear as two separate entities.

- CBA—This Hungarian supermarket chain dates back to 1992, when ten entrepreneurs acquired 17 food stores in the so-called Közért Vállalat[7] privatisation. CBA's expansion started in Budapest, but then extended to the whole of Hungary—by 1998, there were more CBA stores in the countryside than there were in the capital city. In 2001, CBA started to expand internationally—nowadays, there are thousands of CBA stores in the neighbouring countries.

- Coop—The history of this Hungarian-owned supermarket chain goes back 50 years. However, the company—as we know it today—was founded in 1995, and currently owns more than 500 stores. In 2000, Coop started to expand in the Czech Republic and Slovakia, but its stores in Hungary continue to outnumber those overseas. A significant section of its customer profile consists of buyers from small village shops.

- Cora, Match, and Profi—Two of the sons of Jean-Jacques Delhaize (a Belgian wine merchant from Charleroi) started their own business in the second half of the Nineteenth Century—the supermarket chain Delhaize Le Lion is now present in both Belgium and the US. Louis Delhaize, the third son, gave his name to the Louis Delhaize group—its more extensive store network covers countries such as Belgium, France, Hungary, Luxemburg, and Romania, for example.

In Hungary, the group owns three supermarket chains. The first, Profi, opened in 1989. The second, Match, started under this new name in 2004, having been

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6 http://www.wikipedia.org.

7 Supermarket Company.

purchased from Julius Meinl—the initial Csemege chain stores were launched in 1952. The third, Cora, started in 1997, but was taken over by Auchan in 2012.

- Lidl—A German family by the name of Schwarz launched this company in 1930—its current image dates back to the 1970s, and the supermarket chain is owned by the Schwarz holding. Lidl started their operations in Hungary in 2004—since then, over one hundred new stores were built. Although Lidl owns Handelshof and Kaufland, these supermarket chains are not present in Hungary. With a profile similar to Aldi, Lidl focuses on low price, quality, and freshness.

- Metro—This wholesale operation built its first store in Mülheim an der Ruhr in 1984, with the stated aim of renewing wholesale services. Metro provides a wide range of goods that can be bought quickly from one single location—the innovative cash-and-carry gave impetus to the company's development, which expanded in many countries in Europe and Asia. The first Metro store opened in 1994, in Hungary—since then, 13 other Metro stores started to operate in the country.

- Penny Market—This supermarket chain is a member of the Rewe Group, which offers retail sales and tourism services. The Rewe Group was founded as a cooperative in Cologne in 1927—since then, it has expanded in many European countries. The first Penny Market store in Hungary was launched in 1996—today, there are 190 such stores in the country. The slogan 'Fresh-Cheap-Good' outlines the supermarket chain's business policy.

- Reál Élelmiszer—Reál Hungária Élelmiszer Kft. began to operate in Hungary in 2001. Entirely under Hungarian ownership, this supermarket chain is owned by six of its member companies. The store network is made of the founders' retail stores as well as other private companies. More than 2,000 stores belong to this supermarket chain. Of these, approximately 500 have a floor area of 100 square metres and are called Reál Food—the remaining stores are known as Reál Points.

- SPAR-csoport—Adriaan van Well founded SPAR in 1932 in the Dutch city of Zoetermeer. The company consists of independent wholesalers and retailers who organise themselves as one supermarket chain and act accordingly on the market. This organisational model proved successful from the very start and—in the 1950s—SPAR extended its store network across Europe, Africa, the Far East, South America, and Australia.

Austria SPAR International AG coordinates the store network in Hungary—the first Spar store here opened in 1991. SPAR took over the supermarket chains Billa (in 2002), Kaiser (in 2003), and Plus (in 2008). There are currently three types of SPAR stores—SPAR supermarkets (with a floor area between 400 and 1,000 square metres), Inter SPAR hypermarkets (with a floor area between 4,000 and 6,000 square metres), and SPAR Cities, which serve inner-city needs.

- Tesco—Sir Jack Cohen founded Tesco in 1919. In time, this once small company expanded across England and—in the 1960s—grew into a significant

supermarket chain. Around that time, the company began its international expansion—today, Tesco is present in Europe, North America, and Asia. The launch of the first Tesco store in Hungary in 1994 was followed by more than 200 other such stores. The various names of the Tesco stores reflect their size—in ascending order, these are Tesco Express, Tesco S-Market, Tesco Supermarket, Tesco Extra, and Tesco (hypermarket).

Data

Stores

The data at the core of this article reflects the supermarket chain structure in Hungary as of the first quarter of 2012, when it was downloaded from the supermarket chains' websites. Where the nearest shop of a particular company is located is sometimes important to customers—as is information on how to reach this nearest shop. Companies adopt different business policies—and use different devices—to inform customers of their geographical location and accessibility. Three groups of companies thus emerge. The companies in the first group provide directly accessible information—the Global Positioning System (GPS) coordinates can be retrieved easily and the data does not require additional analytical work. The chances of companies in this group being found by customers through other information channels—such as navigation devices—are high. The companies in the second group do not make the information public—the data is not downloadable directly, but an own-shop search box is usually incorporated in the company websites. Nevertheless, the GPS coordinates are embedded in the Hyper Text Markup Language (HTML) code and can be retrieved or identified visually. The companies in the third group require the use of geocoding—in other words, determining GPS coordinates from postal addresses. The Internet facilitates access to free geocoding service providers, although access to any such service is usually limited to a given number of queries.

One way or other, for supermarket chains in the first two groups, the GPS coordinates were available and deemed reliable—in one case only, the GPS coordinates were determined manually, with the use of a street map. The relatively low number of observations facilitated comprehensive data collection. The Google geocoding service was used for supermarket chains in the third group. However, the service is limited to postal addresses included in its own database—as well as by a recognisable address format—and, therefore, open to fault. Consequently, each observation was checked and—where necessary—corrected with the use of

external information, such as information made available by WikiMapia[8]. Two methods were used to control for error, if the supermarket chain had more than one store in Hungary. First, the coordinates were checked to ensure that they were inside Hungary. Second, because the Google geocoding service offers several options, if unsure, the options were reviewed one by one.

In terms of data reliability, the supermarket chains were divided into two groups: with reliable company data (Aldi, Auchan, CBA, Cora, Lidl, Match, and Profi)[9] and with poor company data (Coop, Metro, Penny Market (herewith, Penny), Réal Élelmiszer (herewith, Real), SPAR-csoport (herewith, Spar), and Tesco)[10].

Population

A 2010 independent database was the source for population data, structured by Hungarian streets (ordered by name, district, and city), coordinates of the middle of any given street, and number of people who live in any given street. However, gathering the population data was not unproblematic.

First, due to missing coordinates, the 2010 independent database was incomplete—thus, of its 107,879 observations, 4,230 (around 4 per cent) were incomplete. This problem was circumvented by using two imputation methods. The database was structured so that neighbouring values were close. If proximity was deemed plausible (two streets in the same village, for example), the missing values were replaced with the immediately neighbouring values. If proximity was deemed implausible, the missing values were searched manually.

Second, the geodetic systems were different (Varga 2002), with coordinates of Hungarian stores in EOV[11] and coordinates of Hungarian streets in WGS84[12]. The problem was circumvented by converting WGS84 data into EOV data with Quantum Qis software—this allowed easy subsequent calculations of distances.

Third, the coordinates of the middle of any given street represent a simplification of that street's coordinates that had to be taken into account. Through approximation to a point, a spatial object loses information—the error thus introduced has to be minimised. Street population is the only additional

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8 http://www.wikimapia.org.

9 Because of shared ownership at the time, Cora, Profi, and Match appear under the generic name Match later in the study.

10 Because it is not a retail supermarket chain, Metro was not included in this study.

11 Egységes Országos Vetület (Uniform National Projection), the Hungarian geodetic system.

12 World Geodetic System 1984.

information on which correction can be based. Since it is plausible to assume that the more people live in a street, the longer the street is, and the more stores are within easy reach, it may be useful to introduce weighting.

Geometrically, a street would be described through a curve. If few people live in that street, then the street is likely to be short and weighting is likely to have no relevant effect—the middle of the street is a sufficiently good approximation of the street. On the contrary, if many people live in that street, then the street is likely to be long and weighting is likely to have a relevant effect—the middle of the street is not a sufficiently good approximation of the street. The more people live in a street, the more the curve symbolising that street can change, in both length and shape—since the exact length and shape are unknown, errors of approximation are inevitable. Setting a population threshold seems necessary, but what would that threshold be? Where is the border between short streets and long streets? For the sake of the argument, let the population threshold be 1,000 people—there are 658 such streets in Hungary, representing 11.5 per cent of the total population. If the population threshold is set at 5,000 people, then there are only nine such streets in Hungary, representing less than 1 per cent of the population (see Table 1).

Table 1: Hungarian streets with more than 5,000 people in the year 2010 (listed in ascending population order)

Street	City
Fazekas János tér	Nyíregyháza
Barátság útja	Dunakeszi
Gál István lakótelep	Tatabánya
Páskomliget utca	Budapest
István út	Debrecen
Csontváry K. Tivadar utca	Budapest
Pesti út	Budapest
Havanna utca	Budapest
Derék utca	Debrecen

Source: Based on a 2010 independent database.

However, even just a brief look at the satellite map reveals that all these nine streets are located in residential areas and—with the possible exception of Pesti út—are not really long. Considering these streets long would be seriously misleading. Moreover, further investigation reveals that really long streets belong to more than just one administrative district and that the database splits them accordingly—for example, Pesti út is split in two and Hungaria körút in four. Consequently, weighting is unlikely to reduce errors, and this study used the

original coordinates without correction and sought to identify the store closest to the middle point of any given street.

Investigating a supermarket group would have been useful, but unfeasible, due to insufficient information—instead, two groups of shops were investigated, to account for differences in shopping situations generated by characteristics such as the kind of products customers want, the number of products customers need, and others. In the *all shops* group, customers only need some basic foods. Because they want to buy a small number of products fast—and because price is not that important to them—customers in this group shop at the closest shop, whether independent store or supermarket chain store. Because the relevant information was not accessible, the all shops group in this article does not include independent stores. In the *medium-size shops* group, customers need more than just some basic foods and like product variety—also, price is more important to these customers than to customers in the first group, and supermarkets and hypermarkets are more appealing to them than other types of store. The medium-size shops group includes Aldi, Auchan, Cora, Lidl, Match, Penny, Profi, and Spar (see fn. 9, p. 161)—and is a subset of the all shops group.

Results

The method of analysis used in this article is based on Stelder (2012)—the closest shop to any given street and the closest shop belonging to a different supermarket chain were identified, the respective distances between street and shops were calculated, and the difference between the two distances was used to generate four distance thresholds: 300 metres, 500 metres, 1,000 metres, and 3,000 metres. The smaller this difference, the lower the additional travel costs for customers buying products at the closest shop belonging to a different supermarket chain, and the lesser the possibility of customers being locked in a spatial monopoly. This difference distinguishes among (1) customers who shop on foot from more than just one store within a 300-metre radius; (2) customers who ride a bicycle to shop within a 500-metre radius; (3) customers who drive or travel by public transport to shop few products within a 1,000-metre radius; and (4) customers who drive or travel by public transport to shop many products within a 3,000-metre radius. In other words, this difference distinguishes among customers who are not locked in spatial monopolies of type (1), (2), (3), or (4). Calculating the shortest possible route between customer and shop—like navigation devices do—was unfeasible, due to the very high number of necessary calculations, and the crow-fly distance was used instead.

Table 2: The regional distribution of supermarket chain stores in Hungary for the all shops group in the year 2012 (in percentages)

Chain store	Region / Country						
	SGP[a]	ST[b]	NGP[c]	NH[d]	CH[e]	WT[f]	Hungary
Aldi	1	1	1	1	1	3	1
Auchan	0	0	0	0	0	1	0
CBA	18	15	8	11	17	28	14
Coop	45	58	63	69	58	31	58
Lidl	3	4	2	2	3	3	2
Match	3	2	3	3	2	7	4
Penny	4	4	4	3	4	4	2
Real	17	5	11	5	3	4	9
Spar	6	8	4	4	8	13	5
Tesco	3	4	3	2	3	6	5

[a] SGP = Southern Great Plain
[b] ST = Southern Transdanubia
[c] NGP = Northern Great Plain
[d] NH = Northern Hungary
[e] CH = Central Hungary
[f] WT = Western Transdanubia

Before detailing the results, it is worth looking at the distribution of supermarket chain stores by region. Table 2 shows that—with the exception of the Northern Great Plain, where Real comes second and CBA third—Coop is the most dominant supermarket chain in the country, CBA is the second most dominant, and Real or Spar are the third. Regionally, the Aldi, Lidl, Match, and Tesco stores are distributed uniformly, but either Spar or Real always comes third—Spar is more dominant than Real in regions where it has more stores than Real, and vice versa. At the same time, Table 3 (p. 165) shows that—faced with competition from Match, Spar, Tesco, and others—Coop is less dominant in the medium-size shops group.

Table 4 (p. 165) shows that—on average—the closest store is 838 metres far, in the all shops group, and 3,481 metres far, in the medium-size shops group. Unsurprisingly, in both groups, stores are closest to customers in Central Hungary, while the figures for regions in Eastern Hungary[13] are above the average and those for the Southern Transdanubian region are well above the average.

[13] Southern Great Plain, Northern Great Plain, and Northern Hungary.

Table 3: The regional distribution of supermarket chain stores in Hungary for the medium-size shops group in the year 2012 (in percentages)

Chain store	Region / Country						
	SGP[a]	ST[b]	NGP[c]	NH[d]	CH[e]	WT[f]	Hungary
Aldi	5	5	5	2	5	7	5
Auchan	1	0	0	1	1	2	0
CBA	1	1	1	0	3	1	11
Coop	23	12	31	36	11	10	17
Lidl	11	15	8	9	12	9	8
Match	9	6	12	11	9	19	16
Penny	15	15	15	13	15	9	10
Real	3	0	3	4	0	1	3
Spar	21	32	15	17	32	33	23
Tesco	11	13	9	8	13	9	7

[a] SGP = Southern Great Plain
[b] ST = Southern Transdanubia
[c] NGP = Northern Great Plain
[d] NH = Northern Hungary
[e] CH = Central Hungary
[f] WT = Western Transdanubia

Table 4: Population (in percentages) and average distances between Hungarian customers and the store closest to them (in metres) in the year 2012

Region / Country	Population	Average distance	
		All shops	Medium-size shops
Western Transdanubia	10	802	3,664
Central Transdanubia	11	849	3,947
Southern Transdanubia	10	1,301	5,341
Central Hungary	28	535	1,276
Southern Great Plain	13	932	4,312
Northern Great Plain	15	1,001	4,879
Northern Hungary	13	905	4,015
Hungary	100	838	3,481

Source: KSH (2013).

Table 5: Hungarian population locked in spatial monopolies by supermarket chains in the all shops group in the year 2012 (in percentages)

Region / Country	Distance (in metres)			
	< 300	**< 500**	**< 1,000**	**< 3,000**
Western Transdanubia	52.93	41.61	32.92	23.71
Central Transdanubia	56.98	46.57	35.70	24.95
Southern Transdanubia	57.02	47.72	36.10	26.30
Central Hungary	39.18	24.92	11.19	3.96
Southern Great Plain	48.93	35.03	22.83	16.11
Northern Great Plain	56.11	45.84	34.98	27.24
Northern Hungary	63.11	54.90	45.52	33.95
Hungary	51.01	39.34	27.80	19.20

Table 5 shows that the longer the distances customers are prepared to travel, the higher the access to more than just one store—if the entire Hungarian population were to shop on foot, then more than 50 per cent of people would be locked in spatial monopolies. This percentage decreases with the means of travel, reaching 39.34 per cent for bicycle riders, 27.80 per cent for car drivers and people travelling by public transport who buy few products, and 19.20 per cent for car drivers and people travelling by public transport who buy many products.

Given its geographical location, Central Hungary has the highest number of shops. Here, the population locked in spatial monopolies is below 40 per cent in the 300-metre category—relative to the 51.01 per cent category average, 39.18 per cent may be regarded as an outlier. Moreover, since the shops outside major supermarket chains were not included in this analysis, the real percentage is likely to be even lower than this. In the 3,000-metre category, the population locked in spatial monopolies is less than 4 per cent, in Central Hungary, indicating high levels of competition.

The Southern Great Plain has the second lowest percentage of population locked in spatial monopolies in all four categories—48.93 per cent at 300 metres, 35.03 per cent at 500 metres, 22.83 per cent at 1,000 metres, and 16.11 per cent at 3,000 metres—as one would expect from a region in Western Hungary[14], which is more developed than Eastern Hungary. There may be fewer—but more uniformly spaced—shops in the Southern Great Plain than in Central Hungary.

The differences in spatial monopolies between Eastern Hungary and Western Hungary are negligible, while the population locked in spatial monopolies is at its

[14] Western Transdanubia, Central Transdanubia, and Southern Transdanubia.

highest in Northern Hungary, where the figures may be affected by uneven population density.

Table 6: Hungarian population locked in spatial monopolies by supermarket chains in the medium-size shops group in the year 2012 (in percentages)

Region / Country	**Distance** (in metres)			
	< 300	**< 500**	**< 1,000**	**< 3,000**
Western Transdanubia	48.83	33.26	19.87	11.20
Central Transdanubia	46.87	30.68	14.25	5.36
Southern Transdanubia	45.22	28.49	13.55	7.86
Central Hungary	53.14	37.39	18.57	4.26
Southern Great Plain	49.19	35.12	22.36	12.75
Northern Great Plain	47.59	36.97	26.78	14.21
Northern Hungary	49.94	39.75	28.99	19.23
Hungary	49.51	35.32	20.79	9.90

Table 6 shows further interesting aspects of the spatial monopolies of supermarket chains in Hungary. With fewer stores in the medium-size shops group than in the all shops group, the population locked in spatial monopolies should be higher—however, with the exception of Central Hungary, the figures are actually lower, indicating higher levels of competition. This does not mean that customers are in a better position vis-à-vis the medium-size shops group, but that the group has a different location structure, more favourable to customers—brands are located close to one another, for example in shopping centres. In practice, with several brand stores located within a very short radius, reaching one of these stores equates with reaching all the other stores too. However, customers need to travel 3.5 kilometres on average to reach such shopping centres—more likely than not, these customers own their own cars. The last column of Table 6 clearly indicates that—as expected—Western Hungary outperforms all the other regions, on developmental grounds.

Central Hungary comes last in the 300-metre category, last-but-one in the 500-metre category, fourth in the 1,000-metre category, and first only in the 3,000-metre category. However, as expected, even in this latter category, the population locked in spatial monopolies by the medium-size shops group is slightly higher than the population locked in spatial monopolies by the all shops group, presumably on structural grounds. In the particular case of Central Hungary, the number of shops seems to have a greater impact than the existence of shopping centres, due to high population density.

Table 7: Hungarian population locked in spatial monopolies by supermarket chains in the all shops group in the year 2012 relative to the closest store in each brand (in percentages) (continued on facing page)

Chain store	Region / Country						
	SGP[a]	ST[b]	NGP[c]	NH[d]	CH[e]	WT[f]	Hungary
Total							
Aldi	1	1	1	1	1	1	0
Auchan	0	0	0	0	0	0	0
CBA	15	21	15	30	18	8	11
Coop	52	55	56	31	46	63	71
Lidl	2	2	3	2	2	2	2
Match	6	3	3	8	3	3	3
Penny	2	2	4	4	4	4	3
Real	8	3	3	5	19	12	5
Spar	6	11	12	14	5	4	3
Tesco	8	3	3	5	3	2	1
< 300 metres							
Aldi	0	0	1	1	0	1	0
Auchan	0	0	0	0	0	0	0
CBA	11	19	10	33	18	4	9
Coop	74	75	73	41	57	79	85
Lidl	0	0	1	1	1	1	1
Match	2	0	1	4	1	1	1
Penny	0	0	1	2	1	1	0
Real	6	1	2	3	18	11	3
Spar	2	3	10	11	1	1	0
Tesco	4	1	2	4	2	1	1
< 1,000 metres							
Aldi	0	0	0	0	0	1	0
Auchan	0	0	0	0	0	0	0
CBA	9	17	9	33	17	3	8
Coop	84	80	79	48	63	84	89
Lidl	0	0	1	0	0	0	0
Match	0	0	0	2	0	1	0
Penny	0	0	0	1	0	0	0
Real	4	1	3	3	18	9	2
Spar	1	2	7	9	0	0	0
Tesco	2	0	1	3	1	1	0

< 3,000 metres							
Aldi	0	0	0	0	0	0	0
Auchan	0	0	0	0	0	0	0
CBA	7	12	9	31	13	2	6
Coop	90	87	86	60	71	90	92
Lidl	0	0	0	0	0	0	0
Match	0	0	0	0	0	0	0
Penny	0	0	0	0	0	0	0
Real	2	0	2	3	16	8	1
Spar	0	0	2	4	0	0	0
Tesco	1	0	1	1	0	0	0

[a] SGP = Southern Great Plain
[b] ST = Southern Transdanubia
[c] NGP = Northern Great Plain
[d] NH = Northern Hungary
[e] CH = Central Hungary
[f] WT = Western Transdanubia

Tables 7 and 8 (pp. 168–169 and 170–171) show the population locked in spatial monopolies relative to the closest store in each brand. For example, in the 300-metre category, 65 per cent of the population can reach only Coop stores—however, since 51.01 per cent of the population lives in the 300-metre spatial economy of the all shops group (see Table 5, p. 166), the overall figure is approximately 32.5 per cent.

Coop dominates the all shops group, with very high values everywhere, except in Central Hungary. CBA holds the second position in this group.

Spar dominates the medium-size shops group, while Coop stays strong—mainly in the 1,000-metre category and in the 3,000-metre category, where the supermarket chain locks 7 per cent of the population—and Match and Penny hold some remarkable positions. In some of the regions, CBA, Penny, and Spar emerge as possible spatial monopolists.

With its low purchasing power, rural Hungary does not attract the number and variety of stores urban Hungary does, leading to low levels of competition in the countryside and an overall landscape dominated by Coop and Spar.

Table 8: Hungarian population locked in spatial monopolies by supermarket chains in the medium-size shops group in the year 2012 relative to the closest store in each brand (in percentages) (continued on facing page)

Chain store	Region / Country						
	SGP[a]	ST[b]	NGP[c]	NH[d]	CH[e]	WT[f]	Hungary
Total							
Aldi	6	6	3	4	1	4	1
Auchan	0	1	0	1	1	0	0
CBA	18	3	1	0	1	0	0
Coop	24	11	12	11	28	29	44
Lidl	4	10	15	6	8	9	6
Match	12	7	6	23	12	13	11
Penny	10	13	11	9	15	17	12
Real	2	0	0	1	2	6	5
Spar	21	36	39	38	23	12	16
Tesco	3	13	13	6	10	10	5
< 300 metres							
Aldi	7	5	1	3	1	3	0
Auchan	0	2	0	1	1	0	0
CBA	27	3	0	1	1	0	0
Coop	31	17	17	14	37	42	62
Lidl	1	8	13	4	6	8	4
Match	12	3	3	20	11	10	5
Penny	2	11	6	8	11	15	8
Real	1	0	0	1	2	5	7
Spar	18	35	49	41	18	6	10
Tesco	2	15	11	6	12	10	5
< 1,000 metres							
Aldi	3	5	1	3	1	3	0
Auchan	0	3	0	1	0	0	0
CBA	33	4	0	1	1	0	0
Coop	36	20	19	18	47	47	70
Lidl	0	8	14	3	5	9	3
Match	9	2	1	17	8	10	3
Penny	1	11	3	9	10	14	5
Real	2	0	0	0	1	3	8
Spar	16	31	52	43	16	4	9
Tesco	1	15	10	5	11	10	4

< 3,000 metres							
Aldi	1	1	0	3	1	0	0
Auchan	0	6	0	2	0	0	0
CBA	34	7	0	1	0	0	0
Coop	48	33	28	29	62	54	80
Lidl	0	5	1	2	2	9	1
Match	5	1	0	9	2	11	3
Penny	0	16	0	10	12	15	3
Real	0	0	0	0	0	3	9
Spar	12	21	65	39	12	3	0
Tesco	0	9	6	5	9	5	3

[a] SGP = Southern Great Plain
[b] ST = Southern Transdanubia
[c] NGP = Northern Great Plain
[d] NH = Northern Hungary
[e] CH = Central Hungary
[f] WT = Western Transdanubia

Summary

The results presented in this article are similar only in part to those in the Netherlands (Stelder 2012), where 47 per cent of the population is locked in spatial monopolies in the 300-metre category, 32 per cent in the 500-metre category, and approximately 15 per cent in the 1,000-metre category. These figures are lower than their Hungarian equivalents, particularly in the 1,000-metre category—at the same time, the population density in the Netherlands is higher than in Hungary.

More than half a million Hungarians are locked in spatial monopolies in the 3,000-metre category, while 720,000 are locked in spatial monopolies in the medium-size shops group. Since these customers live primarily in the countryside, the figures could be explained by differences between the rural and urban structures and by single shops being scattered across peripheral lands. More likely than not, given the low overall purchasing power, any one village cannot sustain more than just one such shop—as a result, there can be no strong competition in rural areas. The spatial monopoly structure that characterises Hungary is not favourable to customers, many of whom have access to only a limited variety of products. The competition authority needs to ensure that supermarket chains neither abuse their market power nor damage the interests of customers.

Coop dominates the countryside. Does the company abuse its market power? Does the company need to be kept under control? To answer such questions, the competition authority would have to investigate the regional prices and the pricing mechanisms of supermarket chains. Even then, distinguishing fact from fiction would be difficult—supermarket chain stores could always claim in their defence the higher costs (transport, rentability, etc.) rural areas involve compared with urban areas. Thus, public policies that facilitate healthy market competition—by preventing supermarket chains from opening stores in neighbouring villages, for example—are an efficacious alternative to lengthy, expensive, and outcome-uncertain investigations.

In conclusion, what does the future hold for research on the spatial monopolies of supermarket chains in Hungary? Among others, this article has shown that supermarket chains such as Auchan and Tesco have many customers, although their stores are not usually located particularly close to them. Investigating such stores that seem to both attract large numbers of customers and generate high purchasing powers—in spite of distance—is clearly a possible avenue for future research, as well as future articles.

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