

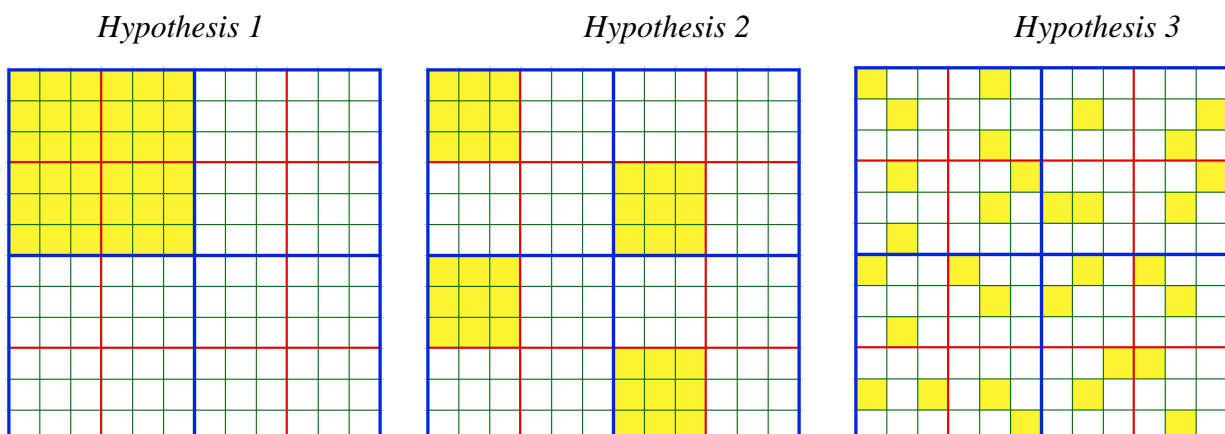
Trends of Segregation by geographical scale since the early 1990's

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Quantitative measurement of segregation phenomena often imply selecting a specific geographical scale. This selection can be chosen in function of data disponibility or due to a scientific choice made by the researcher. In this presentation, we would like to combine multiple goographical scales of analyses to provide a synthetic history of the segregation trends in the biggest French urban areas. To do so, we use a specific methodology based on the decomposition of the classical Duncan segregation index, which allows identifying the implication of three different geographical scales on the evolution of job segregation in France.

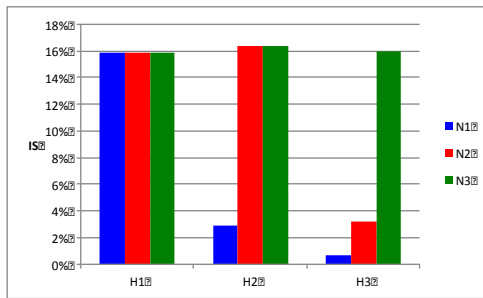
Methodology

The segregation index formula gives the percentage of a group of people who should move from their residence in order to obtain an homogeneous repartition of the population. One of the key factor here is the distance of the move or in other words the size of the geographic unit we use to compute this index. This unit can be large, for example the traditionnal opposition between inner cities and suburbs, or it can be thin like the census block for exemple. By construction, the segregation index get higher as the thinner the geographical scale is. We can explain this with a simple microsimulation model in order to test various hypotheses of scale level segregation. This model generates a fictive area subdivided at 3 different geographical scales named **N1**, **N2**, and **N3**. At the beginning of simulation, the population will be randomly posted within the area independent of the geographical scales. Then, we will urge some people to move in specific spatial units with 3 hypotheses illustrated by the figures below. The yellow parts represent the units of grouping.



The segregation can be calculated for the 3 geographical scale levels. Graphs below show the results for the 3 hypotheses at the 3 geographical scales:

Figure 1: SI calculated at the 3 geographical scales for the 3 hypotheses



- **Hypothesis 1:** the 3 geographical scales give the same value of SI.
- **Hypothesis 2:** SI values calculated at N2 and N3 scales remain stable while those calculated at N1 scale decreases.
- **Hypothesis 3:** SI calculated at the N3 scale remains stable when N1 and N2 scales give low SI values.

How can we explain these mechanisms? If we focus on figures schematizing the hypothesis of grouping by N1 scale, we notice that if people are congregated in some N1 units, then this inevitably involves them grouping together into specific N2 and N3 units. If there is no grouping at another level of aggregation, we can thus demonstrate that an index calculated at the finest level is mathematically superior or equal to indexes calculated at more included levels.

Within the framework of Duncan's segregation index, we can mathematically prove that there are simple relations between indexes calculated at different geographical scales. We will use this relation to study the impact of different geographical scales on the global segregation trends in French urban areas since 1990.

Data's presentation

For this kind of work, we need geolocalised data. To study the evolution of segregation intensity over time in French urban areas, our only option is to use census data. This data allows us working at several geographical scales. We will use three geographical scales to study different aspects and dynamics of this phenomenon.

The thinnest one is the 'iris' level. This is the thinnest level provided by the French statistics office (INSEE). This unit is useful for quantitative studies for a specific reason: the iris are shapes in function of a population size rule :each of them has to be as close as possible to the size of 2000 people.

The intermediary level is the community/city level. Even though this geographic unit is problematic because of its heterogeneity in terms of shape and population size, it represents nevertheless an important political scale for education, health or transport topics.

Finally, the bigger scale will focus on the traditional opposition between the city center and the suburbs.

This kind of research is usually done to study racial segregation. In France, it is quite impossible to do so due to the secrecy politics for statistics. However, it is possible use the localization of people in regard of their professional activity.

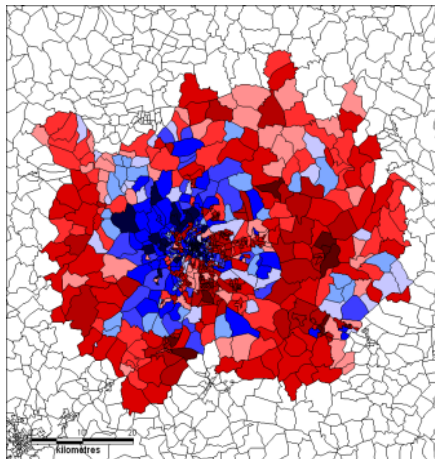
That's what we propose here: we show how job segregation varies by taking in account different geographical scales.

Preliminary results

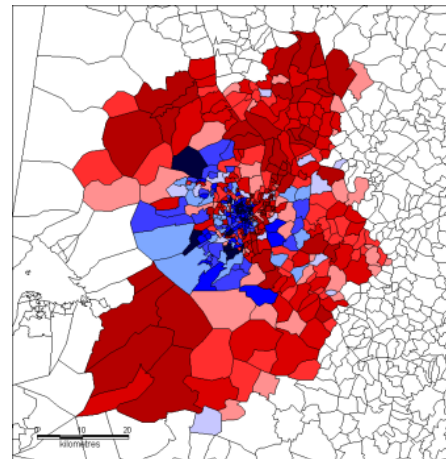
To understand the segregation trends in French urban area between 1990 and 2010, we need to clarify what was the situation at the beginning of the observed period. In most of the French cities, the localization by professional activities followed a sectorial model. White collar workers used to occupy the inner city and a specific part of the suburbs. Blue collar workers were mainly in the suburbs, at the exception of the white collars suburbs part. The intermediary jobs position was much more homogeneously distributed in the urban network.

The next map synthetizes this spatial organization that we found in most of French urban cities except mediteranean ones or cities next to the German border. The blue parts of these maps represent areas where white collar workers are over represented and the reds ones areas where they are under represented:

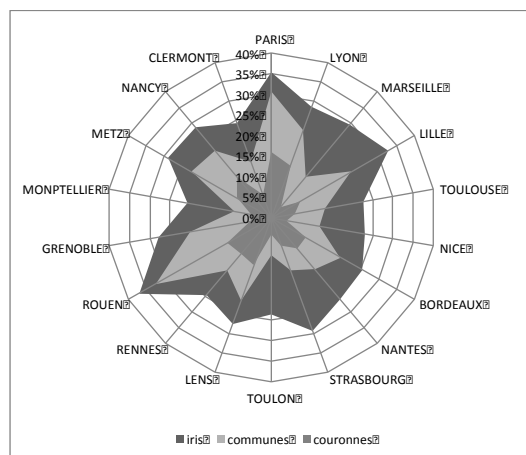
Map 1:Over/under-representation in
Lyon



Map 2:Over/under-representation in
Bordeaux



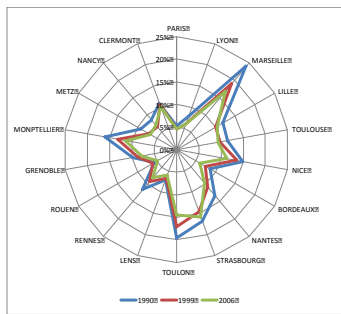
On these maps, we can clearly see that the three geographical scales are involved in segregation by professional activities, which can be confirmed by the next figure which shows the decomposition of the segregation index for the white collars.



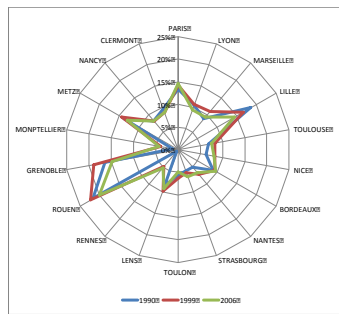
After exposing the spatial organisation of the French urban area, we now focus on the evolution of the segregation index by taking into account the impact of the three geographical scales.

The next figures will present the evolution of the segregation index for the three geographical scale since 1990.

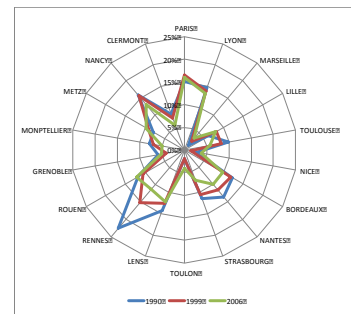
Segregation index trend at the iris scale



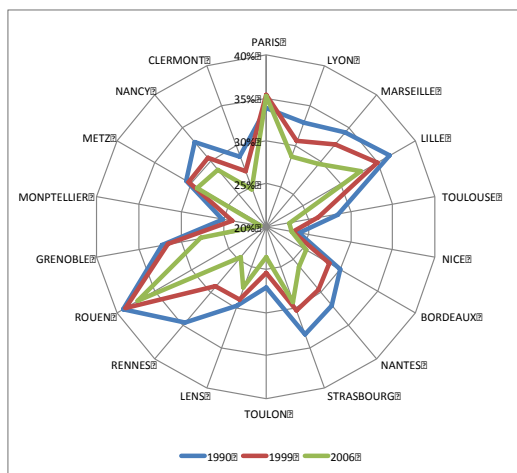
Segregation index trend at the communal scale



Segregation index trend at the couronne scale



These figures need to be analysed in front of the global segregation index variation at the three geographical scales that is presented in the figure beside.



All geographical scale effects mixed, we can see that for most French urban areas, the segregation is lower in 2006 than in 1990. We thus conclude that in general, there is more social mixity nowadays. But our research question was to focus on the geographical scale which drive this trends. This question can quite well be answered with the three figures below.

For most of the biggest French urban areas, we can see that the segregation trend is directly linked to the iris scale. If there is some variation on the two other scales for some specific city, most of the mouvement is due to one of the iris. This can be directly linked to the gentrification phenomena that occurred in France. The renovation of the old popular side of inner cities brings a mouvement of appropriation of theses spaces by white collar workers. But with the exception of Paris, this mouvement did not totally evict blue collar workers who are still numerous in these areas of the inner cities. We can say that French cities are in a transitionnal situation where blue and white collar workers are closer to each other than before. Paris is the only place where white collar workers evicted blue collar workers and that's why we can see an opposite trend for the biggest city of France.

We see that this dynamic is not the same for all professional activities. For example, the jobless people are more and more segregated over time. This trend occurred at the largest geographical scale. While it's the intermediate scale which is relevant for other kind of jobs.

Bringing information on geographical scales of segregation can be useful for French urban mixity politics. These politics often base it's action at the city level while it should probably take into account a plurality of action scales.