GENDERED MOBILITY: RESHAPING GEOGRAPHY BETWEEN WORK AND NON-WORK DAYS

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Outline

• Introduction
• Conceptual Framework
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We study the gendered dimension of daily activity spaces.

Much research has demonstrated that women and men adopt different travel patterns and use space differently on account of constraints placed by in-home gendered roles as well as outside constraints placed by out-of-home work.

We analyze how activity spaces change when work place constraints are relaxed by comparing workday and non-workday geographies.

We imagine the non-work day activity space as formed in-part by a relaxation of the work place constraint.
Conceptual Framework

a) Workday locations

b) Non-workday locations

c) All locations

d) Overlaid polygons

e) Reshaped polygons under constraints and personal preferences
Hypothesis

• We assume that during workdays women are constrained substantially by in-home and out-of-home tasks and thus their geographies are smaller.

• During non-workdays, once the constraints of work are removed, we expect geographies for women to be considerably expanded.

• We expect the amount of expansion to be larger for women than for men.

• We expect these changes to be mediated by variables including the presence of children, the presence of other adults, personal tastes, and neighborhood characteristics.
Background

• Home and work activities inform the time spent on other out of home non-work activities during workdays for women and men *(Bhat and Singh, 2000)*

• There are regularities in activity participation in space and time during workdays than during non-workdays for women and men *(Kang et al., 2010)*

• Work and household duties constraint women and affect their travels *(Hayden, 2005 and Law, 1999)*

• Women who are in charge of a lot of household duties usually work locally and then have shorter commutes *(Hanson and Pratt, 1995; Hasson and Polevoy, 2011; Tuner and Grieco, 2000)*

• Higher number of spatial and temporal fixed activities for women compared to men (work, dropping kids at day care or school, etc.) constrain their travel to other places and configure their daily workday activities *(Kwan, 1999; Kwan, 2000)*
Background

• Women with children at home have different mobility needs showing the importance of non-workdays (Dowling, 2000)

• Women are sometimes responsible of chauffeuring husband and kids to different locations in addition to the household shopping and other errands (Dowling, 2000)

• Other Factors that can contribute to gender travel behavior are: sociodemographic, socioeconomic, family structure, safety and security, and built environment (Hayden, 2005; Hasson and Polevoy, 2011; Law, 1999; Tuner and Grieco, 2000; McLafferty and Preston, 1991; Uteng and Cresswell, 2012; Jonston-Anunmonwo, 1992; Strathman, Dueker, and Davis, 1994; McGuckin and Murakami, 2007; Handy, 2004; Krizek, Johnson, and Tilahun, 2005; Mokhtarian and Raney, 1997)
Data

• We use the disaggregate data collected by the Chicago Metropolitan Agency for Planning (CMAP) from January 2007 to February 2008

• The GPS subset of the CMAP data used in our study has:
  • 112 workers with 7 day on-person GPS data
  • We use a subset whose workplace and workdays could be identified from the passive GPS records
  • Of the 112 workers, 14 people work from home and 90 people have both work day and non-work day data collected

• We also use the American Community Survey (ACS) dataset for home area characteristics
Research Approach

• We use convex polygons to describe the activity spaces of individuals.
• We wish to compare:
  \[
  \frac{\text{Average Non workday Area}}{\text{Average Workday Areas}}
  \]
• However, when no more than one out of home activity is enjoyed, the convex area can be zero and the ratio undefined. Thus we modify by adding the distance to the longest duration activity both on the numerator and denominator
  \[
  \frac{\text{Average Non workday Area} + \text{Distance to Longest Duration Activities}}{\text{Average Workday Areas} + \text{Home to Work Distance}}
  \]
• We employ a logit model to analyze the variables that are associated with significant changes in activity spaces.
Research Approach

Overlaid Workday and Non-Workday Polygons for three Workers
### Analysis

#### Differences in Geographies during Workdays and Non-Workdays between men and women

<table>
<thead>
<tr>
<th></th>
<th>Workdays</th>
<th></th>
<th></th>
<th>Non-Workdays</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
<td>Diff.</td>
<td>Women</td>
<td>Men</td>
<td>Diff.</td>
</tr>
<tr>
<td>Average Daily Areas (KM²)</td>
<td>21.3</td>
<td>60.0</td>
<td>-38.7</td>
<td>***</td>
<td>36.7</td>
<td>29.3</td>
</tr>
<tr>
<td>Average Daily Perimeters (KM)</td>
<td>29.6</td>
<td>48.6</td>
<td>-19.0</td>
<td>***</td>
<td>30.7</td>
<td>25.3</td>
</tr>
<tr>
<td>Average In-Home Activity Duration (Minutes)</td>
<td>865.5</td>
<td>682.7</td>
<td>182.8</td>
<td>*</td>
<td>738.9</td>
<td>676.2</td>
</tr>
<tr>
<td>Home to Work Distance (KM)</td>
<td>11.4 (7.1 miles)</td>
<td>19.5 (12.1 miles)</td>
<td>-8.1 (-5.0 miles)</td>
<td>***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Gender difference exists during workdays but not significantly during non-workdays
- Difference is likely because women spend more time doing in-home activities during workdays and thus work close to home

*** significant at 0.01 level, ** significant at 0.05 level, * significant at 0.1 level
Analysis

Difference in Average Daily Areas by Gender, Type of Day and Household Structure:

- Women have smaller daily areas than men during workdays but slightly larger areas than men during non-workdays.
- Women with children under 5 and 12 have smaller daily areas during both workdays and non-workdays.
We model the possibility that non-work day areas fall into one of the following three categories:

- are significantly smaller than workday areas (between 0-75% of the work day area)
- are more or less similar to work day areas (75% to 125% of work day areas)
- are significantly larger than work day areas (greater than 125% of workday areas)

\[
R = \frac{\text{(Average Non workday Area)}}{\text{(Average Workday Areas)}} + \frac{\text{(Distance to Longest Duration Activities)}}{\text{(Home to Work Distance)}}
\]

Y = 0, if R < 0.75; Y = 1, if 0.75 < R ≤ 1.25; Y = 2, if R > 1.25

We use an ordered multinomial logit model to estimate

\[\Pr(Y = j) = f(S, I, T, A, N)\]

with:

Y = Area ratio category (can take on value j where j can be 0, 1, or 2 as defined above)
S = Gender and household variables including household structure and income
T = Transportation related variables
A = Activity related variables
N = Neighborhood/Home area characteristics
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Estimate</th>
<th>P-Value</th>
<th>Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept 2</td>
<td></td>
<td>-1.298</td>
<td>0.216</td>
<td>0.273</td>
</tr>
<tr>
<td>Intercept 1</td>
<td></td>
<td>-0.090</td>
<td>0.931</td>
<td>0.914</td>
</tr>
<tr>
<td>Socio-Demographic/ Household variables (S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women no children</td>
<td>dummy: 1 if worker is a female with no children in her household</td>
<td>3.376</td>
<td>0.000</td>
<td>29.250</td>
</tr>
<tr>
<td>Women with children under 12</td>
<td>dummy: 1 if worker is a female with children under 12 in her household</td>
<td>1.925</td>
<td>0.021</td>
<td>6.853</td>
</tr>
<tr>
<td>Men no children</td>
<td>dummy: 1 if worker is a male with no children in his household</td>
<td>1.718</td>
<td>0.040</td>
<td>5.572</td>
</tr>
<tr>
<td>Men with children under 12</td>
<td>dummy: 1 if worker is a male with children under 12 in his household</td>
<td>1.872</td>
<td>0.025</td>
<td>6.499</td>
</tr>
<tr>
<td>Two or more adults in the household</td>
<td>dummy: 1 if worker lives in household with more than one adult</td>
<td>0.678</td>
<td>0.382</td>
<td>1.971</td>
</tr>
<tr>
<td>Household income</td>
<td>worker’s household income</td>
<td>-1.138</td>
<td>0.158</td>
<td>0.320</td>
</tr>
<tr>
<td>Transportation (T)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses transit to work</td>
<td>dummy: 1 if worker rides transit to work</td>
<td>-1.419</td>
<td>0.010</td>
<td>0.242</td>
</tr>
<tr>
<td>Activity (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workday home activity duration</td>
<td>average workday home activity duration</td>
<td>-0.889</td>
<td>0.052</td>
<td>0.411</td>
</tr>
<tr>
<td>Neighborhood/Home Area Characteristic (N)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home distance to downtown</td>
<td>home distance to downtown</td>
<td>-0.012</td>
<td>0.780</td>
<td>0.988</td>
</tr>
<tr>
<td>Goodness of Fit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Square</td>
<td></td>
<td>0.254</td>
<td></td>
<td>154.370</td>
</tr>
<tr>
<td>Max-rescaled R-Square</td>
<td></td>
<td>0.294</td>
<td>(-2LogL) Intercept Only</td>
<td>131.785</td>
</tr>
</tbody>
</table>
Discussion of Results

• The aggregate summaries of activity geography sizes and time spent in home suggest that women limit their work day geographies and in turn spend considerably longer times in their homes on work days.

• In contrast, during non-work days, the area for women are larger as compared to their workday areas. For men, non work areas are significantly smaller than work day areas.

• Women with no children are more likely to have larger non-work day geographies relative to work day areas than the base category.

• The estimate for women with no children is also much larger than men with no children (3.37 vs 1.71) and women with children under 12 (3.37 vs 1.71)
Discussion of Results

• Men with children under 12 and men with no children are more likely to have larger ratios as compared to those with children above 12 years of age.

• However, all other things equal, being a man with children under 12 is not much different from being man with no children when it comes to how much larger the non-workday activity space is relative to the work day space.

• In contrast, for women, the odds of having a larger non-work day area is smaller when the have children under 12 than when they have no children.
Discussion of Results

• Transit users to work are less likely to have larger non-workday activity spaces.

• Those who spend more time in home on a work day were less likely to increase their non-work area relative to work day areas.

• Income and the presence of multiple adults did not impact the observed ratios.

• Distance to downtown (proxy for suburb/city and density) did not affect the observed ratios.
Thank You

Questions?
References


• Kwan, M.-P. Gender, the home-work link, and space-time patterns of non-employment activities. Economic Geography, Vol. 75, No.4, 1999, pp. 370-394.

References


