Lear Competition Note

From the catchment area to the relevant market

A model of geographic market definition based on critical loss analysis

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Competition authorities throughout the EEA employ a variety of methodologies to define local geographic markets in mergers involving grocery retailers. In doing so, however, several authorities neglect the competitive constraint posed by competing stores located outside a given shop's catchment area. We suggest an accurate, consistent, and resource-efficient approach.

While the concept of relevant market has been under attack in the competition enforcement discourse recently, it continues to form an important pillar in the practice of competition authorities around the world.

A recent Lear Insight[1] outlined a particular issue arising in the definition of the relevant geographic market when consumption of a good entails transportation costs for end consumers, and competition among suppliers of that good is thus likely to be at a local level. Specifically, the Insight discusses the approach adopted by some competition authorities in their evaluation of mergers involving the markets for retail grocery: the Italian AGCM, for instance, assumed that if customers are willing to travel a maximum time of 15 minutes for their shopping, each shop is constrained by competitors within a 15-minute radius. We argued that, unless all customers are located exactly in the same location as the store, this approach leads to a systematic underestimation of the relevant geographic market's extension, as it neglects the simple fact that customers are willing to look for alternative shops located up to 15 minutes in the opposite direction. The Dutch and the French competition authorities made the same mistake, likewise in decisions concerning mergers in groceries retail.[2] By thus adopting a market definition that potentially misrepresents the competitive dynamics of the case, competition authorities risk harming consumers.

So far, so straightforward. But how, then, should a methodology capable of adequately accounting for the local dimension of competition be built? In the following, we provide an overview of common practices adopted by European competition authorities in the assessment of mergers in the retail grocery sector, before proposing a model of market definition based on critical loss analysis.

Review of common practices in the EEA

Identification of catchment areas

The starting point for the geographic market definition in retail markets is usually the identification of the area from which each shop draws its customers (the "catchment area"). This exercise is commonly carried out relying on two alternative approaches.

The isochrone method

Competition authorities often rely on survey-gathered evidence on the maximum travelling time customers are, on average, willing to travel when choosing their shopping venue. Based on these findings, the catchment area of each shop is then defined as the area surrounding it that can be reached within that time ("isochrone"). To illustrate what this could look like in practice, Figure 1 below shows isochrones of 4 and 8 minutes (in walking distance) around *Lear*'s office in Rome.

Figure 1: Isochrones around the Lear office

Source: traveltime.com.

The "real fingerprint" method

Alternatively, competition authorities have relied on sales data, typically collected through fidelity card programs, which allow retailers to track their customers' purchasing behaviour and, crucially, their residential address. On the assumption that fidelity card owners do not systematically tend to live in other areas than other customers, competition authorities are thus able to map each shop's geographical turnover distribution. The shop's catchment area is then assumed to include all the postcode areas surrounding it that generate a certain percentage of its revenue. Customers located further away are left out as presumed outliers, being likely to be "passing by" or one-off customers.

Compared to the isochrone method, this approach allows to identify catchment areas whose shape and extension are defined specifically for each shop. It is therefore sometimes referred to as the "real fingerprint" method.[3]

However, this approach may not always be viable. It requires detailed customers' data that may not always be available and it is resource-intensive in that it requires to define the catchment area separately for each store. Moreover, the high level of information and efforts do not necessarily lead to more accurate results: progressively widening the candidate market by adding postcode areas may lead to patchy catchment areas which neglect certain customers while considering some others located further away.[4]

From the catchment area to the geographic market

Whichever approach is adopted for identifying the catchment area, this area cannot simply be considered to form the relevant geographic market, as stores outside the catchment area may still pose a competitive constraint. As discussed in the introduction, ignoring these constraints would lead to a systematic underestimation of local geographic markets.

The German and Belgian competition authorities avoid this fallacy by considering those competing stores whose catchment areas overlap to form part of the same geographic market.[5] While, in principle, this is an appropriate way to account for competitive constraints posed from outside a store's catchment area, such an assessment should be based on the *extent* of such overlaps. Otherwise, the resulting market definition corresponds to effectively doubling the original catchment area and, as a result, overestimates the competitive constraints posed by shops located further away. Under reasonable assumptions on population distribution, the truth is likely to be in between.

Lessons from the review of common practices in the EEA

To sum up, competition authorities have adopted approaches that are most likely to yield a biased definition of the geographic market. On the one hand, equating the relevant geographic market with the catchment area systematically underestimates the market's extension; on the other hand, doubling the catchment area is likely to lead to the opposite mistake.

If the truth lies between these extremes, then the challenge is to find a more nuanced approach grounded in economic theory. From the standpoint of a competition authority, moreover, the accuracy of the results must be balanced against efficiency, as more sophisticated analyses may strain limited resources.

Having this in mind, we show in the following that one simple rule for the definition of local geographic markets can be developed based on critical loss analysis; and that this rule is consistent with economic theory on market definition.

An alternative approach based on critical loss analysis

According to the European Commission,[6] "market definition is a tool to identify and define the boundaries of competition between firms" and its objective is "to identify those actual competitors of the undertakings involved that are capable of constraining those undertakings' behaviour and of preventing them from behaving independently of effective competitive pressure."

Market definition crucially depends on an assessment of demand-side substitutability: to what degree are customers able and willing to switch to a different product or supplier? The answer to this question determines a firm's ability to profitably increase prices, and can be obtained through a simulation: how would consumers react if a hypothetical monopolist introduced a small, but significant and non-transitory increase in prices ("SSNIP")? Crucially, would such a move be profitable for the hypothetical monopolist? The answer to this question can be obtained through critical loss analysis. A price increase leads to two opposite effects on a firm's profits: on the one hand, the margins collected from retained customers increase; on the other hand, sales are lost, as some customers would switch to alternative providers or reduce consumption. The critical loss is the level of lost sales that makes a hypothetical monopolist indifferent between raising the price or not. The critical loss is defined as $CL = \frac{\sigma}{\sigma+m}$, where $\sigma = \frac{\Delta p}{p}$ is the SSNIP (usually 5% or 10%), and m is the gross variable margin.[7]

Applied to the definition of the relevant geographic market, critical loss analysis can be used to identify the extension of the smallest area at which a local hypothetical monopolist could profitably perform a SSNIP. This can be done in practice by gradually widening the market's boundaries until the SSNIP becomes profitable (i.e. until the actual loss is lower than the critical loss).[8] In the following, we explain how this could be done in detail.

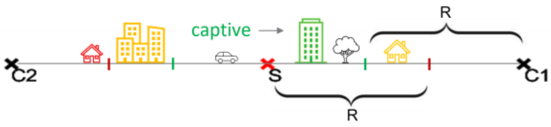
The model

Assume that a certain retailer S is located in a linear, one-dimensional city in which both stores and consumers are identified by a single coordinate. Consumers are willing or able to travel up to a maximum distance of R minutes for their groceries shopping. The catchment area of retailer S is thus the interval $(-R, R)$, with S at the centre.

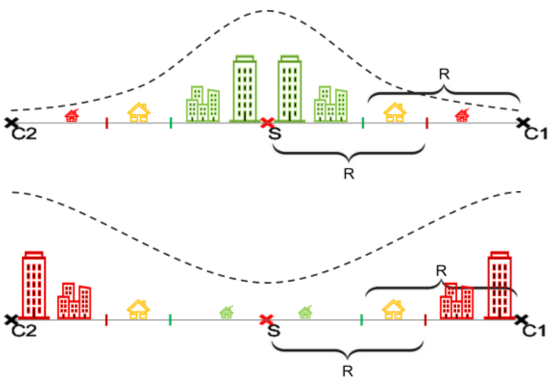
We will next assume that, from the consumers' perspective, all retailers in the city are the same except for their location. As long as prices are the same across supermarkets, customers prefer the shop closest to them. If prices differ, consumers choose the store that offers the lowest price among those that they can reach within R minutes.

The relevant geographic market can now be identified by applying the hypothetical monopolist test to areas gradually expanded by increments of one minute travelling time.[9] This amounts to assuming that S is the only supplier in a given area $(-x, x)$, the candidate market, and that there are two potential competitors C_1 and C_2 located each one minute outside the candidate market in opposite directions.

In case of a price increase, the hypothetical monopolist will lose all customers that are able to reach one of the cheaper competitors within R minutes, and retain only those customers unable to reach C_1 or C_2 – these customers, are "captive" to S. They are the customers located within the green area in the graphics below.



Whether S can profitably perform a SSNIP will crucially depend on the number of captive customers, thus on the population distribution: the more the population is centred around S, the larger is the number of customers which can be expected to stay loyal, and the more likely it is that a price increase is profitable for S. The below graphics illustrate this: assuming a normal distribution (first graph), S would retain more customers following a price increase than in the second graph.



What has so far been discussed in intuitive terms can be modelled as follows: the closest potential competitors faced by S are located, respectively, at points $R + dR$ and $-(R + dR)$, with $dR = 1, \dots, R$. The customer base that the monopolist could retain in the event of a price increase then corresponds to the number of customers in the $(-dR, dR)$ interval.

It can be easily verified that the relevant market cannot be smaller than the catchment area[10] and under certain assumptions on population distribution, is wider, and critical loss analysis can say by what extent. Critical loss analysis, indeed, allows to identify the critical distance dR^* defined as the maximum increment at which the SSNIP is unprofitable. The relevant market is then defined as the interval $(-R - dR^*, R + dR^*)$. In other words, critical loss analysis suggests that the constraint imposed by stores located outside this area is too weak as to make a price increase unprofitable.

For instance, if we assume that competitors are located at a distance of 16 minutes and the lost sales resulting from a SSNIP exceed the critical loss, the market must include stores located at a 16-minute distance. If the SSNIP becomes profitable when the closest potential competitors are assumed to be 17 minutes away, it can be concluded that the relevant market is smaller than 17 minutes, and the extension of the relevant market can be approximated to a 16-minute wide area.

This model was applied under different assumptions on population distribution and gross average margins per customer, and assuming that consumers are willing to travel up to 15 minutes (i.e. *R* = 15) for their groceries shopping. The results are presented in Table 1 below, which shows the extent of the market in travelling minutes $(R + dR^*)$: for simplicity, the table shows the extension of the market in the positive side of the linear city.

Table 1: ***Extent of the market (R+dR*) in travelling minutes across various gross average margins and population distributions***

		Average gross margin (%)				
		10	**20**	**30**	**40**	**50**
Population distribution	***B(0.5,0.5)***	26	28	29	29	29
	U(0,1)	25	26	27	28	28
	B(5,5)	23	24	25	25	25

Note: The B stands for Beta distribution, the U stands for Uniform distribution. Under the B(0.5,0.5) assumption customers are concentrated at the extreme of the catchment area, whereas they are concentrated around the store under the B(5,5) assumption. Critical loss is computed assuming a 5% price increase

The results of the simulation show that:

- the size of the relevant market increases with the margin. The intuition is that if the initial margin is high, the cost of losing customers is high as well: hence the critical loss is low, making it more likely that a price increase is unprofitable. This in turn implies that stores that are far away are more likely to be able to impede a price increase even if they only attract a small number of customers;[11]

- the more customers are concentrated around the hypothetical monopolist, the narrower the relevant market. As was noted before, indeed, S retains more customers if the area in its proximity is more populated. Different population distributions could be modelled based on the local geography (e.g based on whether the store of interest is in an urban or rural area).

These conclusions can be generalized to a two-dimensional setting, where a store's catchment area is an isochrone with radius R, and S faces an infinite number of potential competitors outside the candidate market.

Possible limitations and extensions

The base model presented here is based on certain assumptions which might tend to oversimplify reality. The model is capable, however, of accommodating corresponding extensions.

Most notably, in our base model, customers are assumed to care about the relative distance to each shop only as long as these options are otherwise identical. Once there is a price difference, they are assumed to switch to the cheapest alternative within their reach. Of course, in reality, consumers care a great deal about the relative distance they have to bridge for their shopping and weigh it up with price differences between alternative shops. In the model, this would mean that S could retain not only the captive customers, but also a share of the other customers located closer to S than to its competitors.

This can be accounted for by introducing weights that depend on customers' location and reflect the existence of a travel cost. These weights can be thought of as a switching probability and can be applied to customers in the computation of the actual loss resulting from a SSNIP. This adjustment would yield a smaller actual loss and might thus yield a smaller relevant market.

The other significant simplification in the baseline model is that of assuming homogeneous supermarkets. In reality, they are differentiated in several dimensions, and these differences may be significant to the geographic market delineation in that customers could be willing to accept differing travel times for each type of shop. Just as competition authorities routinely do when applying the isochrone method, however, such differentiations can be broadly accounted for by drawing different catchment areas (different R) according to the type of shop.

Conclusion

This note reviewed some practices commonly adopted by competition authorities for defining local geographic markets in their assessment of mergers in the grocery retail sector. The main takeaways from our review are that the catchment area and the relevant geographic market are two separate concepts, that potential competitive constraints from outside the catchment area must be considered and that the distribution of population cannot be disregarded to assess whether these constraints are sufficiently strong.

Based on these pillars, we propose a simple model that can predict the size of the geographic market based on the following information only: (i) the price-cost margin, (ii) consumers' willingness to travel and (iii) population distribution.

Notably, these pieces of information are easy to obtain and are also available to undertakings. The model described in this note could thus provide a practical and useful tool for undertakings, who might wish to assess whether a competition authority might find that a transaction they are considering raises competitive concerns.

If you would like to discuss these issues further, or if you would like more information about what our economists can do for you, please get in touch with us.

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[1] Lear Insight of November 2021, “Market Around the Block: Geographic Market Definition and Local Competition”, available on our website.

[2] See AGCM decision of 25 February 2020, C12247B, *Conad/Auchan*; ACM decision of 9 July 2021, ACM/21/050672, *Ahold Delhaize/Deen*; Autorité de la Concurrence decision of 21 November 2014, 14-DCC-173, *Carrefour/Dia*.

[3] *Autorité de la Concurrence*, decision of 21 November 2014, 14-DCC-173, *Carrefour/Dia*, para. 74.

[4] An example for this is the *Bundeskartellamt’s* decision of 17 March 2021, B2-85/20, *Edeka/Real*.

[5] See *Bundeskartellamt* decision of 17 March 2021, B2-85/20, *Edeka/Real;* and BCA decision of 15 March 2016, 16-CC-10, *Ahold/Delhaize*. Note that the Belgian Competition Authority only performs this exercise with respect to the merging parties' stores, disregarding the competitive constraints posed by other competing stores outside the catchment area.

[6] European Commission Notice on market definition.

[7] More precisely, the margin is defined as the difference between the original price and average variable cost stated as a proportion of the original price ($\frac{p_1-c}{p_1}$).

[8] This is consistent with guidelines from the European Commission: “*The question to be answered is whether the parties' customers would switch to readily available substitutes or to suppliers located elsewhere in response to a hypothetical small (in the range 5% to 10%) but permanent relative price increase in the products and areas being considered. If substitution were enough to make the price increase unprofitable because of the resulting loss of sales, additional substitutes and areas are included in the relevant market. This would be done until the set of products and geographical areas is such that small, permanent increases in relative prices would be profitable*” (European Commission Notice on Market Definition, para. 17).

[9] Please note that we are assuming that the city is not a continuous interval, being composed by one-minute fringes.

[10] In particular, in any such smaller area the hypothetical monopolist would lose its entire customer base in the event of a price increase. This can be thought of as a generalization of the model where dR can also assume negative values, so that it would range from $-R+1$ to R.

[11] However, attention should be paid to the risk of a *cellophane fallacy*. Indeed, the actual margin may reflect the existence of market power that might lead to the definition of markets that are too wide.