WORKING PAPER 2011:3

Joakim Gullstrand

Christian Jörgensen

Local Price Competition: The Case of Swedish Food Retailers

AgriFood economics centre

Local Price Competition: The Case of Swedish Food Retailers

Joakim Gullstrand[*#] and **Christian Jörgensen**[#]

[*]Department of Economics at Lund University
[#]AgriFood Economics Centre at Lund University

Abstract

Swedish food prices have been an issue many years resulting in a number of studies by the Swedish Competition Authority. This paper sheds new light on the competitive situation by using a detailed dataset covering all Swedish food retailers. The dataset allows an assessment of the importance of price competition as well as whether the market is local or global. The results are unambiguous, and suggest that competition is substantial, but that it wears off quickly. The implications are that a variation in competition may be an important explanation for price variations within Sweden, and that the disciplinary effect of new formats focusing on low prices may be substantial.

JEL codes: L11, L81

Keywords: Local competition, food price, retailers, Sweden

Introduction

The variation in food prices is significant across markets, even in areas with a large degree of economic integration such as the EU. It is also considerable within national borders, but noticeably smaller than across countries. Several plausible explanations for these price differences have been discussed in the literature. One such explanation is that differences in prices may reflect differences in costs because wages and rents vary between localities (Dawson, 2007). Another explanation is differences in quality, since the service level differs widely between retailers (Bonnano and Lopez, 2009). A third is that the market for food items seems to be very narrow, as prices for homogenous food items differ across distances as short as hundreds of meters (Haltiwanger et. al., 2010).

All these plausible explanations may be valid for the Swedish food-retailer market, which shows large regional differences, some of which stem from the fact that Sweden is sparsely populated with a little more than 9 million and an area almost the size of France. Hence, the Swedish retail market displays relatively large transport distances as well as lack of scale in many regions, both of which are plausible reasons for price differences. In addition to regional cost differences, the choice of retailers with different convenience levels varies across regions and new operators focusing on low prices are mostly found in the southern part of Sweden. The Swedish food retail market is also, by any standard, highly concentrated. In fact, it is the most concentrated market in Europe with a market share of almost 50 percent for a single retailer. Since only a fraction of the semi-largest retail chains is found in the most distant regions, the competitive situation, and hence prices, may differ widely within Sweden. Large distances, together with local markets, may reinforce the effects of regional variations in quality and concentration.

The purpose of this study is to add new insight into the pricing behaviour of food retailers by investigating market boundaries and the importance of price competition. In order to analyse these questions, we employ price records for a large number of stores and the exact geographical location of more than 95 percent of all Swedish stores. To our knowledge, this is the first study that uses the full information on store locations in order to incorporate the spatial dimension in an analysis of price competition among food retailers. The detailed information on localisation allows us to model the competitive situation on the Swedish food-retail market in order to assess whether it may be characterised as local (i.e., as discussed in Pinkse et al, 2002, direct competition with neighbours only) or global. The policy implication is important since local competition implies more segmented markets and hence less competition. In addition, we measure the importance of price competition and hence assess the disciplinary effects of new formats (i.e. hard discounters focusing on low prices) on the Swedish food market.

The remainder of the study is as follows. The characteristics of the Swedish food retail market are discussed in section two, while section three presents the results from earlier studies focusing on price competition and local market boundaries. Sections four and five provide a description of the data and the model used, respectively. Section six contains the results and section seven concludes the paper.

The Swedish food retail market

The most important characteristic of the Swedish retail market for food and beverage, when it comes to competition issues, is a high market concentration of retailers. The Swedish retail market is dominated by three groupings with a total market share of about 86 percent. When the six largest retail chains are considered, the total market share grows to 98 percent.[1] The high concentration is further emphasised by the dominance of one retail chain, the ICA group, whose market share corresponds to almost half of the market. ICA's dominance has grown considerably in recent years; it had more than a third of the market in 2002. Its success may party be explained by an increased internationalisation in 2002 when Ahold, one of Europe's largest retailers, became a major stock holder of ICA. This may have increased ICAs competitiveness through greater economies of scope and scale as well increased buying power.[2] Although the Swedish retail market is dominated by the ICA group, the individual stores within the ICA group are supposed to act independently of each other in price-setting, as they are prohibited from

[1] The market shares for the six largest groupings in Sweden are in descending order as follows: the ICA Group (49.4 percent), Coop (20.3 percent), Axfood (15.9 percent), Bergendahls (7.7 percent), Lidl (2.8 percent) and Netto (1.9 percent). These figures are own calculations based on data from DELFI Marknadspartner and the market shares indicated by DELFI, DLF and Fri Köpenskap for 2008.

[2] The other two major retailers in Sweden, Axfood and Coop, have not undergone such an internalisation although Coop Sweden merged in 2002 with the corresponding chains in Denmark and Norway. The partnership was reduced to a common purchasing corporation from 2008 onwards.

coordinating prices with the exception of occasional offers (e.g., sales promotions that are coordinated as TV commercials nationwide).[3] However, a recent pro-competitive trend has emerged on the Swedish food market with the expansion of hard discount stores. These stores focus on low prices and offer a lower convenience and a smaller product variety than traditional formats. Hard discount stores were introduced in Sweden with the establishment of Danish Netto in 2002 (partly owned by ICA from 2002 to February 2007). Netto was followed by the major German hard discount chain Lidl in 2003, and from 2004 until 2008 they increased their combined market share from about 2 percent to almost 5 percent (Delfi Marknadspartner et. al., 2006, 2009).

The competitive pressure of hard discounters may, however, be more pronounced in the Southern part of Sweden since these stores are more firmly established there. For example in 2008, about 14 percent of all stores in the southernmost parts of Sweden (Skåne and Blekinge) were either Netto or Lidl stores, while the corresponding figure for Northern Sweden (Norrland) was only about 2 percent.[4] Norrland is also more dominated by a few retailers than any other region in Sweden. Calculating Herfindahl-indices for the six dominant chains in the regional markets defined by the industry itself, we find that the Herfindahl-index is 0.46 for the northern part of Norrland (Lappland, Norrbotten and Västerbotten) and 0.37 for the southern part of Norrland. The mean for the remaining six regional markets is a more modest 0.32, ranging from 0.28 for greater Stockholm to 0.35 for Mälardalen (west of Stockholm). This pattern may be explained by distribution costs and large scale economies, which enable only the largest chains to be successful in remote areas with low population density. Ellickson (2007), for example, finds that concentration in the retail industry is somewhat higher in such areas in the U.S., although concentration remains high even in large core markets.

The concentration of Swedish local markets is growing as Swedish grocery stores are becoming significantly fewer and bigger. This development may be a double-edged sword, since on the one hand it may increase efficiency through economies of scale, but on the other hand it may

[3] The second largest grouping, Coop, on the other hand, is allowed to make central decisions on prices.
[4] "All stores" refers to all ICA, Coop, Axfood, Netto and Lidl and thereby excludes the smallest food shops. Own calculations based on Delfi Marknadspartner et. al. (2009).

aggravate the competitive situation on local markets.[5] In the period 1996-2002, the total number of Swedish grocery stores decreased by 16 percent, while the average firm size increased by 50 percent (Maican and Orth, 2009). The trend of larger and fewer stores is continuing as the share of hypermarkets increased from 2.2 percent to 3.1 percent, at the same time as the number of overall stores decreased by 3 percent, in the short time span 2005-2008.[6]

Another recent feature in Sweden, as well as in most industrialised countries, is the remarkable growth of private labels. The market share for private labels was 18 percent in 2008, which was an increase from 11 percent just five years earlier (ACNielsen, 2003&2009).[7] Private labels tilt market power to retailers' advantage by increasing buyer power and providing retailers a new role as producers and innovators of goods.[8] Private labels may also increase horizontal market power since they facilitate coordination among stores and may act as a tool to discriminate among consumers. The literature suggests that private labels facilitate retailers' price differentiation across consumers and reap larger margins on leading national brands, as brand-loyal consumers are price insensitive. Private labels also differentiate retailers and make it harder for consumers to detect price and quality differences across retailers, which can soften competition among stores (according to chain affiliation), although empirical studies on this subject are scarce.[9]

Studies on Competition on Local Retail Markets

The literature on retail food prices and competition focuses mostly on whether an increased competition, measured by concentration or new entries, in a geographical defined area has any

[5] See Dawson (2006) and Bergström (2002).
[6] Own calculations from Delfi data. Note however that one may observe a countervailing trend that has continued for a number of years, which is an increased number of small stores with few products and long opening-hours. Hence traffic stores have gained market shares parallel and opposite to the expansion of larger stores since the 1970s (Bergström, 2002).
[7] Although the market share for private labels of total sales is increasing over time, it is quite modest in a European perspective. In many European countries private labels exceeds a market share of 20 percent with the top notice 45 percent for Switzerland (ACNielsen, 2005).
[8] It is likely that the consolidation of retailers itself promotes the growth of private labels as the development of private labels demands investments.
[9] Studies have provided mixed results of the effect of private labels on prices of national brands (Bontemps et. al., 2005). Bontemps et. al. (2005) argue that one has to distinguish between categories of private labels in order to understand their impact on national brand prices. For Sweden, results suggest that the introduction of private labels has lowered prices on national labels.

disciplinary effect on prices or not.[10] In short, this literature underlines that a high concentration in retailing is associated with higher prices (see Cotterill, 1986, 1999 and Cotterill and Putsis, 2000). In addition to the effect of concentration on prices, the deepening interest in price competition in recent years has also been fostered by the major expansion of Wal-Mart. One reason for this is that Wal-Mart has significantly lowered prices and empirical studies have shown that an entry of Wal-Mart has a significant effect on the price level of incumbent firms. Capps and Griffin (1998) found, for example, that the presence of Wal-Mart in a U.S. county reduced the prices in stores belonging to smaller chains by as much as 21 percent.[11]

Studies on price competition on European retail markets are fewer and more ambiguous. Alto-Setälä (2002 and 2003), using individual store prices in Finland, found no impact on market concentration, measured as Herfindahl-indices, on prices. The dispersion of food prices was better explained by search costs (such as low budget shares and low price) and demographic variables (such as high proportion of families with children and high income). Alto-Setälä *et al* (2004), however, revised this finding since they found a positive impact on food prices and market concentration. Giulietti and Waterson (1997) also questioned the effect of competition between stores and store types in Italy since such competition did not erode the discriminating price behaviour of firms, which was explained by a very strict planning regulation.[12]

One reason for ambiguous results may be the problem of defining the local market, since studies incorporating the actual distance between stores suggest that the local market is indeed narrow and should be defined according to single kilometres or the closest competitor. In addition, individual store characteristics may be very important for an understanding of the spatial boundaries of the local market. Fik (1988), for example, spatially modelled price competition as price-reaction functions in the metropolitan area of Tucson in the U.S. He then showed, using individual store prices together with the distance to the nearest competitor, that the intensity of price reaction is a decreasing function of distance. Similar moderations of the competitive

[10] Although Fox and Sethuraman (2006) distinguish four important dimensions of retail competition (price, variety - number of categories – assortment - number of items within a category - and store location), the most studied one is price competition.
[11] The substantial impact on prices of the entry of Wal-Mart has been further emphasised by Basker (2005), focusing on non-food prices, Hausman and Leibtag (2007), using consumer scanner data, and by Volpe and Lavoie (2008), using primary price data.
[12] The discriminating behaviour in the Italian case was strengthened in a follow up by Giulietti (1999).

pressure with distance have been found for employment growth (Haltiwanger *et* al, 2010) as well as for revenue losses (Zhu and Singh, 2009) on the U.S. food retail market. Both studies suggest that the competitive pressure from a store is prominent on other stores located within a few kilometres and that the impact rapidly declines with additional distance. The negative effect of a competitor entry on employment growth was only one third after a distance of one and a half kilometres to the entering competitor, while the effect on revenue losses was halved after three kilometres. In addition, Zhu and Singh (2009), among others, stressed the importance of store characteristics for understanding the spatial competition. They found, for example, that the Wal-Mart supercenters were the only ones that competed beyond 15 kilometres. Woo *et al* (2001) found that the entry effect of Wal-Mart differed across formats, and the results of Cleeren *et* al (2009) also underscored the importance of formats since they found that intra-format competition was significantly stronger than inter-format competition among supermarkets.[13]

When it comes to price competition on the Swedish retail market, Asplund and Friberg (2002) are the most cited and they found, in line with studies from the U.S., that concentration (measured with Herfindahl indices) was associated with higher prices. This relationship was valid for both the local concentration of stores and the regional concentration of retail chains.[14] The effect was, however, rather weak and no significant effect was found for wholesale concentration on the local market. The rather weak relationship between concentration and price competition was underlined by the Swedish Competition Authority (2002). They used scanner data for a wide range of products and found no significant relationship between market concentration (measured as Herfindahl indices on municipality level) and price differences across municipalities. On the other hand, they found some evidence of local competition since, as expected, the geographical distance to the closest competitor (store) was positively correlated with prices. In addition, consumer studies support the view of a negative relationship between competition and distance; Swedish consumers have been found to be very sensitive to travelling distances when it comes to shopping for non-durables (Lundberg et. al., (2004) & Lundberg and

[13] The findings in Gonzales-Benito *et al* (2010) strengthen the importance of store formats when it comes to understanding the spatial competition. They found that the revenues of a hard discounter dropped 41 per cent when it was located 300 instead of 500 meters from the closest competitor but only 5 and 11 per cent if the competitor was a supermarket and a supercenter, respectively.

[14] Locality in their study usually corresponds to the postal area.

Lundberg (2010)).[15] The results in these studies suggest that consumers buy about 60 per cent of all their non-durables in their most favoured store, and 85 per cent in their two most favoured stores.[16] However, Svensson (2004) found that the loyalty to a particular store may be very different depending on the locality. Households in Stockholm were found to be more disloyal in their purchasing behaviour than in other Swedish cities.[17]

Modelling price competition

The focus of this study is to assess how local the Swedish food market is, and whether the composition of the market affects the competitive situation. Two major approaches to analysing price competition are found in the literature. One approach, and an often used one, is to base the analysis on a reduced form of the competitive pressure. The reason for using a reduced form is the number of possible relationships between prices and market structures, which depends on the strategic variable used by firms (price versus quantity) as well as the possibility of collusion (see the discussion in Asplund and Friberg, 2002). This approach may take the following form:

$$p_k = X_k \beta + \varepsilon_{k,} \qquad (1)$$

where p_k is the observed price of firm k and X is a matrix with exogenous variables, and β is a vector of parameters to be estimated. The exogenous variables in such a model should reflect the supply and the demand situation of the market, the market structure (e.g. Herfindahl indices or concentration ratios for each market), and the characteristics of the observed firm. This approach may, however, be associated with several econometrical problems. One such problem may be endogeneity, because a store's price decision is affected by the local market, and the local market structure may not be detached from the pricing behaviour of the stores in that particular market. An additional problem is that the use of administrative borders, when different market-structure variables are calculated, may bring about a spatial interdependence, as the geographical

[15] Surveys conducted by the Swedish Institute for Transport and Communication Analysis suggest that the travelling distance with the main purpose of buying groceries is 9.83 kilometers (Maican and Orth, 2009).
[16] The most favored store is most likely also the closest one since walking was the most common way to get to the favorite store.
[17] This may of course be a consequence of diverse travelling costs between areas with different population density.

aggregation of stores may not coincide with the "competition area" of these stores. That is, we may construct a spatial pattern in our data.

The other approach, and the one chosen for this study, is to take our point of departure from a specific reaction function. The approach used in this study was developed by Pinkse *et al* (2002), who proceeded from the fact that "*consumers purchase one or more of several variants of a differentiated product*" (p. 1115) without determining whether the competition was local or global (their framework nested local and global models). In short, seller l (a store in this case) sells its product with the characteristic y_l (e.g. the level of convenience) at a nominal price p_l. Each buyer has its own unique localisation in space, which implies a unique utility function (approximated by a flexible normalized quadratic function) that depends on the varieties reached by the consumer from this particular point. The derived demand for store l's product may be used in its profit function in order to derive the following reaction function (see Pinkse et al, 2002; Pinkse and Slade, 2004; and Pennerstorfer, 2006):

$$p_k = R(p_{-k}) = \frac{1}{-2d_{kk}^A}\left(\alpha_k - d_{kk}^A c_k + \sum_{l \neq k} d_{kl}^A p_l + \sum_l d_{kl}^B y_l\right), \qquad (2)$$

where c_k denotes the marginal costs of firm k, p_l the price level in store l (1, ..., n), y_l the characteristics of the product sold, and (d_{kl}/(-2d_{kk}) the slopes of the reaction functions (with respect to prices, superscript A, or to characteristics y, superscript B) indicating how a firm reacts to other firms' prices or product characteristics. As we assume that the demand for i's output falls with its price level, the slope (i.e. d_{kk}<0) of the reaction function is always positive. Moreover, an important characteristic of the slope of the reaction function, as pointed out in Pinkse *et al* (2002), is that it is proportional to the diversion ratio. Hence, it is correlated with the proportion of all consumers switching from i to j when i's product becomes relatively more expensive. We, as in Pinkse et al (2002) and Pennerstorfer (2006), assume that a firm's reaction depends on how close the two competitors are. It is rather probable that a price fall in one store will have a smaller impact on the price decision of a store 50 km away compared to a store only 1 km away. Hence the impact of competitors' price and characteristics on the price of firm l

depends on the spatial distribution of competitors around it. This is expressed in the following specification used in our analysis:

$$\mathbf{p} = R(\mathbf{p}_{-l}) = \mathbf{X}\beta + \mathbf{WZ}\delta + \mathbf{Wp}\gamma + \mathbf{e}, \qquad (3)$$

where **X** is a matrix with the cost and demand factors associated with the observed firm, **Z** is a matrix of characteristics (may be a sub set of **X**) that influence the pricing decision of our observed firm through its neighbours (defined by the weight matrix **W**), **p** is the price vector, and β, δ and γ are parameters to be estimated. The specification in equation (3) has a similar endogeneity problem to the one discussed above, since the price of store *l* is explained by the price level of its neighbours. In addition, the distance to competitors may be endogenous as the choice of location depends on the location of competitors.

We consider this endogeneity in **Wp** by following the approach of Pinkse *et al* (2002), and hence we determine a set of spatial weight matrices (**W**) endogenously by considering both distance to and the price level of neighbours when we determine the set of relevant competitors. The first weight matrix is defined by the nearest neighbour when distance between stores is determined as the Euclidean distance times a transport cost plus the price level of the neighbour (i.e. the competitive distance between store *i* and *j* is defined as $ED_{ij}t + p_j$, where ED is the Euclidean distance in meters, *t* is the transport cost and p_j the price level).[18] This implies that the competitive distance increases with the distance to and price level of potential competitors. Thus, each row in the endogenous nearest-neighbour weight matrix, $\mathbf{W}^{ne}$ (where *n* stands for nearest neighbour and *e* endogenous) singles out the competitor with the shortest distance. The second endogenous weight matrix ($\mathbf{W}^{de}$) is defined by all stores within a price adjusted Euclidean distance, and we use a threshold of 1,000 meters.[19] We extend this circle by means of an adjusted Euclidean distance of 1,000 to 10,000 metres as well as a distance of 10,000 to 20,000 metres. Since we have information of the coordinates of all stores, we escape the problem of using

[18] The transport cost is approximated by the petrol price (around 13 SEK) per liter and the use of petrol per km in order to transport oneself between two stores, and we assume that the per liter consumption level is one liter per 10 km.

[19] We use, as in Pinkse *et al* (2002), the following function to $1/\{0.001(ED_{ij}+[p_j-p_i]/t)+1\}$ to determine the competitive distance between stores, where ED is the Euclidean distance.

administrative borders, and we have the opportunity to compare nearby with arm's length competition and may therefore investigate the geographical pattern of competition.

Our next step is to determine spatial weight matrices exogenously (see also Pennerstorfer, 2009), and the first one is defined by the nearest neighbours ($\mathbf{W}^{nx}$, where *n* stands for nearest neighbour and *x* exogenous), which implies that each row in the spatial weight matrix singles out the closest competitor according to the Euclidean distance without adjusting for price differences. The second weight matrix is defined by a threshold so that all firms within a critical distance (Euclidean distance) are defined as competitors while firms further away are not ($\mathbf{W}^{dx}$).

Data

Data sources

Our price data, as in Asplund and Friberg (2002), are nationwide store-level price data collected annually by the National Organization of Pensioners (PRO) to compare not only price levels across time but also geographical regions as well as chains and formats. Prices are observed for 60 items of which 54 are food items in the range from convenient stores to hypermarkets.[20] We have chosen to use PRO price data for the year 2007 since it is the most recent year for which we could match store prices with a full set of demographic and spatial information used in the subsequent analysis. Still, the sample of items and stores in the PRO dataset is not representative for the overall food consumption, but the virtue of the PRO price data is that it is sampled in a single week and therefore no corrections are needed for differences due to seasonal adjustments.[21] In addition, the dataset covers a large number of stores, a total of 1 153 in 2007, and it is also possible to match price information with other store characteristics since the identity of each store is public.[22] Therefore, we have merged the information on prices for individual stores with information from Delfi Marknadspartner, which covers all food retail stores in Sweden and consists of a number of store characteristics. These characteristics are; the local address, the location of the retailer's distribution central, retail chain affiliation, format classification, annual sales and selling space. In addition to these store characteristics, we include local information (at a municipality level) on average income, population and size in hectares.

[20] Prices for 60 items have been collected since 2004 (prices for 40 items were collected prior to 2004).
[21] The sample covers around 25 per cent of all stores in Sweden and it is biased towards larger stores since it makes up around 50 per cent of the total revenue in Sweden.
[22] Since we have not been able to identify 31 stores, our sample consists of 1 122 stores.

Finally, with the assistance of Lantmäteriet (the Swedish mapping, cadastral and land registration authority) and internet search engines , we have matched 97 percent of all food retailers in Sweden with their corresponding coordinates.[23]

Before we present some descriptive figures of our dataset, we would like point out that the PRO dataset has been facing some critique, because some stores seem to temporarily lower their prices the same week (or day) the prices are collected. The incentive for doing so is evident, as PRO's price registrations earn significant media attention and the collected prices are easily accessible on the internet. Our subsequent analysis supports such a notion, but as items change over time we believe that we are able to circumvent the problem of rigged prices. The PRO's basket of items always includes 60 goods and is quite rigid over the years, but novel items are introduced occasionally. If these replacement items are harder to anticipate than the recurrent price registrations, then they should more accurately measure the pricing behaviour of the stores.[24] In order to appear as a low-priced store without lowering all prices, a well informed store may lower the prices of goods that are likely to be included in PRO's sample. Hence, stores applying this strategy (compared to those that lack the same resources or information to do so) are expected to have comparatively low prices for items included in the PRO's sample the previous year. The potentially different pricing behaviour between recurrent and novel items is tested in the Appendix using independent stores (or stores not affiliated with the big grocery chains) as a reference group. The results suggest that the bigger chains use different pricing behaviour and hence we focus our analysis on the novel items in the PRO dataset, although we also use the recurrent goods as a robustness check.

Variables and descriptive figures

Our variable of interest is the price level of a store. We construct a store level price index as in Asplund and Friberg (2002). It is calculated by dividing the price of good i in store k with the

[23] The internet search engines Eniro and Hitta.se were used.

[24] Between 2006 and 2007, nine items were replaced; medium fat milk (1.5 percent fat content) replaced high fat milk (3 percent fat content), fresh chicken replaced frozen chicken, dish washer tablets replaced dish washer powder, brand changes were made for ketchup, tooth paste, spaghetti, and baby food (gruel) while a new product, entrecote, was introduced.

average price of good *i*. and the price index of store *k* is then defined as the mean price index of all goods. Formally, the price index for store *k* is written as follows:

$$PI_k = \frac{1}{n_I}\sum_i (p_{ik} / \frac{1}{n_K}\sum_k p_{ik}), \qquad (4)$$

where p_{ik} is the price of good *i* in store *k*, n_K is the number of stores, and n_I is the number of goods. We use two different baskets of goods, one consisting of only novel items and the other of only recurrent items.[26] As is shown in Table 1, prices are a little more than 50 percent higher in the most expensive store compared to the cheapest one. Reflected by the standard deviation, prices differ, on average, by about 6 percent compared to the average store, and the prices vary somewhat more for the basket of recurrent goods. The price variation is considerably smaller than the 9 percent standard deviation in Asplund and Friberg (2002) where the most expensive store was almost twice as expensive as the cheapest store. If we limit the number of items in order to reproduce their sample (with the exclusion of cocoa as it is not included in PRO´s sample anymore), we find, however, a rather similar price variation (around 8 percent and the most expensive store is more than twice as expensive as the cheapest one).

[Table 1 about here]

Since we have price information for around 25 per cent of all stores in Sweden, it implies that we lack the information with which to capture the complete competitive situation around all stores (i.e. **Wp** in equation 3) as long as one neighbour, defined by **W**, does not belong to the observed sample. We do, however, have full information on all neighbours when it comes to store and municipality characteristics, and we make use of this information in two ways in order to approximate the local competitive environment. The first approach is to predict the price level for all stores missing this information with a heckit model, as PRO is more likely to collect price information from stores with a certain size and location. The first step is to regress, using a probit model, a dummy, taking the value of one when the price information exists, on store

[26] We use unweighted averages since we lack detailed information on the consumption shares of goods included in the PRO datset.

characteristics (sales area, turnover and a dummy indicating whether the store was included less than five years ago), municipality characteristics (average income, population density and area in hectares) and a set of regional dummies (we use 85 regions and each region consists of 2-3 municipalities). In the second step we regress the price level on store characteristics (sales area, turnover and a hard discount indicator), municipality characteristics (average income and population density), mills ratio from the first step and our set of regional dummies.[27] The final step is to predict the price level of all stores, which we use as an approximation of the price level when we lack this information. A comparison between the predicted and the actual price level shows a high similarity with a correlation around 0.64 (around 0.68 per cent when we consider the recurrent products). The second approach is more direct since we exclude all prices, even those collected, on the right hand side of equation (3) and approximate the price competition by the sales area of each store. Hence we substitute **Ws** for **Wp** in equation (3), where **s** is a vector of inverted sales areas.[28] In addition to approximating the competitive pressure from neighbouring stores, we also investigate the robustness of our results when we consider price competition from the closest neighbours by restricting the sample to those firms that have a nearest neighbour with price information from PRO. This implies that we restrict our sample to half the size, since around 48 per cent of all stores with price information have a closest neighbour from which prices have been collected.

In addition to the price competition from neighbouring stores, the price decision of each store is influenced by its cost structure (c_k in equation 2) and characteristics other than prices (y_l in equation 2). These variables (called the cost and demand variables) relate to both the firm's own as well as its competing stores' characteristics. When it comes to the own store variables, we approximate the cost structure by the scale of the store (sales area) since economies of scale and scope have been pointed out as important in retailing (Ellickson, 2006). The larger the scale or scope, the lower is the price. We also incorporate dummy variables for the different retail groupings since they distinguish themselves from each other when it comes to convenience, private labels, and management. Hence we use four dummies in order to capture the

[27] We do not report these estimations for brevity, but they are available upon request. Note that the mills ratio is highly significant in our second step, most coefficients are precisely estimated and all variables are logarithmised.
[28] Sales area is highly correlated with price level and it explains around 30 per cent of the variation in price levels when we use only sales area in a regression.

characteristics of ICA, COOP, Axfood and Bergendahls (the four largest retail groupings), while all other stores are used as a benchmark. We also incorporate a format dummy indicating whether the firm is defined as a hard discounter or not. Variables other than the firm's own characteristics may be regional or local aggregates such as population and income (as in Pinkse *et al*, 2002) or spatial aggregates of the characteristics of competing stores in the neighbourhood (as in Pennerstorfer, 2009). We use both these types of variables. The average income and the population density of each municipality are included both as demand and supply variables, as a higher income level may lead to higher demand and higher prices while a high population density may lead to higher real estate prices, and hence increased costs. Another important characteristic when it comes to the composition of the local market is to consider the impact of a hard discounter. Table 1 shows some descriptive figures.

When it comes to the spatial environment of the stores in Sweden, the distance to the nearest neighbour is rather short and the median distance is around 500 metres (based on the Euclidean distance), although it differs between municipalities and store formats. Figure 1 shows the average distance to the nearest neighbour as well as to the nearest larger store when the sample is divided into larger municipalities (more than 80,000 inhabitants) and larger stores (bigger than 2,000 square metres). Larger stores often face closer competition, but this competition is formed by smaller stores since the average store keeps larger stores at arm's length. Finally, the distance to the closest competitor is always much longer in smaller municipalities, especially when we consider the distance to the nearest larger competitor.

[Figure 1 about here]

Results

The first set of results is found in Table 2, which shows the estimates from a OLS regression without considering the endogeneity problems of choosing the closest neighbour with the help of the price adjusted spatial weight matrix ($\mathbf{W}^{ne}$) in equation 3. Three different specifications are used as a robustness check and the goodness of fit is around 0.34 in all cases, which suggests that we explain a relatively large part of the price variation in the sample. The first specification uses the complete sample of stores, and the results indicate a positive correlation between the price of the store and the price of the neighbour. Hence the results suggest that there is a competition among stores and a ten per cent increase of the average price level of the nearest neighbour implies that the store in focus may increase its price level by one per cent. It is also interesting to see that the nearest neighbour's price is also the one with the highest economical importance since the elasticities of the other variables are either rather small or in several cases insignificant, especially when it comes to chain affiliation. If we consider specification 2 in Table 2, then it is revealed that the competition effect holds even after a reduction of the sample, so that only stores whose price level is based on collected prices instead of predicted ones (i.e. only store pairs found in the PRO sample) are considered. It is not only significant, but also stronger, and the result suggests that a 10 per cent increase of the neighbour's price level increases the price of the store by 3 per cent. Finally, we investigate whether we can discern any competitive effect when the inverted sales area of the nearest neighbour is used instead of the price level (collected or predicted). The competitive effect using this specification (number 3 in Table 2) is, however, insignificant (p-value around 0.16), although the relationship is in line with a competitive relationship with the nearest neighbour.

The second most important explanation for the price level of Swedish stores is the size of the store, which may reflect economies of scale and scope faced by food retailers. If the store increases its sales space by 100 per cent, the price level may fall by 3 per cent. The format of the stores is also important, and stores defined as being hard discounters have marginally lower prices. Finally, the demographic variables are also highly significant, although the economic importance for an individual store is rather small, and the prices may be higher in more populated as well as in richer areas.

[Table 2 about here]

The second set of results, based on instrumental variable (IV) estimates, is found in Table 3, and we present three similar specifications to those in Table 2. The endogenous variables in this model are not only the price of the nearest competitor but also the size of the firm, since economies of scale and scope are important when it comes to price behaviour. The instruments used in the regression, in addition to all the exogenous variables in the model, are; six regional dummies (upper north, lower north, middle east, middle west, south and Gothenburg), the herfindahl index (based on sales) within a 50 km and the sales area of the nearest competitor (based on the exogenous spatial weight matrix). Hence the economic structure in the broad neighbourhood of each store is used as instruments. In addition, we use the average size of stores more than 10 km but closer than 20 km away, since there is a risk that the size of the closest neighbour is endogenous (i.e. we used $\mathbf{W}^{dx}$). Several tests (as in Pinkse et al, 2002) have been performed in order to evaluate the instruments. First, we apply Hansen's J-test of overidentification for all IV-estimates, and the nullhypothesis of a valid model is never rejected. Second, we investigate whether the instruments explain the endogenous variables or not, and they do since the p-value related to the F-test, where the null assumes that all the coefficients equal zero when we regress each endogenous variable on the instruments, is lower than 0.00 in both cases. In addition, only one of the instruments (the dummy for upper north of Sweden) has a p-value above 0.10 in both cases. Hence the instruments seem to be valid explanatory variables of the endogenous variables. Finally, we evaluate whether the instrument of the average size of the neighbouring stores (those between 10 and 20 km away from the store) is a valid explanatory variable in equation (3) or not (using the average size of the stores between 20 to 30 km way as an instrument instead). The effect is insignificant, and hence should not be included directly in the reaction function.

If we consider the results of the IV regression, we find that they echo the ones just discussed above. The only differences are that the price competition seems to be even stronger compared to the OLS estimates and that the inverted sales area of the nearest competitor is significant when instruments are used. Additional results using the IV approach are found in Table 4, which shows how the competitive effect wears off with distance. That is, the relationship between a store's and its competitors' pricing within a distance of one km is very similar to the relationship with the closest competitor. However, this relationship is insignificant as soon as the distance is more than one kilometre. Accordingly, our results underscore that price competition is very local. Additional variables in these regressions not used in Table 3 are the number of stores that are found within the distance evaluated in order to control for whether there is any competition, in addition to the average price level, from the number of competitors. The result is similar to the one given by the price information. A larger number of stores within a close distance disciplines the pricing behaviour of stores, but this effect wears off fast as no effect is found after a kilometre.

Robustness

In order to evaluate whether the results are robust or not, we use the prices of the recurrent goods used in PRO's price collection, and we also consider some alternative instruments. If we start with the alternative prices (see Table 5), then we can see that the results are very robust. The results point out that we have a positive pricing relationship between the close competitors, and that the levels of the estimates are also in line with each other. Hence, the results are not sensitive to whether we use the recurrent prices or not. The only difference found between these two price indices is that one of the chain dummies (the one for the largest chain) becomes significantly negative.

The second set of robustness results is found in Table 6, which shows the results from similar regressions to the above (rows 1-4), but with different instrumental variables (column i-iii). In all regressions we use the Herfindahl index within 50 km and broad regional dummies as instruments but the characteristics of the neighbouring stores differ. In the first column (i) we use the same exogenous metrics to define the neighbours, which implies that it is neighbours at arm's length, rather than the price information, that is used as an explanatory variable. That is, we use the average sales of exogenously determined neighbours between 10-20 kilometres away as an instrument in regressions 1-2, 20-30 kilometres away in regression 3 and 30-40 kilometres away in regression 4. We also include, in addition to the average sales area, a rough measure of the neighbours' productivity (revenue per square meter). In the second column (ii), we use the same instrument as above, but we change the metrics to match the competitive distance in focus (i.e. the sales are of the exogenously determined nearest neighbour when the price of the nearest neighbour is in focus etc.). Finally, we exclude all characteristics of the neighbours and focus on broader regional dummies and the Herfindahl index within 50 km in column (iii). The results are similar to the ones already discussed. First, the local competition is notable. The only exception is that the competitive effect (although still positive) drops slightly when we use the same exogenous metrics as the price competition in focus. Second, the competitive effect wears off quickly and disappears after one kilometre. Third, the instrumental variables seem to be valid according to different tests.

Conclusions

This study focuses on the geographical boundaries for price competition of food retailers on the Swedish market. Our study therefore sheds light on how narrow local competition indeed is, and hence provides insight into how municipalities may react to stimulate food retail establishments to increase competition and lower prices within their boundaries.

Our data consist of the exact location and detailed characteristics of all food and beverage stores in Sweden, which, merged with price information on a large sub-set of stores, enables us to investigate the geographical pattern of competition. Instead of modelling local competition according to administrative borders, we use the exact spatial distribution of stores to determine the set of competitors a store faces. As both prices and location can be assumed to be endogenously determined, we use various instruments in the analysis to circumvent the problem of endogenity.

The results support the notion that the larger size of a store substantially lowers prices. Another finding is that prices are positively associated with population and wealth, although the economic importance is small. We show that the price competition is substantial among neighbouring stores within a kilometre. A 10 percent increase of its neighbour's price increases a store's price by about 3 percent. However, the effect wears off quickly, as no significant effect is found between stores separated by a distance of more than one kilometre. Consequently, we conclude that the competition among Swedish food stores is indeed local, and that our definition of local competition is more narrowly defined than in most previous studies.

Our results have important policy implications as the area of a municipality should be considered as many small local markets for food retailing. Our study therefore supports the notion found in studies of Swedish consumer behaviour; i.e., that the consumers' main food store is close in terms of distance. An entry of a food store hence has a major impact on the consumption patterns within a close distance, while consumers and stores at the other end of the city are more or less unaffected. Hence, our findings have obvious policy implications that should serve as guidelines when it comes to price competition on the Swedish food retail market.

Tables

Table 1: *Some descriptive statistics*

Price index	Definition (source)	Mean (min/max)	Standard deviation
Price index: Novel goods	Se equation 4 (PRO)	0.99 (.83 / 1.28)	0.58
Price index: Recurrent goods	Se equation 4 (PRO)	0.99 (.82 / 1.23)	0.63
Sales area	Square meters (DELFI)	1,283 (90 / 13,000)	1,132
Average income	Average income on municipality level in thousands of SEK (SCB)	217 (173 / 409)	29
Population density	Total population per square kilometer at municipality level (SCB)	420 (0.3 / 4,228)	1,016
Square kilometers	Municipality level (SCB)	1,280 (8 / 19,371)	1,961
Number of stores 1,114			

Note: PRO stands for Pensionärernas Riksorganisation, SCB for Statistics Sweden and DELFI for Delfi Marknadspartner.

Table 2: Nearest neighbour, OLS-regression[a]

Variables	Coefficient (p-value) {marginal effect}		
	(1)	(2)	(3)
Price of nearest neighbour (based on $\mathbf{W}^{ne}$)	0.114 (0.00) {**0.120**}	0.326 (0.00) {**0.331**}	
Sales area	-0.00002 (0.00) {**-0.031**}	-0.00002 (0.00) {**-0.027**}	~0 (0.00) {**-0.032**}
Inverted sales area of competitor (based on $\mathbf{W}^{ne}$)			0.535 (0.14) {0.002}
Dummy for hard discounter	-0.0712 (0.00) {**-0.0002**}	-0.055 (0.00) {**-0.0001**}	-0.073 (0.00) {**-0.0002**}
Population per square metre	0.002 (0.00) {**0.002**}	~0 (0.39) {-0.0001}	~0 (0.00) {**0.002**}
Average income	0.0001 (0.02) {**0.031**}	0.0001 (0.17) {0.025}	0.002 (0.02) {**0.033**}

Additional variables included [b]	Yes	Yes	Yes
Adjusted R-squared	0.34	0.35	0.32
Reduced sample [c]	No	Yes	No

Note: [a] We have suppressed the constant and all p-values are based on robust standard errors clustered around municipalities. [b] Additional variables included are chain affiliation dummies. [c] Reduced sample implies that we exclude all stores for which the price level of the nearest competitor is based on predictions instead of collected prices.

Table 3: Nearest neighbour, IV-regression[a]

Variables	Coefficient (p-value) {marginal effect}		
	(1)	(2)	(3)
Price of nearest neighbour (based on $\mathbf{W}^{ne}$)	0.469 (0.00) {**0.489**}	0.660 (0.00) {**0.660**}	
Sales area	-0.0001 (0.00) {**-0.055**}	~0 (0.28) {-0.013}	~0 (0.00) {**-0.034**}
Inverted sales area of competitor (based on $\mathbf{W}^{ne}$)			0.588 (0.08) {**0.002**}
Additional variables included [b]			
Hansen's J-test (p-value) [c]	2.12 (0.91)	2.13 (0.91)	10.41 (0.17)
Adjusted R-squared	0.30	0.27	0.32
Reduced sample [d]	No	Yes	No

Note: [a] We have suppressed the constant and all p-values are based on robust standard errors clustered around municipalities. The instruments used in the regression, in addition to all the exogenous variables in the model, are; six regional dummies (upper north, lower north, middle east, middle west, south and Gothenburg), the Herfindahl index (based on sales) within a 50 km and the average sales area of the competitors between 10 to 20 km away (based on the exogenous spatial weight matrix $\mathbf{W}^{dx}$). [b] Additional variables included are chain affiliation dummies, a dummy for hard discounters, and the population density as well as the average income of the municipality. [c] This is a test of overidentification. [d] Reduced sample implies that we only include stores with closest neighbour and with collected prices instead of predicted price level.

Table 4: Neighbours determined by price adjusted Euclidean distance, IV regression

Variables	Coefficient (p-value) {marginal effect}			
	(1)	(2)	(3)	(4)
Average price within 1 km	0.650 (0.00) {**0.674**}			0.730 (0.00) {**0.757**}
Average price within 1-10 km		-0.198 (0.31) {-0.213}		0.088 (0.45) {0.095}
Average price within 10-20 km			0.154 (0.29)	-0.237 (0.14)

			{0.166}	{-0.256}
Sales area	~0 (0.01) {**-0.032**}	~0 (0.17) {-0.021}	~-0 (0.61) {-0.007}	~0 (0.04) {-0.019}
No. of competitors within 1 km	-0.0021 (0.04) {**-0.005**}			-0.003 (0.02) {**-0.008**}
No. of competitors within 1-10 km		~0 (0.26) {0.003}		~0 (0.83) {0.0004}
No. of competitors within 10-20 km			~-0 (0.30) {0.002}	~0 (0.66) {0.0008}
Additional variables included [b]	Yes	Yes	Yes	Yes
Hansen's J-test (p-value) [c]	1.49 (0.96)	6.89 (0.33)	7.86 (0.25)	19.20 (0.51)
Adjusted R-squared	0.27	0.24	0.23	0.27

Note: [a] We have suppressed the constant and all p-values are based on robust standard errors clustered around municipalities. The instruments used in the regression, in addition to all the exogenous variables in the model, are; six regional dummies (upper north, lower north, middle east, middle west, south and Gothenburg), the Herfindahl index (based on sales) within a 50 km and the average sales area of the competitors between 10 to 20 km (in regression 1), 20 to 30 km (in regression 2) and 40 to 50 km (in regression 3 and 4) away (based on the exogenous spatial weight matrix $\mathbf{W}^{dx}$). [b] Additional variables included are chain affiliation dummies, a dummy for hard discounters, population density and the average income of the municipality. [c] This is a test of overidentification.

Table 5: Estimations using recurrent prices

Variables	Coefficient (p-value) {marginal effect}	
	OLS	IV
Price of nearest neighbour	0.107 (0.00) {**0.113**}	0.369 (0.00) {**0.389**}
Sales area	-0.00002 (0.00) {**-0.036**}	~0 (0.00) {**-0.061**}
Additional variables [b]	Yes	Yes
Hansen's J-test (p-value) [c]		10.34 (0.11)
Adjusted R-squared	0.43	0.15

Note: [a-c] see Table 4.

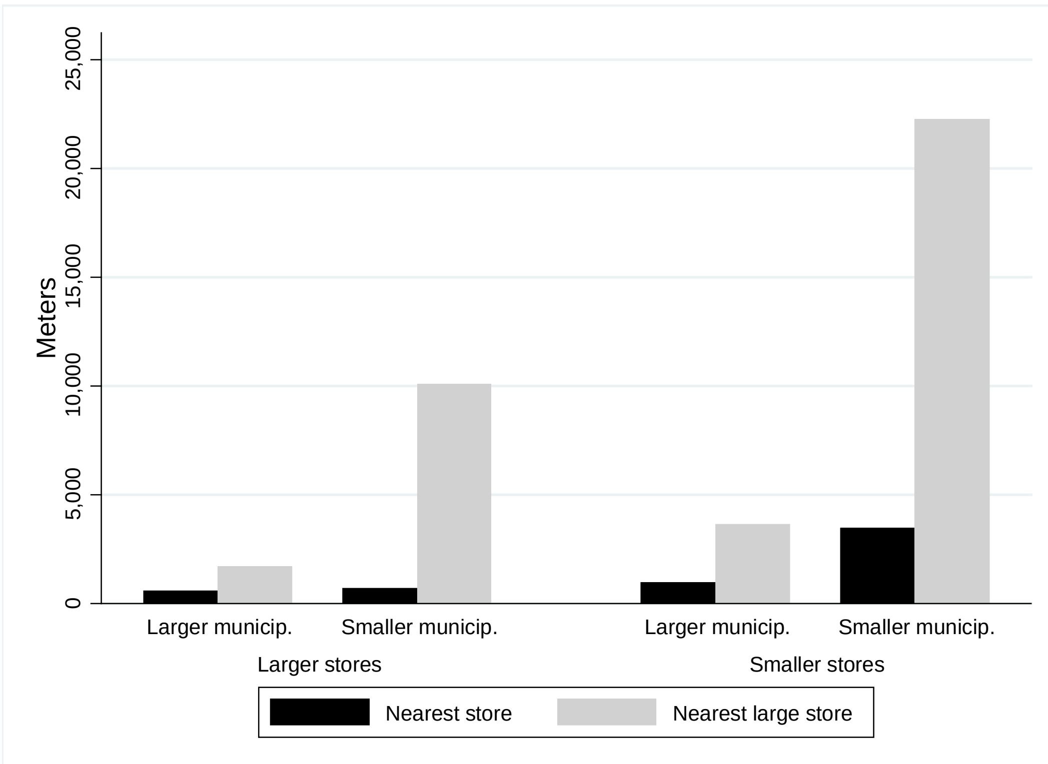
Table 6: Alternative instruments [a]

	Coefficient (p-value) {marginal effect}		
Instruments	(i)	(ii)	(iii)
Regressions			
(1) Price of nearest neighbour	0.451 (0.00) {**0.471**}	0.082 (0.03) {**0.085**}	0.429 (0.00) {**0.448**}
Spatial dimension of instruments	Between 10-20 km	Nearest	
(2) Average price within 1 km	0.631 (0.00) {**0.655**}	0.227 (0.00) {**0.236**}	0.478 (0.00) {**0.497**}
	Between 10-20 km	Between 0-1 km	
(3) Average price within 1-10 km	-0.123 (0.51) {-0.132}	-0.214 (0.39) {-0.231}	-0.662 (0.18) {-0.712}
	Between 20-30 km	Between 1-10 km	
(4) Average price within 10-20 km	0.142 (0.00) {0.153}	-0.013 (0.85) {-0.014}	0.218 (0.13) {0.235}
	Between 30-40 km	Between 10-20 km	
Instruments used (in addition to Herfindahl index of stores within 50 km and regional dummies)	Average sales area and productivity	Sales area	None
Instruments explain endogenous variables	Yes / Yes / Yes /Yes	Yes / Yes / Yes /Yes	Yes / Yes / Yes /Yes
Instruments explain dependent	No / No / No / No	No / No / No / No	No / No / No / No
Hansen's J-test p-value	0.94 / 0.96 / 0.28 / 0.11	0.20 / 0.25 / 0.14 / 0.09	0.86 / 0.95 / 0.97 / 0.11

[a] We have suppressed the constant and all p-values are based on robust standard errors clustered around municipalities. All regressions (1-4) are based on a IV-regression using different instruments (i-iii) and they all include the following variables; chain affiliation dummies, a dummy for hard discounters, population density and the average income of the municipality.

Figures

Figure 1: Average distance to nearest competitor.



References

Aalto-Setälä, V. (2003) "Explaining Price Dispersion for Homogeneous Grocery Products", *Journal of Agricultural &Food Industrial Organization* 1-14.

ACNielsen (2003) *The Power of Private Label – A Review of Growth and Trends around the World*, Executive News Report from ACNielsen Global Services July 2003.

ACNielsen (2005) *Lågkonjunkturen och dagligvaruhandeln*.

Anders, S. M. (2008) "Imperfect Competition in German Food Retailing: Evidence from State Level Data", *Atlantic Economic Journal* 36:441-454.

Asplund, M. and R. Friberg (2002) "Food Prices and Market Structure in Sweden", *Scandinavian Journal of Economics* 104:547-566.

Basker, E. (2005) "Selling a Cheaper Mousetrap: Wal-Mart's Effect on Retail Prices", *Journal of Urban Economics* 58:203-229.

Bergman, M. (2004) "Anpassas svenska priser till europeisk nivå?", *Ekonomisk Debatt* 37:21-36.

Bergström, F. (2000) "Är externa köpcentra et hot mot cityhandeln?", *Ekonomisk Debatt* 28:331-343.

Bergström, F. (2002) *Konkurrens och dynamik i detaljhandeln*, Forskningsrapport S66, Handelns Utredningsinstitut.

Bonnano, A. and R. A. Lopez, (2009), "Competition Effects of Supermarket Services", *American Journal of Agricultural Economics* 91, 555-568.

Bontemps, C., Orozco, V., Réquillart, V. and A. Trevisiol (2005) "Price Effects of Private Level Development", *Journal of Agricultural &Food Industrial Organization* 3:1-16.

Capps, O. and J. M. Griffin (1998), "Effect of a Mass Merchandiser on Traditional Food Retailers", *Journal of Food Distribution Research* 29:1-7.

Copenhagen Economics (2005) *Economic Assessment of the Barriers to the Internal Market for Services*, Report for DG Enterprise.

Dagens Nyheter, "ICA bluffar om sina låga priser", 2009-10-21,www.dn.se.

Dagens Nyheter, "Så gör Icas konkurrenter", 2009-10-21, www.dn.se.

Dawson, J. (2006) "Retail Trends in Europe" in *Retailing in the 21st Century – Current and Future Trends* (M. Krafft and M. K. Mantrala editors), Springer, Berlin.

Dawson, J. (2007) “Scoping and Conceptualising Retailer Internationalisation”, *Journal of Economic Geography* 7:373-397.

Delfi, DLF and Fri Köpenskap (2006) *Dagligvarukartan 2005*, www.dlf.se.

Delfi, DLF and Fri Köpenskap (2009) *Dagligvarukartan 2008*, www.dlf.se.

Dobson, P. W., Waterson, M. and S. W. Davies (2003) “The Patterns and Implications of Increasing Concentration in European Food Retailing”, *Journal of Agricultural Economics* 54:111-125.

Ellickson, P. B. (2006) “Quality Competition in Retailing: A Structural Analysis”, *International Journal of Industrial Organization* 24:521-540.

Fik, T. J. (1988) “Spatial Competition and Price Reporting in Retail Food Markets”, *Economic Geography* 64:29-44.

Fox, E. J. and R. Sethuruman (2006) “Retail Competition”, in *Retailing in the 21st Century – Current and Future Trends* (M. Krafft and M. K. Mantrala editors), Springer, Berlin.

Giuletti, M. (1999) “Price Discrimination in Grocery Trade: Evidence from Italy”, *Applied Economics* 31:319-329.

Giuletti, M. and M. Waterson (1997) “Multiproduct Firms’ Pricing Behaviour in the Italian Grocery Trade”, *Review of Industrial Organization* 12:817-832.

Haltiwanger, J., Jarmin, R. and C. J. Krizan, (2010), “Mom-and-Pop Meet Big-Box: Complements or Substitutes?”, Journal of Urban Economics, 67: 116-134

Hausman, J. and E. Leibtag (2007) “Consumer Benefits from Increased Competition in Shopping Outlets: Measuring the Effect of Wal-Mart” *Journal of Applied Econometrics* 22:1157-77.

Lundberg, J. and S. Lundberg (2010) *Retailer Choice and Loyalty Schemes – Evidence from Sweden*, Mimeo, Umeå University.

Lundberg, J., Lundberg, S. and L. Westin (2004) *Hushållens efterfrågan på dagligvaror och val av dagligvarubutik i Umeå kommun*, Cerum Working Paper, Umeå University.

Maican, F. and M. Orth (2009) *How do “Big-Box” Entrants Influence the Productivity Distribution in Swedish Food Retailing?*, Mimeo, University of Gothenburg.

Ohta, H. (1981) “The Price Effects of Spatial Competition”, *Review of Economic Studies* 48:317-325.

Pennerstorfer, D. (2008) “Spatial Price Competition in Retail Gasoline Markets: Evidence from Austria”, *Annals of Regional Science* 43:133-58.

Rosén, E. and U. Rämme (2009) *Hot eller möjlighet? En analys av externhandelns effekter på den etablerade handeln*, Handelns utvecklingsråd, Stockholm.

Svensson, T. (2004) *Hushållens inköp av dagligvaror i städer*, AB Handelns Utredningsinstitut, Stockholm.

Swedish Competition Authority (2002) *Varför är byggvaror dyra i Skåne och maten billig i Västsverige?* Konkurrensverkets rapportserie 2002:1.

Swedish Competition Authority (2009) *Konkurrensen på dagligvarumarknaden*, Uppdragsforskningsrapport: 2009:2.

Volpe, R. J., III, and N.Lavoie (2008), "The Effect of Wal-Mart Supercenters on Grocery Prices in New England", *Review of Agricultural Economics* 30:4-26.

Woo, J.-B., Huang, C. L., Epperson, J. E. and B. Cude (2001) "Effect of a New Wal-Mart Supercenter on Local Retail Food Prices", *Journal of Food Distribution Research* 32:173-181.

Appendix

Pricing behaviour between recurrent ant novel items in the PRO dataset

In order to test whether the pricing behaviour differs between the so-called recurrent and novel products, we regress the natural log of the price of the basket of recurrent items and novel items as well as individual items on; chain affiliation (binary variables), a dummy for the novel bundle, and the natural log of selling space.[29] Price premiums for novel goods are calculated as the difference between the effect of chain affiliation on recurrent and novel goods.[30] As is shown in Table A1 below, most chains have higher prices for the basket for novel goods compared to the reference stores, although the price premium expressed in percentages differs considerably between chains

Table A1: *Estimated price premium between novel and recurrent items*

Chain	Price premium
ICA	11.2 percentages ***
COOP	10.8 percentages ***
Willys	7.3 percentages ***
Hemköp	None
Bergendahls	None
Netto	14.0 percentages ***
Lidl	14.2 percentages ***

Notes: Price premiums are significant at the 1 percent level.

Performing a corresponding individual regression for each item separately underscores that the big chains are more systematically inclined to have lower prices on recurrent goods. Table A2

[29] Selling space is also interacted with the bundle consisting of novel goods as the price elasticity regarding selling space varies between items (. The reference group is independent stores not affiliated with the big grocery chains (which are relatively small) and convenience formats included in the Axfood group (Handlar'n and Tempo), which are mainly marketed by their location and not by their price policy.

[30] The price premium is calculated as follows: First, the average price of bundles for novel and recurrent goods is subtracted from the coefficient for chain affiliation (chain affiliation + chain affiliation for novel goods). Second, the price premium is then simply calculated as the difference in percentages between the impact of chain affiliation on the prices of the bundles for recurrent and novel goods.

summarises these regressions, and it is evident that the all but one (Hemköp) of the big chains have a lower price premium for recurrent products.

Table A2: *Positive and negative price premiums for novel and recurrent goods*

Chain	Positive		Negative	
	Recurrent goods	Novel goods	*Recurrent goods*	Novel goods
Ica	*8.3 %*	22.2 %	*58.3 %*	44.4 %
Bergendahls	*30.0 %*	33.3 %	*28.3 %*	22.2 %
Coop	*23.3 %*	44.4 %	*43.3 %*	33.3 %
Willys	*11.7 %*	22.2 %	*70.0 %*	55.6 %
Hemköp	*38.3 %*	33.3 %	*13.3 %*	22.2 %
Netto	*0 %*	11.1 %	*83.3 %*	77.8 %
Lidl	*13.3 %*	22.2 %	*58.3 %*	55.6 %

Note: Price premiums are significant at least at the 5 percent level.