HSR AS TRANSIT

The continuing transportation-driven evolution of metropolitan form

March 2015 – Ryan J. Westrom and Joseph M. Sussman
OVERVIEW

I. HSR as Transit
II. The rise of urbanization: Transportation and metropolitan form
III. HSR rail and metropolitan form
   a) Metropolitan form effects
   b) 21st Century Garden Cities?
   c) Transit-oriented development
   d) New urbanism
IV. Learning from case communities
V. Concluding thoughts
“Transportation technology that allows individuals to access the megacity without living within its boundaries offers potentially large social benefits.”

-Siqi Zheng and Matthew E. Kahn

Source: Zheng and Kahn, 2013
HSR and Regions

International Megaregion

Megaregion

Commuting Region

Microregion

Urban Transportation
Rail Station
HSR Link
Commuter Rail

HSR as Transit Within Commuting Region

Metropolitan Area (of varying size)

Source: Sussman, Archila, and Westrom, 2014
THE RISE OF URBANIZATION
Transportation and metropolitan form
Cities

- Cities formed to allow collaborative (or agglomerative) benefits to society.
- Historically, villages grew up around wells, and then grew to the size a 20-minute walk to the well would allow.
- Villages at transportation crossroads grew further to become cities.
- But whatever their shape, cities have always been formed by their transportation. Economist Edward Glaeser observes, “Transportation technologies have always determined urban form.”
Cities
Cities
Intraurban Transport and Metropolitan Growth

Source: Muller, 2004
HSR RAIL AND METROPOLITAN FORM
Effects of Technological Innovations on Travel Speeds and Times

<table>
<thead>
<tr>
<th>Technology</th>
<th>Approximate date introduced</th>
<th>Typical door-to-door speed (mph)</th>
<th>Travel time per mile (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>Early</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Horse-drawn omnibus</td>
<td>1827</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Horse-drawn streetcar</td>
<td>1835</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Cable car</td>
<td>1875</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>Electric streetcar</td>
<td>1890</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Rail rapid transit</td>
<td>1910</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Motor bus</td>
<td>1915</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Automobile</td>
<td>1920</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>High-speed rail</td>
<td>1964</td>
<td>120</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: Pickrell, 1999 and author
The Formation of Discontinuous Regions

Conceptual Diagram: Discontinuous Regions

- Feasible commuting time from dominant city core - part of discontinuous labor and commercial market
- Interstitial space - closer but not as accessible due to network effects
- High-speed rail connection
- Municipal boundaries that create governance complexity
- Formerly independent cities become part of the new discontinuous region.

Traditional metropolitan area of dominant city

Source: Stein, 2013
21st Century Garden Cities?

Source: Howard, 1902
Transit-Oriented Development

Source: Peter Calthorpe
New Urbanism

Source: PlaceMakers
LEARNING FROM CASE COMMUNITIES
Leiria and Coimbra, Portugal
Kankakee and Champaign-Urbana, Illinois
Source: RAVE
An Overview of Coimbra
Coimbra, Portugal
An Overview of Leiria
Leiria, Portugal
An Overview of Champaign-Urbana
Champaign-Urbana, Illinois
An Overview of Kankakee
Kankakee, Illinois
## Travel Time Comparisons

<table>
<thead>
<tr>
<th>Locale</th>
<th>Rail Distance (mi.)</th>
<th>Existing Highway Travel Time**</th>
<th>Existing Rail Travel Time***</th>
<th>Existing Flight Travel Time****</th>
<th>Proposed HSR Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kankakee</td>
<td>56</td>
<td>61</td>
<td>73</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>Champaign-Urbana</td>
<td>129</td>
<td>129</td>
<td>130</td>
<td>135</td>
<td>55</td>
</tr>
<tr>
<td>St. Louis</td>
<td>314</td>
<td>267</td>
<td>320</td>
<td>155</td>
<td>127</td>
</tr>
<tr>
<td>Lisbon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Leiria</td>
<td>92.6</td>
<td>83</td>
<td>175</td>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>Coimbra</td>
<td>127.0</td>
<td>109</td>
<td>111</td>
<td>-</td>
<td>56</td>
</tr>
<tr>
<td>Porto</td>
<td>197.0</td>
<td>165</td>
<td>159</td>
<td>145</td>
<td>75</td>
</tr>
</tbody>
</table>
# Key Data

<table>
<thead>
<tr>
<th>Locale</th>
<th>City Population</th>
<th>Metropolitan Population</th>
<th>Rail Distance (mi.)</th>
<th>GDP#</th>
<th>GDP/capita</th>
<th>Unemployment Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>2,695,598</td>
<td>9,461,105</td>
<td>-</td>
<td>$ 524.6</td>
<td>$ 55,448.07</td>
<td>11.2</td>
</tr>
<tr>
<td>Kankakee</td>
<td>27,537</td>
<td>113,449</td>
<td>56</td>
<td>$ 3.2</td>
<td>$ 28,479.76</td>
<td>14.4</td>
</tr>
<tr>
<td>Champaign-Urbana</td>
<td>122,305</td>
<td>231,891</td>
<td>129</td>
<td>$ 9.2</td>
<td>$ 39,837.68</td>
<td>8.9</td>
</tr>
<tr>
<td>St. Louis</td>
<td>319,294</td>
<td>2,787,701</td>
<td>314</td>
<td>$ 132.7</td>
<td>$ 47,601.95</td>
<td>10.8</td>
</tr>
<tr>
<td><strong>Illinois</strong></td>
<td>12,830,632</td>
<td>-</td>
<td>-</td>
<td>$ 695.2</td>
<td>$ 54,182.83</td>
<td>9.2</td>
</tr>
<tr>
<td>Lisbon</td>
<td>547,361</td>
<td>3,035,000</td>
<td>-</td>
<td>$ 95.2</td>
<td>$ 31,367.38</td>
<td>11.7</td>
</tr>
<tr>
<td>Leiria</td>
<td>50,200</td>
<td>126,879</td>
<td>92</td>
<td>$ 2.3</td>
<td>$ 18,113.00</td>
<td>10.7</td>
</tr>
<tr>
<td>Coimbra</td>
<td>102,455</td>
<td>435,900</td>
<td>127</td>
<td>$ 7.8</td>
<td>$ 17,926.00</td>
<td>12.4</td>
</tr>
<tr>
<td>Porto</td>
<td>237,591</td>
<td>1,817,172</td>
<td>197</td>
<td>$ 41.6</td>
<td>$ 22,892.71</td>
<td>16.5</td>
</tr>
<tr>
<td><strong>Portugal</strong></td>
<td>10,562,178</td>
<td>-</td>
<td>-</td>
<td>$ 237.6</td>
<td>$ 22,495.36</td>
<td>12.3</td>
</tr>
</tbody>
</table>
What are Coimbra and Champaign-Urbana like?

- **Micro-urban**
  - An informal term for smaller cities of 250,000 or less with specific urban characteristics normally found in large metropolitan centers
- **How do they epitomize 21st Century urbanization?**
  - Smart people — intellectual leader and source of knowledge
    - University of Coimbra, University of Illinois
  - Technology exploration, innovation, and entrepreneurship
    - iParque, The Research Park at the University of Illinois
  - Academics, tech, and health care?

- One can imagine the potential for these 21st Century ‘clusters’.
Urban Transect Zones

Source: Duany Plater-Zyberk & Company
Takeaways?

• HSR can move cities into a commuting region,
  But these connections must be planned for.

• In the end, we do not invest in infrastructure as an end in itself. We do it for the benefits it brings.

• With the benefits shown for these HSR systems, planners must accommodate this investment in a fashion that further leverages their potential.

• Doing so may again shift metropolitan form, now to a regional scale, while also bringing corollary growth, but without the sprawl inherent in conventional megacities.
Some Influential References


Thoughts/Questions?
Authors

Ryan J. Westrom
Senior Transportation Planner/Engineer
District Department of Transportation
2015 Chair, Travel Forecasting Subcommittee (MWCOG)

Prof. Joseph M. Sussman
Massachusetts Institute of Technology