

A G.I.S. APPROACH TO LOCAL MARKET DEFINITION: The case of Lidl's acquisition of the Scotts properties in Żabbar

Vitali Andrea Giuseppe
PhD Research Proposal in Quantitative Finance and Economics
- University of the Basque Country -
computationalantitrust@gmail.com

ABSTRACT

When competition takes place at the local level, defining the relevant market enforces a detailed economic analysis, which can lead to contentious outcomes.

This study introduces a novel approach to delineating the catchment area using the **Voronoi Diagram (VD)**, a geometric computational technique commonly used in Geographic Information System (GIS).

Applying this methodology to a real antitrust case offers valuable **insights into local competition** and leads to different conclusions about the extent of the local market compared to the traditional approach.

The method holds significant potential and could also be utilized in market studies, as it requires **only stores coordinates for implementation**.

THE CASE

In January 2021, Lidl and Scotts (the parties) submitted a merger to the Malta Competition and Consumer Affairs Authority (MCCAA), involving the acquisition of three Scotts supermarkets and other properties by Lidl. The MCCAA expressed concerns that the transaction could potentially lead to a **substantial lessening of competition (SLC)**, particularly in the Żabbar local market. In June 2021, a revised proposal that ruled out the acquisition of Żabbar's properties was approved by the Malta Authority (MCCAA/13/2020).

In November 2021, the parties re-submitted the Żabbar merger, withdrawing it in that same month (MCCAA/11/2021).

In December 2023, the merger was filed for a **third time (MCCAA/13/2023)**. During Phase I, the MCCAA continued to raise serious doubts that the proposal might adversely affect competition. However, in Phase II, the case will be thoroughly examined even in light of recent changes in the Maltese grocery retail sector, with a final decision still pending. The MCCAA's main reservation regards the **proximity of existing Lidl stores** in Żejtun, Luqa, and Qormi. The Authority is concerned that the merger could result in a dominant position within the local market.

The MCCAA's position was established after a wide inquiry, **using data and methods from a previous merger case** in the same sector (MCCAA/01/2020). The latter investigation included a review of past case law and market studies, a population-based survey, and two requests for information sent to Malta's leading supermarkets.

Based on the gathered information, the MCCAA defined the product and geographic dimensions of the relevant market, as outlined in the next section.

THE RELEVANT MARKET DEFINITION

The product market was identified across **42 outlets**, including supermarkets, discount stores, and other direct competitors.

The MCCAA first selected stores with **sales areas exceeding 200 sq.m.**, indicating that these larger outlets constrain smaller ones, but not vice-versa. The Authority second excluded standalone food specialists, convenience stores, and independent retailers, as they were assessed not to exert significant competitive pressure in terms of **price-quality-range-services (PQRS)**.

The geographic side was defined both nationally and locally, with the national level excluding the island of Gozo.

The MCCAA delineated the relevant local market as the consumer substitution options available within or near the merger target's **catchment area**, the region where most customers originate.

The catchment area was drawn by the **isochrone method**: the line that connects points with equal travel time. Although widely used in antitrust cases, this method has faced criticism because the defined catchment areas are highly sensitive to the isochrone size.

The **isochrone size** depends on consumers' willingness to travel, a complex factor that is not directly observable.

In this instance, the Authority has deemed that Malta's local geographic markets represents a **unique context**, estimating the consumers' willingness to travel for grocery shopping in **12.8 minutes of driving time**, unlike the 20 to 30 minutes suggested by previous European merger cases.

The isochrone size was inferred through a survey of 406 buyers and then refined as the **weighted average driving-time** by applying 4 different scenarios to account for potential bias and varying traffic conditions.

MERGER COMPETITIVE EFFECTS

According to the MCCAA, if the transaction were approved, Lidl would control **4 out of the 12** supermarkets in the Żabbar local market.

To evaluate the competitive impact of the proposed merger, the MCCAA analyzed market shares and calculated the **Herfindahl-Hirschman Index (HHI)** for the identified relevant markets.

In conclusion, the Authority found a post-merger **HHI of 3414.7** with a Δ of **509.2**, indicating a level of concentration that suggests the merger could be deemed unlawful.

VORONOI DIAGRAM METHOD

The **Voronoi Diagram (VD)** method partitions a plane into distinct regions known as **Voronoi Cells (VC)**. Each cell is associated with a specific generator point and, consists of all the points on the plane that are closer to that generator than to any other.

MATHEMATICAL DEFINITION

Given a set of n generator points, $S = \{S_1, S_2, \dots, S_n\} \in \mathbb{R}^2$, the Voronoi Cell, $VC(S_i)$, corresponding to the generator S_i , is given by:

$$VC(S_i) = \{p \in \mathbb{R}^2 \mid \text{dist}(p, S_i) \leq \text{dist}(p, S_j), \forall j \neq i\}$$

where, $\text{dist}(p, S_i) = \sqrt{(p(x) - S_i(x))^2 + (p(y) - S_i(y))^2}$ denotes the Euclidean distance in \mathbb{R}^2 .

$$VD(S) = \{VC(S_1), VC(S_2), \dots, VC(S_n)\} = \bigcup_{i=1}^n VC(S_i)$$

Voronoi Cells $VC(S)$ are unique, convex, disjoint, cover entirely the plane. In summary, the Voronoi Diagram $VD(S)$ is composed of three elements:

- I. **Generators:** the set S of the points that originate each cell.
- II. **Edges:** the common boundary between each pair of cells.
- III. **Vertices:** edges endpoints that lie on the shared border between three or more cells.

In local markets, transport cost significantly affects consumers' shopping decisions. The VC of a store is defined as its **area of influence**: the region where the outlet is assumed to hold a degree of **market power**.

Indeed, **consumers maximize their utility by shopping at the nearest outlet** when all stores are equally attractive concerning PQRS. In this scenario, consumers focus exclusively on minimizing transportation costs, which are determined by the distance between the store and their location.

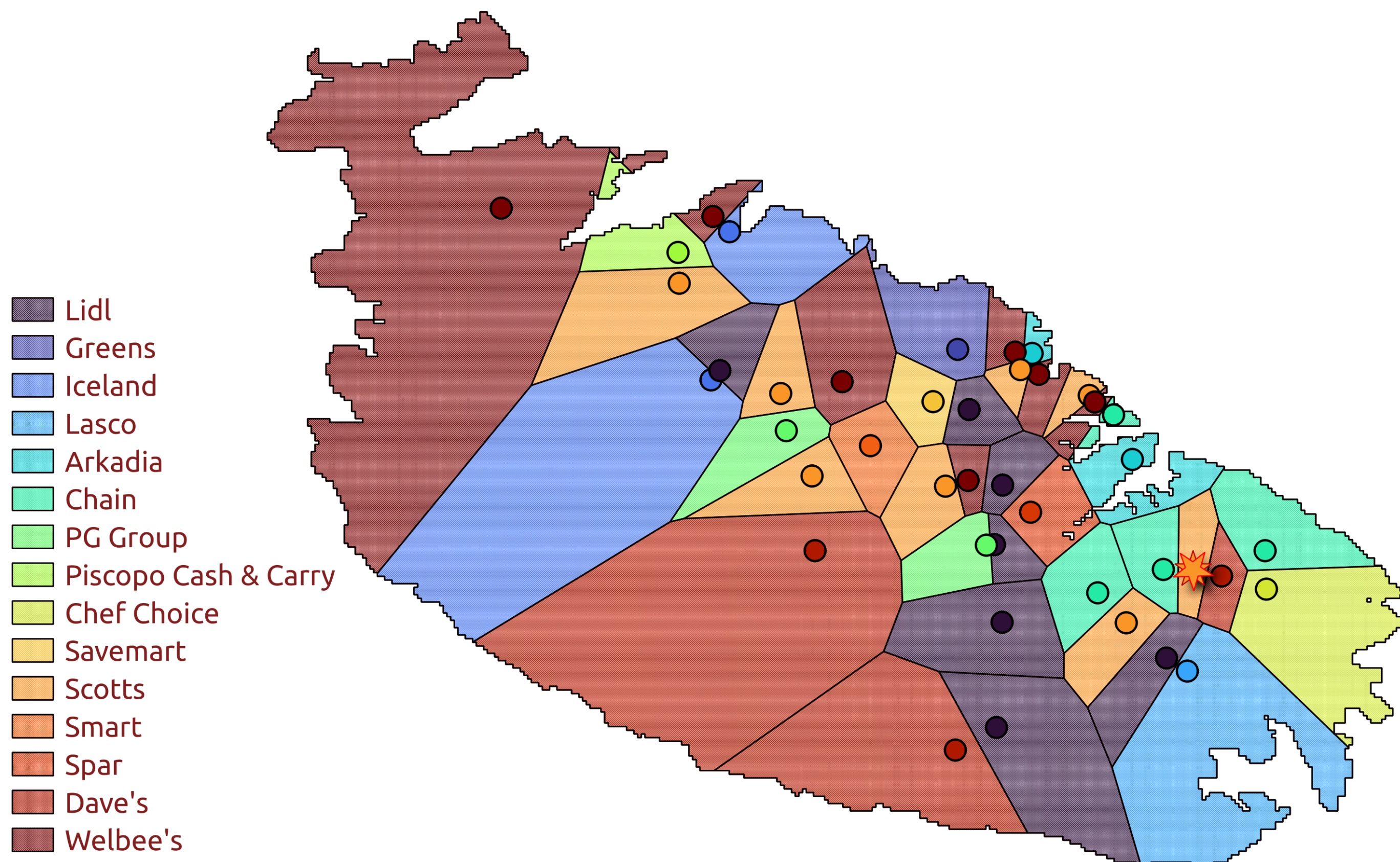
The VC of a store represents its **initial reasonably narrow focal market** and, competition occurs on its edges. The VD method generates a competition hierarchy: shops with a common boundary are considered **first-order competitors**, while those bordering first-order competitors are second-order competitors, and so forth.

To delineate the final catchment area, the initial focal market is expanded by testing iteratively **demand-side substitutability** of the first-order competitors stores. This is achieved by removing first-order competitors's stores from their corresponding VC and then addressing this question:

Where would the first-order competitors' consumers go to shop if their stores were unavailable?

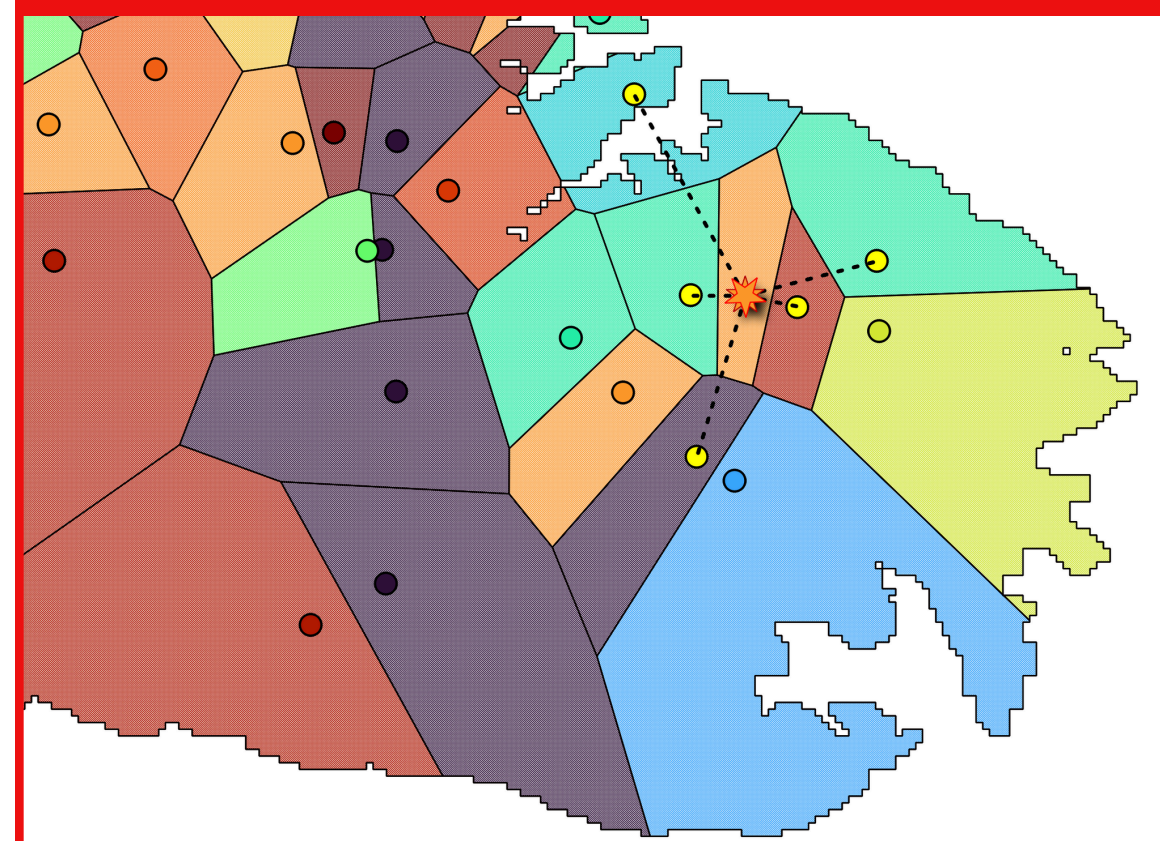
1 VORONOI CATCHMENT AREA: COMPUTE THE AREA OF INFLUENCE FOR EACH STORE

Supermarkets in Malta with a sales area greater than 200 sq. m. and similar PQRS attributes



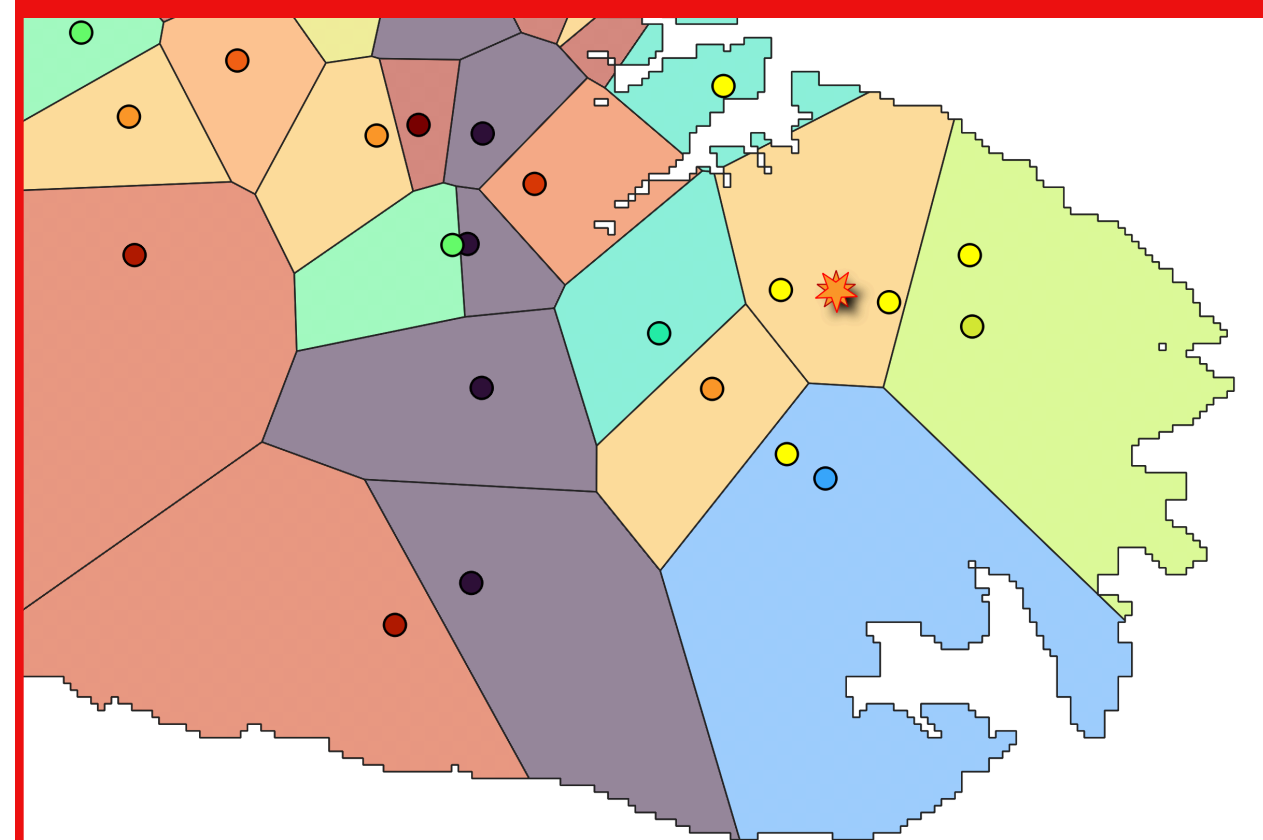
2 VORONOI CATCHMENT AREA:

Identify and exclude all the first-order competitors of the target



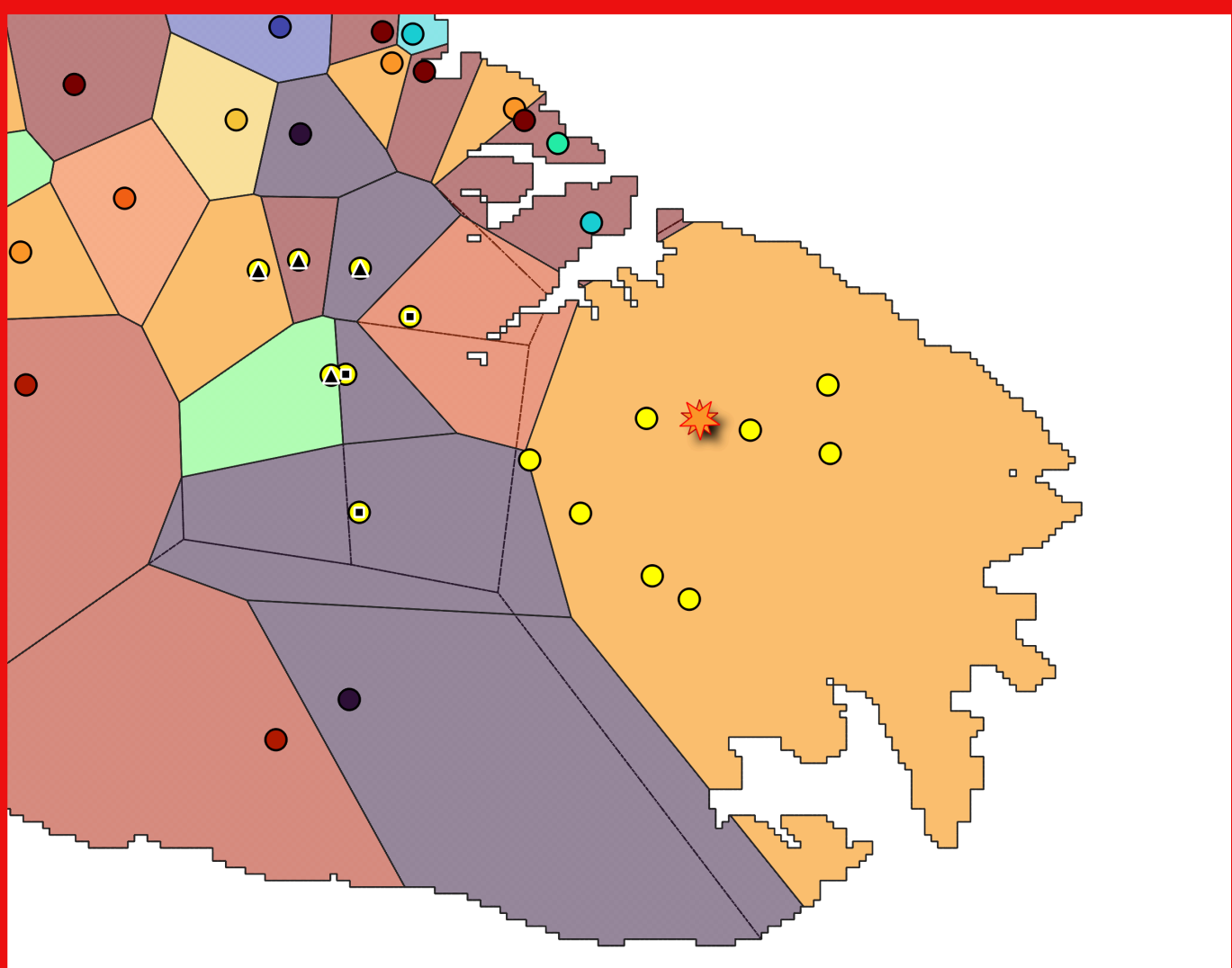
3 VORONOI CATCHMENT AREA:

Repeat step 1 and 2 widening at each iteration the catchment area



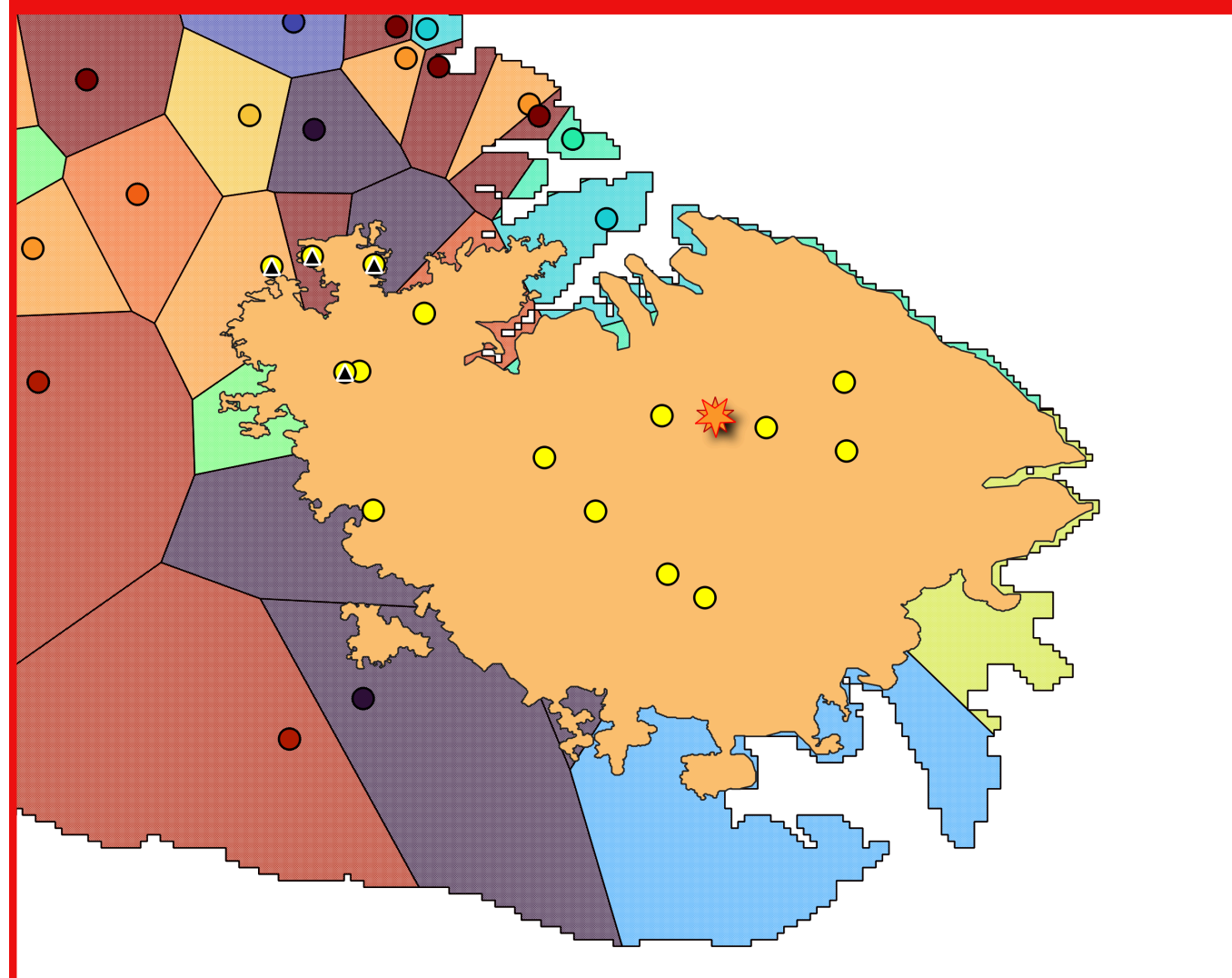
4 VORONOI CATCHMENT AREA:

Algorithm stopping criteria: either no additional stores are added to the catchment area, or the maximum iteration limit is reached



ISOCHRONE CATCHMENT AREA

The map below displays a 12.8-minute isochrone centered on the merger target, computed with QGIS Travel Time plug-in



CONCLUSION

The VD method outlines a more restricted relevant local market than MCCAA, encompassing **9** instead of **12** supermarkets. This supports literature suggesting that Competition Authorities may define geographic markets too broadly, as only nearby competitors truly engage in effective competition.

In this case, the VD method **excludes Lidl's Qormi and Luqa** supermarkets from the relevant local market, as customers in those areas would opt for different alternatives rather than the Żabbar outlet if those stores were unavailable.

This indicates that Lidl's Qormi and Luqa supermarkets are located in a local market where **competitive conditions differ significantly** from those in Żabbar. These findings are likely to impact the computation of concentration metrics and, ultimately, influence the Authority's decision.

FUTURE RESEARCH

On the one hand, future efforts will concentrate on applying the proposed methodology to various other merger cases to empirically assess the effectiveness of the current model and compare it with **more complex models**.

On the other hand, upcoming research will also focus on developing **alternative concentration metrics**, which could provide deeper insights and enhance the evaluation of SLC hypothesis when defining relevant markets at both the local and national level.