Time use constraints in multimodal trips making

Madrid case study

Pablo Jordá Lope TRANSyT – UPM (Spain)
1) Introduction
2) Methodology
3) Case study: Madrid metropolitan area
4) Results
5) Conclusions
1) Introduction (I)

- People dedicate a limited time to their daily trips, so multimodal trips are penalized because they are usually longer (in time) than unimodal trips.
- Public transport chains have a problem to keep their competitive performance level against car.
1) Introduction (& II)

- It is necessary to assess if a specific public transport option could be a real alternative to car mobility.
- Data available from mobility surveys can be used to define a “comparative travel time ratio” (CTTR) between public transport travel time and car travel time.

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2) Methodology

- In each Origin / Destination pair:
  - PT mode trips $\rightarrow$ Travel time = $t_{pi}$
    $\rightarrow$ Patronage = $a_i$ (PT mode trips/total trips/day)
  - Car trips $\rightarrow$ Travel time = $t_c$
  - $CTTR_i = t_{pi} / t_c = b_i$
3) Study case: Madrid metropolitan area and its zones

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### 3) Social indicators. Madrid metropolitan area, 2004

<table>
<thead>
<tr>
<th></th>
<th>Inhabitants</th>
<th>Surface area km²</th>
<th>Density inh/km²</th>
<th>Jobs</th>
<th>Jobs/1,000 inh</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Madrid municipality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBD</td>
<td>1,018,732</td>
<td>42</td>
<td>24,256</td>
<td>959,877</td>
<td>942</td>
</tr>
<tr>
<td>Periphery</td>
<td>2,116,513</td>
<td>564</td>
<td>3,753</td>
<td>815,648</td>
<td>385</td>
</tr>
<tr>
<td>Metropolitan ring</td>
<td>2,328,494</td>
<td>2,086</td>
<td>1,116</td>
<td>893,982</td>
<td>384</td>
</tr>
</tbody>
</table>

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3) Public transport modes in Madrid metropolitan area

- **Urban bus**: are operated by the municipal transport company (EMT) in Madrid municipality.
- **Metro**: Metro service in Madrid Metropolitan area. Only 2 of the 12 lines of the network are in the metropolitan ring.
- **Suburban bus**: are operated by many private and public companies in the metropolitan ring.
- **Suburban train**: railways services operated by RENFE.
3) Study case: Madrid metropolitan area Household survey

ENCUESTA DOMICILIARIA DE MOVILIDAD DE 2004 EN LA COMUNIDAD DE MADRID

34,942 households
84,317 persons
Asked about trips in a working day:
Number of trips, modes used, trip origin, trip destination…

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3) Modal split. Urban trips, 2004

- Walking: 32.0%
- Urban Bus: 15.5%
- Metro: 19.9%
- Car: 22.4%
- Taxi: 6.6%
- Motorbike: 0.7%
- Suburban Train: 2.3%
- Suburban Bus: 0.4%

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3) Modal split. Metropolitan trips, 2004

- Car 44.5%
- Walking 30.2%
- Suburban Bus 12.1%
- Suburban Train 8.5%
- Metro 3.7%
- Urban Bus 0.1%
- Motorbike 0.5%
- Taxi 0.4%

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4) Trips inside CBD (O/D 1)

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4) Trips between CBD and Periphery (O/D 2)

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4) Trips inside Periphery (O/D 3)

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4) Trips between CBD and Metropolitan ring (O/D 4)

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4) Trips between Periphery and Metropolitan ring (O/D 5)

Comparative travel time ratio CTTR

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4) Trips inside Metropolitan ring (O/D 6)

Comparative travel time ratio CTTR

Patronage

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4) Urban bus of Madrid Trips

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4) Metro trips

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4) Suburban bus Trips

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4) Suburban rail Trips

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5) Conclusions (I)

• **Monomodal** public transport trips:
  - CTTR values $\leq 1.5$ ✓
  - Patronage is significant ✓

• **Multimodal** public transport trips:
  - CTTR values high, even $>3$ ✗
  - Patronage is not significant ✗
5) Conclusions (& II)

- Trend of CTTR for different modes:
  Decreases as long as we are closer to the CBD and public transport patronage is getting higher ⬆
  - Urban buses trips
  - Metro trips
  - Suburban buses + Metro trips
  In other cases, it is not clear

- If CTTR 1.5 – 2, public transport is competitive against car
Thank you for your attention

www.transyt.upm.es
pjordan@caminos.upm.es