Effects of labor subcentres in urban property values.  
Case study of the metropolitan region of Barcelona

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SUMMARY

1. Introduction
2. Methodology
3. Discussion
4. Conclusions y futures investigations
1. INTRODUCTION

The CBD and the subcentres
1. INTRODUCTION

Definition of subcentre

What is a subcentre?

Definitions (Mc Millen 2001)

(1) Area with significantly higher employment density than their neighborhood.

(2) Have a significant effect on the density function.

(Roca, Marmolejo y Moix, 2007)

(3) Represents the backbone of a subsystem within the urban metropolitan structure.
SUMMARY

1. Introduction
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2. Methodology

Identification of subcentres candidates

Validation of the subcentre candidates

- Literature methods
  - Ressidual regression
  - Cut off
  - Mobility methods
- Density functions
- Mobility index
- Real Estates values
2. Methodology

Identification of subcentres candidates

Validation of the subcentre candidates

Criteria

- Points anomalous density
- Density functions of parametric and spatial regressions
- Mobility index
- Increased $R^2$ in a regression of hedonic price

Outputs

- Candidate subcentre groups
- Candidate subcentre groups of gavitacional methods
- Increased $R^2$ of a parametric or space regression
- Ranking of the mobility index
- Hedonic price regression, explanation of prices based on the presence of subcentres
2. METODOLOGIA

Vectorial Density

Job Density

W/area
\( W = RW + W(\text{IF}) \)

Does not capture differences from the work is proposed, the density vector as a preliminary grasp

Vectorial Job Density

W(\text{IF})/area
\( RW/\text{area} \)

\[ D_{\text{Vectorial}} = \left( (D_{RW})^2 + (D_{\text{Fla}})^2 \right)^{0.5} \]

\[ \alpha = \arctan \left( \frac{D_{RW}}{D_{\text{Fla}}} \right) \]

\[ D_{\text{LTL}} = D_{RW} + D_{\text{Fla}} \]

\[ D_{\text{Vectorial}} = D_{\text{LTL}} = D_{RW} + D_{\text{Fla}} / \alpha = 45^\circ \]
## 2. METODOLOGÍA

**MODELOS PARA IDENTIFICACIÓN A LOS SUBCENTROS**

<table>
<thead>
<tr>
<th>Family</th>
<th>Model Name</th>
<th>Funcional Form</th>
<th>Variable</th>
<th>Criterion for identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>LOG DTL</td>
<td>$D_{LT} = a + e^{b \cdot \text{Dist}_{GCX} + k}$</td>
<td>Job Density</td>
<td>Municipalities whose residuals a positive one standard deviation higher</td>
</tr>
<tr>
<td>Group 2</td>
<td>LOG DVECT</td>
<td>$D_{VT} = a + e^{b \cdot \text{Dist}_{GCX} + k}$</td>
<td>Vectorial Job Density</td>
<td>Municipalities whose residuals a positive one standard deviation higher</td>
</tr>
<tr>
<td>Group 3</td>
<td>EXP DTL</td>
<td>$D_{LT} = a \cdot (\text{Dist}_{GCX})^b + k$</td>
<td>Job Density</td>
<td>Municipalities whose residuals a positive one standard deviation higher</td>
</tr>
<tr>
<td>Group 4</td>
<td>EXP DVECT</td>
<td>$D_{VT} = a \cdot (\text{Dist}_{GCN})^b - k$</td>
<td>Vectorial Job Density</td>
<td>Municipalities whose residuals a positive one standard deviation higher</td>
</tr>
<tr>
<td>Group 5</td>
<td>G&amp;S</td>
<td>Cut Off</td>
<td>Job Density</td>
<td>D jobs&gt;25 Jobs/ha y Jobs &gt;10.000</td>
</tr>
<tr>
<td>Group 6</td>
<td>GL</td>
<td>Cut Off</td>
<td>Job Density</td>
<td>Jobs locally more than 1% of density greater than the average system</td>
</tr>
<tr>
<td>Group 7</td>
<td>SP DTL</td>
<td>$\ln(D_{LT}) = W_p + b \cdot \text{Dist}_{GCX} + k$</td>
<td>Job Density</td>
<td>Exponential function (LN) negative and positive residues of more than one standard deviation</td>
</tr>
<tr>
<td>Group 8</td>
<td>SP DVECT</td>
<td>$\ln(D_{VT}) = W_p + b \cdot \text{Dist}_{GCN} + k$</td>
<td>Job Density</td>
<td>Exponential function (LN) negative and positive residues of more than one standard deviation</td>
</tr>
<tr>
<td>Group 9</td>
<td>Grv FLE</td>
<td>Modelo gravitacional restringido en origen</td>
<td>Flows of workers</td>
<td>Municipalities to submit further inflows that the model assigns</td>
</tr>
<tr>
<td>Group 10</td>
<td>Grv LTL</td>
<td>Modelo gravitacional restringido en origen</td>
<td>Flows of workers</td>
<td>Municipalities to submit further inflows that the model assigns</td>
</tr>
</tbody>
</table>

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1. Introduction
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3. Discussion

Identified subcentres

Group 1: Exponential Regression
Logarithmic
Job Density
22

Group 2: Vectorial Job Density
22

Group 3: Exponential regression
gravitational
Job Density
26

Group 4: Vectorial Job Density
15

Fuente: Elaboración propia
3. Discussion

Group 5: Cut Off
Gulliano y Small

Group 6: García López

Group 7: Spatial Lag regression
Job Density

Group 8: Vectorial Job Density

Fuente: Elaboración propia
3. Discussion

Group 9: Gravitational Flow

19

Group 10: Gravitational Jobs located

23

Summary

Fuente: Elaboración propia
3. Discussion

Schema validation

\[ P_h = f(V_{Urb-Amb}, U_{Accesibilidad}, Z_{Sociocultural}) \]
The exponential gravity models are those with the greatest increase in all measures distances subcentres. The model is the most improved group 3, followed by group 2 and 4. Notably, the spatial patterns fairly improved by incorporating a sub, but their final values are still lower than the regression models. Furthermore, the model thresholds and gravitational, are less improved.
In the measurement of self and self-sufficiency of each group, where only the group of candidates, gravitational LTL (group 10), García López (group 6) and Gulianno and Small (Group5) are self-values below 50%. Also the highest values of self-groups are in space.

For the self, values below 50% are in Group 5, Gulianno and Small, and in group 9, gravitational flows. The highest values are again in the space groups. However, when analyzing the total mass of the LTL system and each sub-group, there was a significant decrease of the spatial patterns as well as an increase in the values of model thresholds.

One can speculate that the spatial patterns, to eliminate the effects of edge or edges of each sub, and indeed its impact on the surrounding municipalities, selected anomalies central density of larger systems, which lowers the total value of LTL involved in each system. Rather, the model thresholds, selecting larger sets and a "myopic" with autocorrelations, pick these larger systems.
\[ P_h = f(V_{Urb-Amb}, U_{Accesibilidad}, Z_{Sociocultural}) \]

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>R² Ajustado</th>
<th>Std. Error</th>
<th>sig</th>
<th>Durbin-Watson</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.863</td>
<td>.745</td>
<td>.735</td>
<td>142.053</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.086</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Coeficientes no estandarizado</th>
<th>Std. Error</th>
<th>Beta</th>
<th>t</th>
<th>Sig.</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>1412.956</td>
<td>44.64</td>
<td>31.652</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distancia a Barcelona</td>
<td>-8.287</td>
<td>1.08</td>
<td>-.459</td>
<td>-7.635</td>
<td>.000</td>
<td>.457</td>
</tr>
<tr>
<td>Zona de Costa</td>
<td>178.383</td>
<td>32.67</td>
<td>.246</td>
<td>5.460</td>
<td>.000</td>
<td>.817</td>
</tr>
<tr>
<td>Equipamiento por superficie municipal</td>
<td>8.731</td>
<td>5.78</td>
<td>.081</td>
<td>1.510</td>
<td>.133</td>
<td>.580</td>
</tr>
<tr>
<td>Componente 1 LTL por tipos</td>
<td>37.221</td>
<td>15.84</td>
<td>.134</td>
<td>2.349</td>
<td>.020</td>
<td>.506</td>
</tr>
</tbody>
</table>

Fuente: Elaboración propia
Real Estates values

The hedonic regression as are summarized in, which notes that most of the regressions are worsening or failing that their coefficients are not significant. In parentheses, below each of the coefficients, are the t values (significance), which correspond to the statistical significance of coefficients. Group 4 (15 sub), using a parametric exponential regression is the most robust because it increases their adjustment and both coefficients, the distance to the CBD and subcenters, are significant. Groups 6 and 10, increases the adjustment to the initial regression, but both have multicolineality problems.
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## Summary

### Group Densities and Mobility Flows

<table>
<thead>
<tr>
<th>Group</th>
<th>Density</th>
<th>Mobility Flows</th>
<th>Real estate s value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Puntos anómalos de densidad</td>
<td>Aumento del R² de una regresión paramétrica o espacial</td>
<td>Aumento de R² en una regresión hedónica, signo y significancia del coeficiente</td>
</tr>
<tr>
<td>Group 1</td>
<td>LOG DLTL</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 2</td>
<td>LOG DVECT</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 3</td>
<td>EXP DLTL</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 4</td>
<td>EXP DVEC</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 5</td>
<td>G&amp;S</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 6</td>
<td>GL</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 7</td>
<td>SP DLTL</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 8</td>
<td>SP DVEC</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 9</td>
<td>Grv FLE</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Group 10</td>
<td>Grv LTL</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Conclusions

The identification and selection of a sub-urban metropolitan area, you need a variety of dimensions, and be seen from all of them. According to the model of Alonso and Mills, the location of these work centers on defining the structure of land rents in an urban setting, the work of Muth, and linked with the density of workers and generates negative exponential model, widely used in literature.

The research sought to develop a proposal for the classification of model identification based on the definition of sub and not on existing methodologies, establishing subcentres employment in the metropolitan area of Barcelona and implemented a validation method based on three axes, the explanation of the density of neighbors, mobility or ability to structure and travel flows, and ultimately its impact on the prices of housing situation.
Conclusiones

The vector density was more effective and efficient in identifying sub-metropolitan, shows that it is true in the models and exponential gravity model space, thus adopting. However, the classical exponential logarithmic regression, the difference is no greater and in fact it works almost on a density equivalent to the traditional model.

The values of housing is related to the distance or accessibility subcentres and therefore can measure the efficiency of a sub-group of candidates, the hypothesis is controversial, since it can establish a proper validation of suburban but the segmentation of housing markets and hence their change in the attributes of the house, beyond its location on the micro and macro environment, must play a decisive role in the price. Besides the case study shows a correlation between variables and the distance to Barcelona, which, most models are rejected by multicollineality, however, the models are allowed and which are better, are consistent with previous validations, therefore, it is estimated that the most robust.