The social content and the generalised costs of travel: Balancing the explanations

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Trends: Road travel time scaled Switzerland (1950 & 2000)
Trends: Quality controlled prices of the mean new Swiss car

![Graph showing trends of quality-controlled prices of the mean new Swiss car over time. The graph plots the year on the x-axis and the quality-controlled price index on the y-axis. Two lines are plotted: one red line for Frei, 2004, and one dotted blue line for Raff und Trajtenberg, 1990. The index is normalized to 2004 = 100.]
Trends: Real price of telecommunication

Adapted from FCC (2001)

US International and interstate average revenue per minute

Index [1995 = 100]

Year

Response: Swiss Suburbanisation since 1970

Adapted from Botte, 2003
Response: Swiss commuting speeds since 1970
Response: Annual vmt increase since 1960

North America
Western Europe
Former Soviet Union

Source: Schäfer
How do we explain this at the macroscopic level?

Economies of scale
Economies of scope

GDP

Activity
Fleet comfort
slots
vtts et al.

Tours

Market size

vkm

Energy costs

k

For a given infrastructure and commercial and private fleet

Elasticity > 0
Elasticity < 0

Slots: possibilities to move goods or people
How do we explain this at the microscopic level?

Possible elements:

- Generalised costs of the route-mode-location alternative
- Budgets
- Taste (Values, attitudes, life style) by socio demographics
- Personal world (i.e. Mental map)
- Social network membership
Generalised cost of a route-mode-destination alternative

Elements:

- (Comfort adjusted) time spent traveling
- Schedule delay (relative to intended arrival time)
- (Decision time-frame relevant) monetary expenditure
- (Comfort adjusted) time spent at the location by type
- Activity expenditure
- Social content
What could we summarize under „social content“?

Who is participating?
For whom is the activity undertaken?

Issues:

• Consistency with self image
• Fulfilment of obligations
• Coordination with others
• „Networking“
Social content of travel (2003 Thurgau): Who is travelling?
The „network actor“ in a dynamic social context

- Personal worlds of others
- Social capital: stock of joint abilities, shared histories and commitments
- Personal world
- Projects
- Household locations
- Social network geography
- Mobility tools
- Biography
- Learning
What are the new research questions?

Travel:
• Can we measure the social content?
• What is its impact on model quality?

Person:
• [Can we measure the personal world?]
• Can we retrieve the (mobility) biographies?
• Can we measure the social network geography?
• What is its impact on model quality?

System:
• How fast has it changed?
• How large are the social costs?
• How can we steer it?
What are the challenges?

Personal world and social network geography:

- Measurement
- Measures

Mobility biographies:

- Retrieval and reconstruction
- Measures
Biography of a male architect, early-30ies

Key To Symbols:
- Place of Residence
- Most Significant People
- Other Friends and Family
- Former Places of Residence

National Links:
- Friend always known
  - Phone weekly
  - Email daily
  - Text weekly
  - Meet up weekly
  - Walking distance
- Mother
  - Phone everyday
  - Never email or text
  - Meet up weekly
  - Walking distance
- Workmate known ’04
  - Phone weekly
  - Email weekly
  - Text weekly
  - Meet up every day at work in Liverpool

Local Ties:
- Sister
  - Phone monthly
  - Email monthly
  - Meet up monthly
  - Train is £38, 4.29 hours, 4 changes.
- School friend
  - Phone monthly
  - Email daily
  - Text weekly
  - Meet up every 3 month
  - Train is £32, 13 hr 12 min

International Ties:
- University housemate
  - Phone weekly
  - Email monthly
  - Text weekly
  - Meet up monthly
  - Train is £30, 2 hr 22 min
- University friend
  - Phone every 3 month
  - Email daily
  - Never text
  - Meet up yearly
  - Flight is £886, 16 hr 45 min
Measurement

Personal world as „mental map“ and „expectation space“:

- Sketching
- Think aloud protocols
- Spatial tasks

Personal worlds as „activity space“ of visited locations:

- Diaries
- GPS/GSM tracing
- Data traces (payments of all kinds, CCTV, phone and pc use)
Measurement

Social network geographies:

• Name generators

• Traces of contacts (email, SMS, IM, internet chat, letters, phone records, etc.)

• Diary – based prompting
Contacts and contact frequency – emails to kwa (Outlook)
Example of an activity space

Women, 24
Full-time
Single
216 trips / 6 weeks
Example of a social network geography

Female, 28, 4 moves,
Measures

Requirements:

- Low dimensional (scalar)
- Describe size, orientation and spread
- Consistency with behavioural possibilities (theoretical intent)
- Ease of calculation
How to measure?

Parametric:
- 95% confidence ellipse (form and type of distribution)

Semiparametric:
- Inclusion geometries (form of geometry)
- (Weighted) shortest path networks (structure of path)
- (Percentage) Minimum convex polygons (convexity)
- Kernel density estimator (form of estimator)
- Mean harmonic home ranges (form of estimator)

Non-parametric
- Observed path geometries
Measures: Confidence ellipse

Schönfelder, 2006
Measures: Kernel densities
Measures: Inclusion geometries

Find:

\[ \min A_i(\beta_{i1} \ldots \beta_{in}) \]

s.t.

Area \( A_i \) covering \( p\% \) of all observed points

with:

- \( i \) : Type of geometry (Ellipse, bean, Cassini ...)
- \( p \) : Predetermined share, e.g. 95\%
Measures: Inclusion geometries

- Ellipse
- Superellipse 1
- Superellipse 2
- Bean
- Cassini

Vaze, Schönfelder and Axhausen, 2005
Measures: Minimum convex poligons (MCP)

MCP

Percentage MCP

Schönfelder, 2006
Measures: Shortest path network

Schönfelder, 2006
Measures: Weighted shortest path network

- Home
- Workplace
- Activity location
- Minimum paths for OD relations

Schönfelder, 2006
Size of activity spaces: Shortest path network

* Observed O-D-relations, Mobidrive, Karlsruhe subsample
Size of social network geometries: 95% CE

Data stems from recent interviews in Zürich, NE England, Berlin and survey work in Germany

88 persons
Size of social network geometries: 95% CE
Activity spaces and network geographies: A hypothesis

Specialisation

Migration

Professional and personal activity space

Network geography

Wages

Activities

Fleet comfort

Housing consumption

Tours

Energy

Elasticity > 0

Elasticity < 0

vtts et al.

Number of networks

Network overlap

Local anomie
Factors generating externalities in the hypothesis

- Wages
- Fleet comfort
- Housing consumption
- Activities
- Tours
- pkm
- vkm
- Energy
- k
- Migration
- Professional and personal activity space
- Network geography
- Network overlap
- Local anomie
- Elasticity > 0
- Elasticity < 0
What remains, needs to be done?

• Prove the mechanisms stipulated

• Provide the data on a representative scale

• Develop stable survey methods

• Think through the policy implications


Literatur


Appendices
Summary

+ Elasticity > 0
- Elasticity < 0

Message costs

k

Migration

Professional activity space

Network geography

Number of contacts and networks

Network overlap

Left skew of intensity distribution

Personal activity space

Supervision gradient

Local anomie
Size of goods markets and productivity: A hypothesis

\[
\begin{align*}
\text{Size of goods markets and productivity: A hypothesis} \\
\text{GDP} & : \text{Market size} \\
\text{Prices} & : \text{Economies of scale, Economies of scope} \\
\text{Transport system and demand} & : \text{Innovation} \\
\text{Capital/Wages} & : \text{Economies of scale, Economies of scope} \\
\text{Monopolies} & : \text{Innovation} \\
\text{Innovation} & : \text{Market size} \\
\text{Energy costs} & : \text{K: Generalisierte Kosten} \\
\end{align*}
\]
Willingness to pay for reduction of free-flow travel time
Willingness to pay for reduction of congested travel time