

Analysis of the composition of big cities around Points of Interest

Stat'App summary note

ENSAE - May 2023

Students : Simon GENET, Léopold MAURICE, Marie-Olive THAURY

Supervisors : Paola TUBARO, Sarah J.BERKEMER

1 Introduction

This project aims to study the accessibility of important amenities (i.e. essential shops and services, schools and cultural institutions) through the concept of 15-minute city in Paris and in its periphery. The 15-minute city concept was coined by Carlos Moreno in 2015 [1] and reflects the urban planning objective of giving inhabitants access to a certain number of essential amenities within a distance achievable on foot or by bicycle in 15 minutes. The objective, which was popularised by the Mayor of Paris, Anne Hidalgo, during the 2020 municipal campaign, is to reduce carbon emissions from mobility while promoting healthy activity.

Paris is the second most unequal city in France (2018 figures) according to the *Observatoire des inégalités* in terms of income, behind Neuilly-sur-Seine¹. As matter of fact, the ratio between the minimum income of the wealthiest 10% and the maximum income of the poorest 10% is 6.4 compared to 3.4 for metropolitan France. Furthermore, Paris and the region remain highly polarised areas in terms of wealth, with poles of poverty in the north-east of Paris (St-Denis, Val d'Oise, Seine et Marne) and Ivry, Vitry, Evry or Corbeil; and poles of wealth such as the 16th arrondissement, the "Golden Triangle" or Neuilly-sur-Seine [2, 3]. The districts of the capital also show great disparities in terms of urban functions, with large hubs and inter-modal areas such as the Halles district, commercial centres such as the Opéra district and areas considered less dynamic such as the 16th arrondissement. As a result, studying Paris and its region means studying a very diverse and unequal space.

Therefore, this project proposes to study the possible socio-economic inequalities of accessibility between the different districts of Paris and the *Petite Couronne*² through the concept of 15-minutes city.

2 Methodology

2.1 Data

To do so, we used the points of interest. (POIs) data from the free geographic database *OpenStreetMap*. POIs are notable urban locations like schools or shops. We listed those POIs in 6 broad categories : restaurants, culture and art, education, food shops, fashion and beauty, supply shops.

The socio-economic variables we tapped come from the *Filosofi* system (localized fiscal and social income). This INSEE database divides the territory into 200-metre squares. It provides, among others, variables such as the age pyramid of the inhabitants, their income and the year of construction of the buildings.

2.2 Accessibility score

Our analyses are based on the two-step floating catchment area method (2SFCA) [4], which provides a service accessibility score. The idea behind 2SFCA is to measure for each service provider the surrounding demand. Then for each person (or place) asking for this service, we calculate the surrounding offer by considering that each service provider divides itself up on the previously calculated demand. Therefore, the higher the demand for a service, the lower the accessibility for this service and, the higher the supply for a service, the higher the accessibility for this service. Figure 1 - originating from an IRDES paper [5] - illustrates it.

If we take the example of the bakery supply : we calculate for each bakery the potential clients in its immediate environment (supply), and for each client the number of bakeries near him (demand). Under the same principle, we looked at the corresponding supply and demand for each major type of amenity, that were listed above.

¹"Le palmarès des villes françaises les plus inégalitaires"

²The *Petite Couronne* is the immediate suburbs of Paris, made up of the three departments bordering the capital: Hauts-de-Seine (92), Seine-Saint-Denis (93) and Val-de-Marne (94). It includes more than a hundred towns.

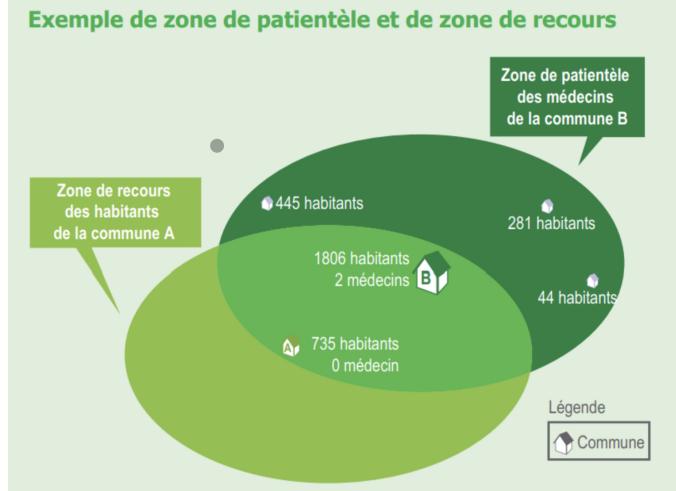


Figure 1: 2SFCA rationale illustration with the example of medical care

To perfect this measure, we weight the demand according to the distance, i.e. we consider that the further away a bakery is, the less likely the consumer is to buy his baguette in this shop, and the less this shop has to be taken into account in the consumer's demand.

To obtain a more global indicator, we summed up the indicators for each type of amenity by weighting them by their scarcity : as schools are less numerous than restaurants, we consider that having a school in one's neighbourhood should be more valued. The accessibility indicator is a positive number that can be read as follows : the higher the 2SFCA for the square, the greater the accessibility to the services for the inhabitants in the square.

3 Main results

3.1 Paris

The analysis shed light on a strong dichotomy of access within Paris : on Figure 2, we can observe a concentric circle gradient in the aggregated accessibility score to services starting from the center of Paris. Whereas the center Paris (Les Halles, the Latin Quarter, Opera district) is very dynamic, the residential neighborhoods located on the outskirts of the city, have less access to services.

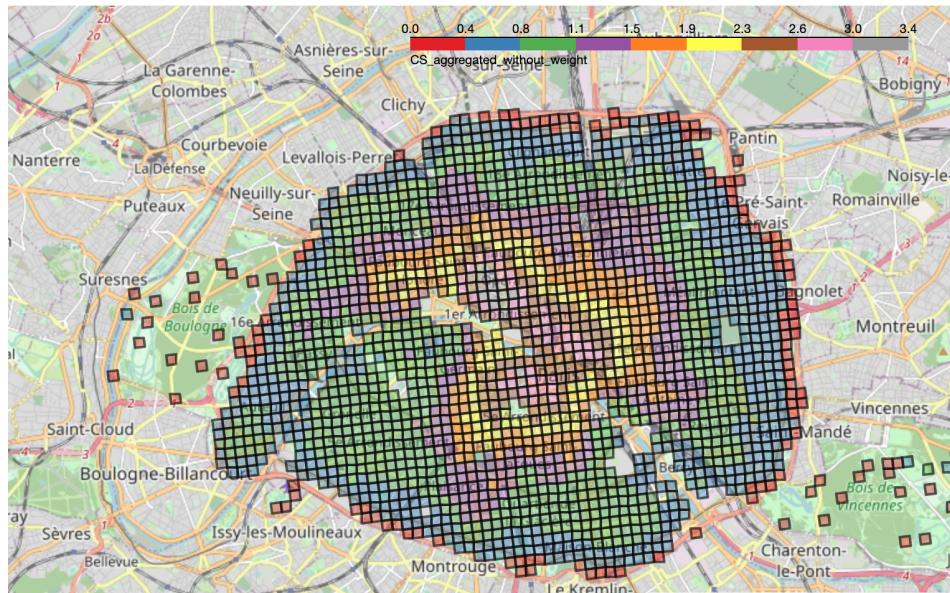


Figure 2: Aggregated 2SFCA for Paris

For an equal number of services, Figure 3 enables us to distinguish, a dynamic district (Opera district) from a more residential district (Javel district). It is easy to see that more than 50% of the Javel district is composed of daily services (food shops, supply shops, education), compared to 26% in the Garnier Opera district. On the contrary, the Garnier Opera district has almost 70% of luxury services (restaurants, fashion), compared to 44% in the Javel district.

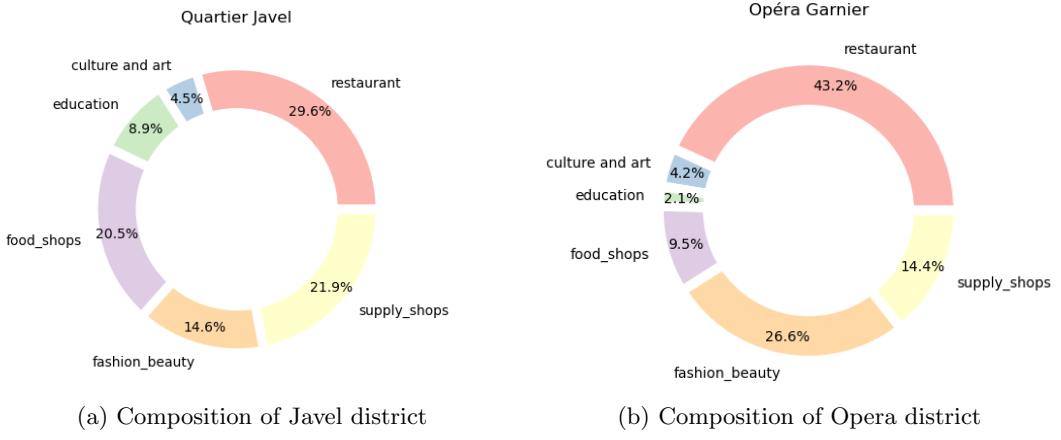


Figure 3: Composition of two Parisian districts.

As illustrated on Figure 4, when grouping squares by their similarities across accessibility measurements, the dynamic centre of Paris is itself divided into two main functions. On the one hand, the green area, that matches *les Halles*, the *Opéra* neighbourhood and the *Champs Elysées* is more inclined towards luxury shops, food shops, restaurants and supply shops. On the other hand, the orange area appears to be more centred on cultural amenities, and therefore includes *Le Marais* and *Saint Germain-des-Prés*, the neighbourhoods with plenty of art galleries, as well as the *Quartier Latin*, which is an educational and cultural centre, as shown by Mariotte, Mayraud and Wolf [6].

The analysis also reveals inequalities in access to services correlated to socio-economic criteria : the poorest neighborhoods, which are located on the edge of the city (violet and red areas), are the least endowed with amenities. We can also note disparities of access according to the age of the individuals as the youngest live in the neighborhoods with fewer services. One explanation could be that families prefer to live in less "dynamic" areas like the 15th arrondissement.

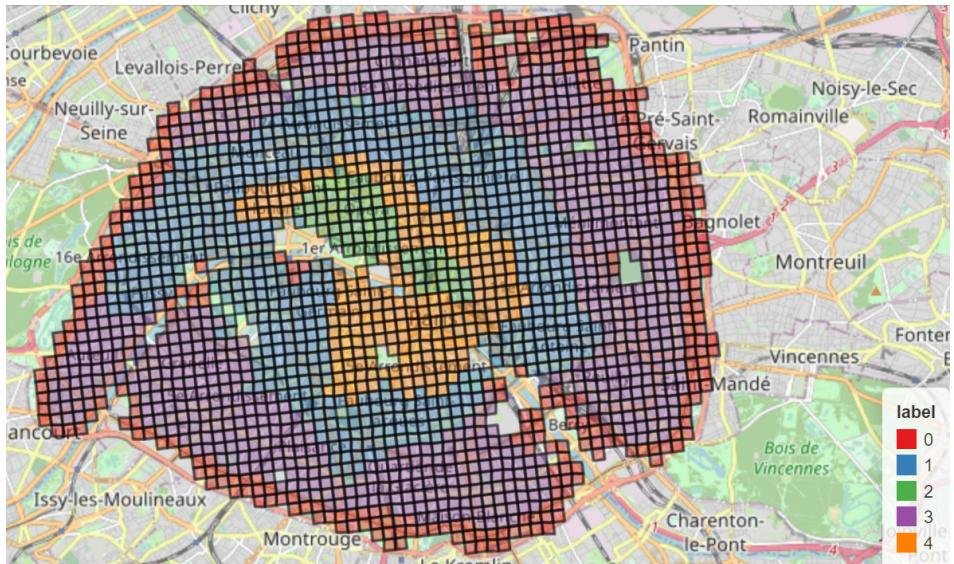


Figure 4: Map of the five types of urban areas within Paris

3.2 The *Petite Couronne*

Extending the analysis to the inner suburbs allowed us to better understand the inequalities in access to services within the *Ile-de-France* region. As a matter of fact, it quickly becomes apparent that services are highly concentrated within Paris intra-muros, to the detriment of its nearby peripheries (Figure 5). In addition, it can be noted, that even within the inner suburbs, there is once again intense activity in the center of the towns at the expense of their edges, as it is the case for example, in Saint-Maur and in Rueil-Malmaison.

Moreover, the extension to the *Petite Couronne* highlights inequalities in access to facilities that were less visible for Paris intra-muros : households living below the minimum social threshold have poor access to amenities. On top of that, geographic units built between 1945 and 1990 have a low accessibility score. This could be a consequence

of the urban policies implemented during the *Trente Glorieuses* period³, aiming to respond to the post-war housing crisis and influenced by a car-centric urban planning : as with the Courant plan (1953) these policies, based on the principle of zoning⁴, resulted in the construction of large residential areas on the outskirts of Paris far from shops and services.

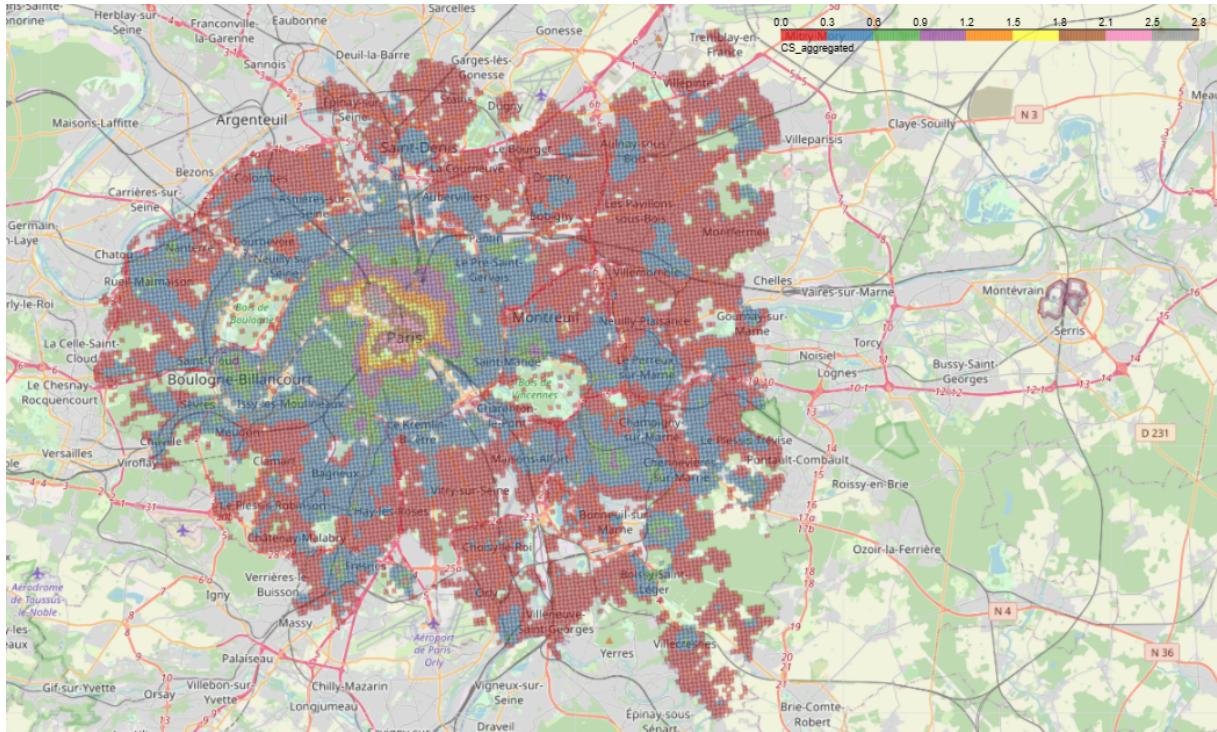


Figure 5: Aggregated 2SFCA for the *Petite Couronne*

References

- [1] Carlos Moreno et al. "Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities". In: *Smart Cities* 4.1 (2021), pp. 93–111. ISSN: 2624-6511. DOI: 10.3390/smartcities4010006. URL: <https://www.mdpi.com/2624-6511/4/1/6>.
- [2] Michel Pinçon and Monique Pinçon-Charlot. *Sociologie de Paris. "Repères"*. La Découverte, 2014. ISBN: 9782707156105.
- [3] Anne Clerval. *Paris sans le peuple. La gentrification de la capitale*. La Découverte, 2016. ISBN: 9782707191021. URL: <https://www-cairn-info.proxy.rubens.ens.fr/paris-sans-le-peuple--9782707191021.htm>.
- [4] Wei Luo and Fahui Wang. "Measures of Spatial Accessibility to Health Care in a GIS Environment: Synthesis and a Case Study in the Chicago Region". In: *Environment and Planning B: Planning and Design* 30.6 (2003), pp. 865–884. DOI: 10.1068/b29120.
- [5] Muriel BARLET et al. "L'accessibilité potentielle localisée (APL) : une nouvelle mesure de l'accessibilité aux médecins généralistes libéraux". In: *ÉTUDES et RÉSULTATS* 795 (Mar. 2012). URL: <https://drees.solidarites-sante.gouv.fr/sites/default/files/2020-10/er795.pdf>.
- [6] Apur. *Atlas des lieux culturels du Grand Paris*. Directeur et directrice de la publication: Alexandre Labasse and Patricia Pelloux. Étude réalisée par: Clément Mariotte, Flora Maytraud, Martin Wolf. Sous la direction de: Patricia Pelloux. Cartographie et traitement statistique: Morad Khaloua. Datavisualisation réalisée par: Anaës Moreau. Photos et illustrations: Apur sauf mention contraire. Mise en page: Florent Bruneau. Retrieved from <http://www.apur.org>. 2023.

³Les *Trente Glorieuses* was a thirty-year period of economic growth in France between 1945 and 1975, following the end of the Second World War.

⁴Zoning is a method of urban planning in which a municipality or other level of government divides the land into zones, each of which serves a specific need.