Neighborhood districts in Paris: A territorial autocorrelation analysis

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Neighborhood Districts in Paris: new local territories of governance

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>Urban general government</td>
</tr>
<tr>
<td></td>
<td>City of Paris</td>
</tr>
<tr>
<td>Level 1</td>
<td>Local bodies government</td>
</tr>
<tr>
<td></td>
<td>20 Municipalities</td>
</tr>
<tr>
<td>Level 2</td>
<td>New territories of governance</td>
</tr>
<tr>
<td></td>
<td>121 Neighborhood districts</td>
</tr>
<tr>
<td></td>
<td>(divisions of each municipality)</td>
</tr>
<tr>
<td></td>
<td>992 French census tracts</td>
</tr>
<tr>
<td></td>
<td>(divisions of each municipality)</td>
</tr>
<tr>
<td></td>
<td>spatial units used in analysis</td>
</tr>
</tbody>
</table>
Neighborhood Districts: political stakes

- Each municipality builds its neighborhood districts

Different strategies:
- Heterogeneous neighborhoods: melting pot
- Homogeneous neighborhoods: gated community or affirmative gerrymandering

Neighborhood Districts = socio-territorial stakes

=> Strategies ↔ territorialization?

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Theoretical possibilities of divisions

<table>
<thead>
<tr>
<th>Socio-spatial morphology</th>
<th>Local territorial production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Homogeneous municipality</td>
<td>=&gt; homogeneous neighborhoods</td>
</tr>
<tr>
<td>2. Heterogeneous municipality</td>
<td>=&gt; heterogeneous neighborhoods boundaries are not discontinuities</td>
</tr>
<tr>
<td>3. Heterogeneous municipality within homogeneous areas</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>=&gt; homogeneous neighborhoods boundaries are discontinuities</td>
</tr>
<tr>
<td>3b</td>
<td>=&gt; homogeneous neighborhoods boundaries are not discontinuities</td>
</tr>
<tr>
<td>3c</td>
<td>=&gt; heterogeneous neighborhoods boundaries are not discontinuities</td>
</tr>
<tr>
<td>4. Gradient area and strong discontinuities in municipality</td>
<td>=&gt; heterogeneous neighborhoods boundaries can either be discontinuities or not.</td>
</tr>
</tbody>
</table>
3 questions to analyze neighborhood districts production:

- Morphology of municipality?
  - Spatial autocorrelation

- Neighborhood districts: homogeneity or heterogeneity?
  - Territorial autocorrelation (belonging effect)

- Districts’ boundaries do overlap discontinuities?
  - Territorial autocorrelation (contiguity + belonging effect)

+ Cartography

A methodology adapted from C. Grasland (1993, 1997)

Data table & dissimilarity matrix

<table>
<thead>
<tr>
<th>Spatial Units</th>
<th>Belonging to neighborhood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1301</td>
<td>ARR01Q04</td>
</tr>
<tr>
<td>1302</td>
<td>ARR01Q04</td>
</tr>
<tr>
<td>1303</td>
<td>ARR01Q03</td>
</tr>
</tbody>
</table>

\[ B_{ij} \] units belonging to neighborhoods
\[ (B_{ij}=1, \text{same district} ; B_{ij}=0, \text{different districts}) \]

\[ C_{ij} = \begin{cases} 1 & \text{contiguous} \\ 0 & \text{not contiguous} \end{cases} \]

Data (percentages of population)


Social indicators
1. Age (6 modalities)
2. Study level (5 modalities)
3. Social category (7 modalities)

Residential indicators
4. Date of construction (4 modalities)
5. Housing status (4 modalities)
6. Surface of housing (4 modalities)

\[ D_{S_{ij}} = \sum_{n=1}^{n} \left| x_n - x_{n_i} \right| \]
**Territorial autocorrelation coefficients**

**Global territorial coefficient**

\[ \text{GTC} = 1 - \frac{DS(B_{ij}=1)}{DS(B_{ij}=0)} \]

GTC > 0 => homogeneous districts

**Local territorial coefficient**

\[ \text{LTC} = 1 - \frac{DS(B_{ij}=1,C_{ij}=1)}{DS(B_{ij}=0,C_{ij}=1)} \]

LTC > 0 => boundaries overlap discontinuities

- **Spatial coefficient**
  \[ SC = 1 - \left( \frac{DS(C_{ij}=1)}{DS(C_{ij}=0)} \right) \]

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**Cartography of dissimilarities & homogeneous areas**

- **HAC of standardized dissimilarities between contiguous units**
- **Overall cartography**
  - Strong dissimilarities concurrently observed on all indicators
  - Moderate dissimilarities observed on all indicators and/or strong dissimilarities observed on some indicators
  - Similarities observed on all indicators

**Exemple**

- Discontinuities
- Homogeneous areas
- Neighborhood districts

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3 answers to analyze neighborhood districts production:

- Morphology of municipality?
  - Classical spatial autocorrelation coefficient (SC)

- Neighborhood districts: homogeneity or heterogeneity?
  - Global territorial autocorrelation coefficient (GTC)

- Districts’ boundaries do overlap discontinuities?
  - Local territorial autocorrelation coefficient (LTC)

+ Cartography based on cluster analysis

Results in 3 municipalities

Heterogeneous municipalities within different social contexts

Same left coalition welling to create neighborhood district but with different strategies:

- 4th: melting pot.
- 11th: rather for heterogeneity.
- 20th: homogeneous districts to promote popular participation.
Neighborhoods’ 20th municipality

An affirmative gerrymandering?
Only in part.

<table>
<thead>
<tr>
<th>Age</th>
<th>Social class</th>
<th>Study level</th>
<th>Date of construction</th>
<th>Housing status</th>
<th>Surface of housing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5C</td>
<td>0.10***</td>
<td>0.22***</td>
<td>0.28***</td>
<td>0.15***</td>
<td>0.25***</td>
<td>0.17***</td>
</tr>
<tr>
<td>6TC</td>
<td>0.15***</td>
<td>0.21***</td>
<td>0.24***</td>
<td>0.18***</td>
<td>0.23***</td>
<td>0.19***</td>
</tr>
<tr>
<td>1TC</td>
<td>0.10*</td>
<td>n.s.</td>
<td>-0.21**</td>
<td>-0.35***</td>
<td>-0.20**</td>
<td>-0.18***</td>
</tr>
</tbody>
</table>

**Note:** **** = very significant; *** = significant; * = borderline significant; n.s. = not significant.

Source: INSEE, RGP, 1999.

Explained variance: 51%

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Neighborhoods’ in 11th municipality

Rather melting pot?
In facts, yes.

<table>
<thead>
<tr>
<th>Age</th>
<th>Social class</th>
<th>Study level</th>
<th>Date of construction</th>
<th>Housing status</th>
<th>Surface of housing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5C</td>
<td>0.08****</td>
<td>0.23***</td>
<td>0.33***</td>
<td>0.11***</td>
<td>0.03***</td>
<td>n.s.</td>
</tr>
<tr>
<td>6TC</td>
<td>n.s.</td>
<td>0.12***</td>
<td>0.04***</td>
<td>n.s.</td>
<td>0.03***</td>
<td>0.06***</td>
</tr>
<tr>
<td>1TC</td>
<td>n.s.</td>
<td>n.s.</td>
<td>-0.51***</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

**Note:** **** = very significant; *** = significant; * = borderline significant; n.s. = not significant.

Source: INSEE, RGP, 1999.

Explained variance: 75%
Neighborhoods’ in 4th municipality: MAUP problems

Melting pot?
No significant answer.

<table>
<thead>
<tr>
<th>Age</th>
<th>Social class</th>
<th>Study level</th>
<th>Date of construction</th>
<th>Housing status</th>
<th>Surface of housing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>0.12***</td>
<td>n.s.</td>
<td>-0.38***</td>
<td>n.s.</td>
<td>0.35**</td>
<td>n.s.</td>
</tr>
<tr>
<td>STC</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>LTC</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Low / ***: very significant / **: significant / *: little significant / n.s.: non-significant
Source: INSEE, RGP, 1999.

Explained variance: 72%

Discussion (1): size of statistical units

63 units / 5 districts
=> Significant Analysis

16 Units / 4 districts
=> No significant analysis

Few very big units shared between 2 districts
=> Discontinuities’ analysis biased

=> May use smaller units
**Discussion (2) : form & layout of statistical units**

For an univariate distribution:

```
1 1 3 3 5 6 7 8
2 2 4 4 5 6 8 7
1 1 4 4 5 6 8 7
1 2 3 4 5 6 7 8
```

3 hypothesis
8 units / 2 districts

- Gradient effect
- Moderate discontinuities intra- and inter-districts
- Strong discontinuities between districts

=> May use a gridmap for a further exploration

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**Conclusions**

- A way to answer to classical questions in geography
- A methodology quite easy to build
- Applicable to:
  - Political strategies of territorialization
  - Small area level (but not too small data set…)
- Coefficients and map are complementary
Thank you for your attention

Powerpoint shortly available on http://alhl.free.fr

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