Sorting based on amenities and income composition: Evidence on the multiplier effect

Workshop: Soort zoek soort
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Background

Follow up on a previous work

- Municipality level (The Netherlands)
- WoON 2009
- Highly educated households
- Willingness to pay for residing in (or close to) historic city centers

This paper

- Neighbourhood level (Amsterdam and surrounding mun’s)
- CBS SSB (GBA + IHI + SEC)
- Income and social economic category
- Willingness to pay for residing in (or close to) the Amsterdam historic city center and a large concentration of high income households
Motivation

o Urban amenities are becoming more prominent
  - Traditional focus on city as center of employment (Alonso-Muth-Mills models)
  - But other (consumption) needs are growing in relative importance

o Consumers attach value to
  - Shops
  - Schools
  - Climate
  - Natural amenities (Bays, beaches, parks,...)
  - Cultural heritage (Ancient inner cities, monuments, museums,...)
  - Live among households with the same characteristics

o Focus on high income households
Literature

- Amenities affect household location choice
  - Theoretical model (Brueckner, Thisse & Zenou, 1996)
  - Beautiful city (Carlino & Saiz, 2008)

- Residential segregation driven by location choice
  - Race and ethnicity preferences (Bayer & McMillan, 2010)
  - Tipping points (Card, Mas & Rothstein, 2008)

- Households with the same preferences sort into the same neighborhoods
House price distribution

Green = low
Red = high
This paper

- **Empirical analysis of household location choice**
  - Sorting model (Bayer, McMillan & Rueben)
  - Willingness to pay / Counterfactual analysis

- **Emphasis on income distribution within the Amsterdam area**
  - Neighbourhood analysis
  - Historic city center
  - Concentration of high income households (top 25%)
Location choice model

- **Spatial unit:**
  - Neighbourhood (appr. 280)

- **Household data: Sociaal Statistisch Bestand (SSB)**
  - Covers all households in The Netherlands

- **Heterogeneous population**
  - Income and social economic category (student/employed/retired)
  - Other household characteristics (age/children)
  - Homeowners / Renters

- **Neighbourhood data:**
  - Employment, accessibility, historic city center, percentage of high income households

- **Prices of a standard house for each neighborhood**
  - Hedonic prices with neighborhood fixed effects
Sorting model

- Two-stage procedure (Bayer et al., 2004)
  1. MNL
  2. 2SLS

1. 
\[ u_{i,n} = \delta_n + \sum_{k=1}^{K} \left( \sum_{l=1}^{L} \beta_{k,l} (Z_{i,l} - \bar{Z}_l) \right) X_{k,n} + \varepsilon_{i,n} \]

Utility function
- \( \delta \): neighborhood fixed effect (ASC)
- \( Z \): household characteristics
- \( X \): neighborhood characteristics

Logit model
\[ p_{r_{i,n}} = \frac{\exp(w_{i,n})}{\sum_{m=1}^{M} \exp(w_{i,m})} \]
\[ \sum_{i=1}^{l} p_{r_{i,n}} = S_n \]

Equilibrium condition
\[ \delta_n = \sum_{k=1}^{K} \beta_{0,k} X_{k,n} + \xi_n \]
Results (homeowners)

First stage estimation: Multinomial logit model

<table>
<thead>
<tr>
<th>Neighborhood characteristics</th>
<th>Household characteristics</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>Student</td>
<td>Unemployed</td>
<td>Retired</td>
<td></td>
</tr>
<tr>
<td>Standardized house price (in euros)</td>
<td><strong>0.01259</strong></td>
<td>7.16892</td>
<td>1.1332</td>
<td>3.53872</td>
</tr>
<tr>
<td></td>
<td><strong>(0.0006)</strong>*</td>
<td>(0.5332)**</td>
<td>(0.1438)**</td>
<td>(0.1147)**</td>
</tr>
<tr>
<td>Historical city center (km2)</td>
<td><strong>0.00313</strong></td>
<td>0.46699</td>
<td>0.2735</td>
<td>0.11243</td>
</tr>
<tr>
<td></td>
<td><strong>(0.0004)</strong>*</td>
<td>(0.2561)*</td>
<td>(0.105)**</td>
<td>(0.0971)</td>
</tr>
<tr>
<td>Historical city center in surrounding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>neighborhoods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>-0.00031</strong></td>
<td>0.48496</td>
<td>-0.04107</td>
<td>-0.19689</td>
</tr>
<tr>
<td></td>
<td><strong>(0.0005)</strong>*</td>
<td>(0.0412)**</td>
<td>(0.0107)**</td>
<td>(0.0088)**</td>
</tr>
<tr>
<td>High income households (%)</td>
<td><strong>0.00027</strong></td>
<td>-0.56594</td>
<td>-0.00735</td>
<td>0.00133</td>
</tr>
<tr>
<td></td>
<td><strong>(0.0001)</strong>*</td>
<td>(0.0067)**</td>
<td>(0.0019)**</td>
<td>(0.0015)</td>
</tr>
<tr>
<td>Distance to the nearest 100,000 jobs (km)</td>
<td><strong>0.00001</strong></td>
<td>-0.0897</td>
<td>0.01799</td>
<td>0.06445</td>
</tr>
<tr>
<td></td>
<td><strong>(0.00004)</strong></td>
<td>(0.0411)</td>
<td>(0.0093)*</td>
<td>(0.0075)**</td>
</tr>
</tbody>
</table>

Location choice of different types of homeowners.
The coefficients are deviations from the mean indirect utility (or the alternative specific constants).
Sorting model

○ Two-stage procedure (Bayer et al., 2004)
  • 1. MNL
  • 2. 2SLS

1. \[ u_{i,n} = \delta_n + \sum_{k=1}^{K} \left( \sum_{l=1}^{L} \beta_{k,l} (Z_{i,l} - \bar{Z}_l) \right) X_{k,n} + \varepsilon_{i,n} \]

\[ p_{r_{i,n}} = \frac{\exp(w_{i,n})}{\sum_{m=1}^{M} \exp(w_{i,m})} \quad \sum_{i=1}^{I} p_{r_{i,n}} = S_n \]

2. \[ \delta_n = \sum_{k=1}^{K} \beta_{0,k} X_{k,n} + \xi_n \]

Alternative specific constant
\( \delta \): neighborhood fixed effect (ASC)
X: neighborhood characteristics
Price and percentage of rich households are endogenous
Results (homeowners)

Second stage estimation: 2SLS

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS (se)</td>
<td>2SLS (se)</td>
</tr>
<tr>
<td>Standardized house price (in euros)</td>
<td>-1.2582</td>
<td>-37.9354</td>
</tr>
<tr>
<td></td>
<td>(0.5621)***</td>
<td>(10.434) **</td>
</tr>
<tr>
<td>Historical city center (km2)</td>
<td>1.3146</td>
<td>7.5236</td>
</tr>
<tr>
<td></td>
<td>(0.3482)***</td>
<td>(3.327) **</td>
</tr>
<tr>
<td>Historical city center in surrounding neighborhoods</td>
<td>0.0521</td>
<td>1.7907</td>
</tr>
<tr>
<td></td>
<td>(0.0435)***</td>
<td>(0.517) **</td>
</tr>
<tr>
<td>High income households (%)</td>
<td>-0.0079</td>
<td>0.2618</td>
</tr>
<tr>
<td></td>
<td>(0.0087)***</td>
<td>(0.0812) ***</td>
</tr>
<tr>
<td>Distance to the nearest 100,000 jobs (km)</td>
<td>-0.1323</td>
<td>-0.1692</td>
</tr>
<tr>
<td></td>
<td>(0.0285)***</td>
<td>(0.1393)</td>
</tr>
<tr>
<td>Constant</td>
<td>15.5797</td>
<td>451.915</td>
</tr>
<tr>
<td></td>
<td>(6.661) **</td>
<td>(124.15) ***</td>
</tr>
<tr>
<td>Price instrumented</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>High income households instrumented</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>F-statistic</td>
<td></td>
<td>6.598</td>
</tr>
</tbody>
</table>
Results (homeowners)

Marginal willingness-to-pay

<table>
<thead>
<tr>
<th>Marginal willingness-to-pay results from the 2SLS estimation</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic city center (+km²)</td>
<td>41,619</td>
<td>2,090</td>
<td>6,231</td>
<td>576</td>
<td>1,728 (ns)</td>
</tr>
<tr>
<td>Historic city center in surrounding n'hoods (+km²)</td>
<td>9,906</td>
<td>90</td>
<td>2,799</td>
<td>-47</td>
<td>-180</td>
</tr>
<tr>
<td>High income households (+%)</td>
<td>1,448</td>
<td>140</td>
<td>-2,124</td>
<td>55</td>
<td>166 (ns)</td>
</tr>
<tr>
<td>Distance to nearest 100,000 jobs (-km)</td>
<td>936 (ns)</td>
<td>20 (ns)</td>
<td>552 (ns)</td>
<td>-15</td>
<td>-160</td>
</tr>
</tbody>
</table>

In terms of house prices!
Column 2-5 show deviations from the mean in Column 1

Top 25% high income households have at least 25k more income than average
Results (simulation)

Simulation where there is no historic city center (total effect)

<table>
<thead>
<tr>
<th>Neighborhoods</th>
<th>Standardized house price (in euros)</th>
<th>Predicted house price (in euros)</th>
<th>Difference</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amstel III en Bullewijk</td>
<td>119,581</td>
<td>191,581</td>
<td>+72,000</td>
<td>+60%</td>
</tr>
<tr>
<td>Bijlmer-Oost E, G en K</td>
<td>144,981</td>
<td>180,890</td>
<td>+35,909</td>
<td>+25%</td>
</tr>
<tr>
<td>Bijlmer-Centrum D, F en H</td>
<td>146,714</td>
<td>181,313</td>
<td>+34,599</td>
<td>+24%</td>
</tr>
<tr>
<td>Grachtengordel-Zuid</td>
<td>359,220</td>
<td>204,869</td>
<td>-154,351</td>
<td>-43%</td>
</tr>
<tr>
<td>Grachtengordel-West</td>
<td>359,694</td>
<td>204,790</td>
<td>-154,904</td>
<td>-43%</td>
</tr>
<tr>
<td>Museumkwartier</td>
<td>380,141</td>
<td>210,465</td>
<td>-169,676</td>
<td>-45%</td>
</tr>
</tbody>
</table>

Average house prices stay the same
Direct + indirect effect (adjustment of other endogenous urban amenities)
Counterfactual simulation
Conclusions

- Important differences between different types of households
  - Higher income households are more attracted to the historic city center of Amsterdam.
  - But higher income households are also attracted to high income neighbourhoods

- Multiplier effect
  - What drives this multiplier effect (work in progress)
    - More specific shops in neighborhoods with a high concentration of high income households...
Conclusions

- The historic city center is a very important feature of Amsterdam
  - Attracts high income households. They seem to prefer to live close to the historic city center of Amsterdam.

- Large impact if cultural heritage would be distributed equally over the neighborhoods
  - Sharp decrease in house prices in the center and sharp increases in the current poorer neighborhoods
  - Without cultural heritage: City center = poor and Suburbs = rich (???)
Thank you for your attention!

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