Preferred citation style

Long-term commitments and their effects on daily travel behaviour

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Structure

Three parts:

• A look back

• Long term commitments and their impacts

• Social networks and their impacts
A look back: Productivity growth since 1000 (W Europe)

Galor and Weil (2000)

Growth rate [%/year]

Year

Productivity
Population
A look back: Average consumption of housing (CH)

Rumley (1984); Keller
A look back: Household size (CH)

Mean household size

- Central Switzerland
- Alpine cantons
- NE - Switzerland
- NW - Switzerland
- Romandie
- Switzerland

Year

1850 1870 1890 1910 1930 1950 1970 1990
Summary for the look back

Extraordinary income streams have been created and are consumed (in part) as

- Travel (Speed)
- More (and dispersed) housing
- Long-distance communication
- Longer lives with less work
- Independence/Isolation
Commitments

Issue:

• How to deal with the different time frames of transport related decisions?
• How to deal with commitments?

Examples:

• Mode choice
• Activity spaces (Schönfelder)
• Ownership of mobility tools (Simma, König, Scott)
Self-selection is pervasive

Well known, but generally ignored

Why?

• Vastly different typical time horizons to various commitments (life style and life cycle) because of
  • Search and transaction costs
  • Costs of change

• Dependency on past behaviour and information (i.e. risk assessments)

• Taste differences (styles)
Why worry?

Requirement of dynamic models

- Simulations of route choice given destination choice
- Simulation of activity programmes given household tasks
- Choice of mode given season ticket ownership
- Choice of new housing given the work location

Out of principle

- Biased parameter estimates
- Wrong inference about causality
What can we do?

Two full strategies:

• Models of choice set composition

• Models of group membership (e.g. car and season ticket ownership)

Two partial strategies:

• Employing user-specified choice sets/limits (Swait, 2001)

• Inclusion of variables describing the commitments and tastes
Example: Car ownership given licence holding

Swiss residents over 18 y.

Licence holders

Daten: Axhausen (1999, 2001)
Example: Swiss railway season and discount tickets

![Graph showing the number of Halbtax tickets over years]

- **Halbtax (old pricing)**
- **Halbtax (uniform pricing)**
- **Annual network season**

The graph illustrates the trend of Halbtax tickets over the years from 1975 to 2000, showing a notable increase in the mid-1980s followed by fluctuations up to 2000.
Example: Mode choice

- Vehcile and season ticket
- No vehicle, but season ticket
- Vehicle, but no season ticket
- Neither

German Panel
Mikrozensus Schweiz
UK National Travel Survey
Example: Activity spaces

Method:

- Approximation of activity space by x,y - confidence interval

Data:

- Mobidrive (Partner: PTV AG, Karlsruhe; ISB, RWTH Aachen)
- Six-week travel diary
- 361 persons in Karlsruhe and Halle
- Spring and autumn 1999
Daily life: Example activity spaces (Karlsruhe 1999)

Ellipses cover the 95% confidence intervals of the locations visited.
Example: Size of activity space by location type

Area of the 95% confidence ellipse [km²]

- CBD Core Urban fringe
- Residential location

- Not a main user of a car without season ticket
- Not a main user of a car with season ticket
- Main user of a car without season ticket
- Main user of a car with season ticket
Data source: Surveys of the Mobiplan project

Partner:

- ISB, RWTH Aachen
- IfS, Universität Karlsruhe
- PTV AG, Karlsruhe

Two sources:

- Survey of recent movers (Karlsruhe and Halle)
- SR survey of mobility tool acquisition

Both winter/spring 2000/2001
Mobiplan: SR survey of mobility tool acquisition

Respondent task:

- Selection of the number and type of vehicles and season tickets for all household members given a specified housing supply

Approach:

- Internet-based survey tool, which allowed iterative adjustment of the selections
- Eight situations for each respondent
Mobiplan: SR survey of mobility tool acquisition

Sample:
- 60 participants of a larger software evaluation
- 106 respondents for the SR experiment
- Quota sample (age, household size)

Variables/choices:
- Housing supply (type, location type, size and cost)
- Location (time distance to work and shopping - car and pt)
- Public transport quality (distance to stop, average headway)
- Usage costs of both modes
- 5 types of car
- 2 types of season ticket (monthly, yearly)
Mobility tool acquisition: Modelling approach

Requirement:
- Consistent representation of correlation between the two choices

Approach:
- Bivariate ordered probit:
  - Number of cars
  - Number of season tickets

No account of costs of the different types of car

Estimation: Gauss 3.6 (Darren Scott)
### Situation 1/8

**Ihr Haushalt: 5 Personen, davon 3 Erwachsene**

<table>
<thead>
<tr>
<th>Wohnlage</th>
<th>Ländlicher Raum mit Garten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art der Wohnung</td>
<td>Reihenhaus</td>
</tr>
<tr>
<td>Wohnungsgrösse</td>
<td>185 m²</td>
</tr>
<tr>
<td>Pkw-Fahrtzeit zur Arbeit</td>
<td>30 min</td>
</tr>
<tr>
<td>Pkw-Fahrtzeit zum Einkauf</td>
<td>15 min</td>
</tr>
<tr>
<td>ÖV-Fahrtzeit zur Arbeit</td>
<td>60 min</td>
</tr>
<tr>
<td>ÖV-Fahrtzeit zum Einkauf</td>
<td>30 min</td>
</tr>
<tr>
<td>ÖV-Fahrtakt</td>
<td>30 min</td>
</tr>
<tr>
<td>Entfernung zur Haltestelle</td>
<td>700 m</td>
</tr>
</tbody>
</table>

**Ihre Kosten pro Monat**

- Miete / Hypothekenzinsen: 1,665.00 DM
- ÖV-Kosten: 127.00 DM
- Pkw-Kosten: 290.09 DM
- Gesamtkosten: 2,082.09 DM

**Person 1**

- Mittelklassewagen
- Keine ÖV-Monatskarte
- Keine ÖV-Jahreskarte

**Person 2**

- Kleinwagen
- Keine ÖV-Monatskarte
- Keine ÖV-Jahreskarte

**Person 3**

- Kleinwagen
- Keine ÖV-Monatskarte
- Keine ÖV-Jahreskarte
Mobility tool acquisition: Bivariate ordered probit

<table>
<thead>
<tr>
<th>Variable</th>
<th>SR Data Set</th>
<th>RP Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Season Tickets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant Term</td>
<td>1.155 **</td>
<td>-0.390 **</td>
</tr>
<tr>
<td><strong>Household Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two members with daily commitments</td>
<td>0.693 **</td>
<td>0.468 **</td>
</tr>
<tr>
<td>Three members with daily commitments</td>
<td>1.064 **</td>
<td>1.275 **</td>
</tr>
<tr>
<td>Four members with daily commitments</td>
<td>1.975 **</td>
<td>1.110 **</td>
</tr>
<tr>
<td>Income remaining after housing costs</td>
<td>-0.800 **</td>
<td></td>
</tr>
<tr>
<td>[DM per month/5000]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Residential Location Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td>-0.542 **</td>
<td></td>
</tr>
<tr>
<td>Fringe</td>
<td>-0.874 **</td>
<td>-0.515 **</td>
</tr>
<tr>
<td>Distance to nearest transit stop [km]</td>
<td>-0.450 *</td>
<td>-0.420 **</td>
</tr>
<tr>
<td><strong>Threshold Values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One and two season tickets</td>
<td>1.366 **</td>
<td>1.090 **</td>
</tr>
<tr>
<td>Two and three season tickets</td>
<td>3.000 **</td>
<td>2.116 **</td>
</tr>
<tr>
<td><strong>Correlation Coefficient</strong></td>
<td>-0.593 **</td>
<td>-0.466 **</td>
</tr>
<tr>
<td>$\hat{\rho}^2(0)$</td>
<td>0.359</td>
<td>0.363</td>
</tr>
<tr>
<td>$\hat{\rho}^2(C)$</td>
<td>0.218</td>
<td>0.148</td>
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</table>
Mobility tool acquisition: Bivariate ordered probit (SR data)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cars</th>
<th>Season Tickets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Term</td>
<td>-0.624 **</td>
<td>1.152 **</td>
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<tr>
<td>Household Characteristics</td>
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<td></td>
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<tr>
<td>Two members with daily commitments</td>
<td>0.751 **</td>
<td>0.722 **</td>
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<tr>
<td>Three members with daily commitments</td>
<td>1.863 **</td>
<td>1.122 **</td>
</tr>
<tr>
<td>Four members with daily commitments</td>
<td>2.134 **</td>
<td>1.999 **</td>
</tr>
<tr>
<td>Income remaining after housing costs [DM per month/5000]</td>
<td>0.642 **</td>
<td>-0.836 **</td>
</tr>
<tr>
<td>Residential Location Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td>0.649 **</td>
<td></td>
</tr>
<tr>
<td>Fringe</td>
<td>1.241 **</td>
<td></td>
</tr>
<tr>
<td>Distance to nearest transit stop [km]</td>
<td></td>
<td>-0.509 **</td>
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<tr>
<td>Travel time difference to work [min/10]</td>
<td></td>
<td>0.166 **</td>
</tr>
<tr>
<td>Travel time difference to shop [min/10]</td>
<td></td>
<td>0.570 **</td>
</tr>
<tr>
<td>Threshold Values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One and two items</td>
<td>1.937 **</td>
<td>1.399 **</td>
</tr>
<tr>
<td>Two and three items</td>
<td>3.538 **</td>
<td>3.065 **</td>
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<tr>
<td>Correlation Coefficient</td>
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<td>-0.579 **</td>
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<tr>
<td>(0)</td>
<td></td>
<td>0.366</td>
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<tr>
<td>(C)</td>
<td></td>
<td>0.227</td>
</tr>
</tbody>
</table>
Commitments: Conclusions

- Strong substitution between types of mobility tools
- Strong interaction with location and service characteristics
- Positive income elasticity of car ownership
Social networks: Draft categorisation

- Family
- Friends
- Hobby (Animal care)
- Sport
- Civic engagements
- Church

- Neighbours

- School/education
- Work (one or multiple networks ?)
- (Military/Civilian service)

- Service providers
Social networks: Possible transport questions

- Physical spatial-temporal coherence/overlap (constraints)
- Replacement of physical and telecommunication-based contact
- Interaction frequency and spatial reach
- Interaction and information/knowledge transfer
Question of spatial coherence (Network 1)
Question of spatial coherence (Networks 1 & 2)
Question of spatial coherence (Network 1, 2 & 3)
Social networks: Possible sociological questions

- Openness/replacement dynamics of the membership
- Structure and definition of the network boundaries
- Revival of contact/repair of links

- Shared skill/learning
- Transfer/transmission of reputation
- Transfer of resources/social capital

- Spatial and social reach (“6 degrees of separation” ?)

- (Time/money/social capital) Cost of maintenance
Social networks: Hypotheses

1. Local spatial-temporal coherence is lower than 1950

Why?

- The unity of work, residence and “Sozialmileu“ has been broken for most people (e.g. long-distance commuting)
- Educational/employment paths are less uniform (in space)
- Mass customisation in travel (car), consumption and leisure (channel flood in entertainment)
Social networks: Hypotheses

2. The number of the current members is larger than in the past

Why?

- Money costs of contact have been dramatically reduced (telephone, email, letter/xeroxing)
- Easier projection of self (email, xeroxing) allows more social grooming (Dunbar’s about 100)
- Time/money costs of in-person contact with spatially distant contacts have become – relatively – affordable (i.e. cheap long-distance travel)

2* Statements about the contact intensity distributions are difficult, as the increase in leisure time might balance the larger number of members
Social networks: Hypotheses

3. Time costs of network maintenance are larger than in the past

Why?

• Less chance of chance encounters
• Lower local spatial network densities
• Less opportunity to use proxies for messaging
• Higher search costs (locating the person) (but for email, mobiles, answering machines)

• Higher time costs to get to most members of the net
• Longer catching-up times
Hypotheses visualised: Situation today (Networks 1-3)
Social networks: Externalities

• Stronger selectivity ?

• Less local inclusion ? (More commercial/institutional personal services ?)

• Less local generalised trust ? (feeling of safety and reliability)

• Car/paid travel dependence ?
(Concurrent) Spatial developments

Economically

- Increased specialisation of locations (regionally, internationally)
- Increased firm size in services and production
- Increased market sizes at all scales

Urban

- Increased scales
- Lower local densities
Spatial developments: Externalities

- Car/paid travel dependence?
- Transport emissions (Noise, CO2, HC etc.)
- Loss of the common pedestrian environment
- Arrival of the themed pedestrian environment
- Spatial segregation (locally, regionally)
Urban structure: Portland, OR, circa 1860
Urban structure: Commercial Irvine, CA, circa 1980
Urban structure: Residential Irvine, CA, circa 1980

1 Mile
What now?

Transport:
  • Better management of resources (demand-responsive operation)
  • Demand-responsive pricing
  • Pricing of externalities

Socially:
  • Better time organisation
    • Common scheduling tools
    • Reorganisation of working time
  • Demand-responsive service delivery
What now?

Spatially:

- Better pricing of externalities
- Growth boundaries
- Rescaling of the environments
- Rebuilding the buildings/infrastructures of the post-war period
- (Subsidised) local service points/local shopping facilities


Literature


Appendix
Daily life: Trip purposes (Uppsala 1971/Karlsruhe 1999)

- **Return home**
- **Leisure**
- **Work**
- **Daily shopping**
- **Private business**
- **Education**
- **Long-term shopping**
- **Pick up/drop off**
- **Work-related business**
- **Other**

Share of all trips [%]

- **Uppsala (weighted)**
- **Karlsruhe Mobidrive**
Daily life: Leisure (Uppsala 1971/Karlsruhe 1999)

- Meeting friends
- Going out in the evening
- Active sports
- Going for a walk and hiking
- Other
- Club meeting
- Excursion: Culture
- Window Shopping
- Meeting relatives

Share of all leisure trips [%]

Uppsala (weighted)
Karlsruhe Mobidrive