

Preferred citation style

Axhausen, K.W. (2006) Social network geographies, activity spaces and travel: Initial hypotheses and empirical results, Department of Sociology, University of Stockholm, Stockholm, September 2006.

Social network geographies, activity spaces and travel: Initial hypotheses and empirical results

KW Axhausen

IVT

ETH

Zürich

September 2006

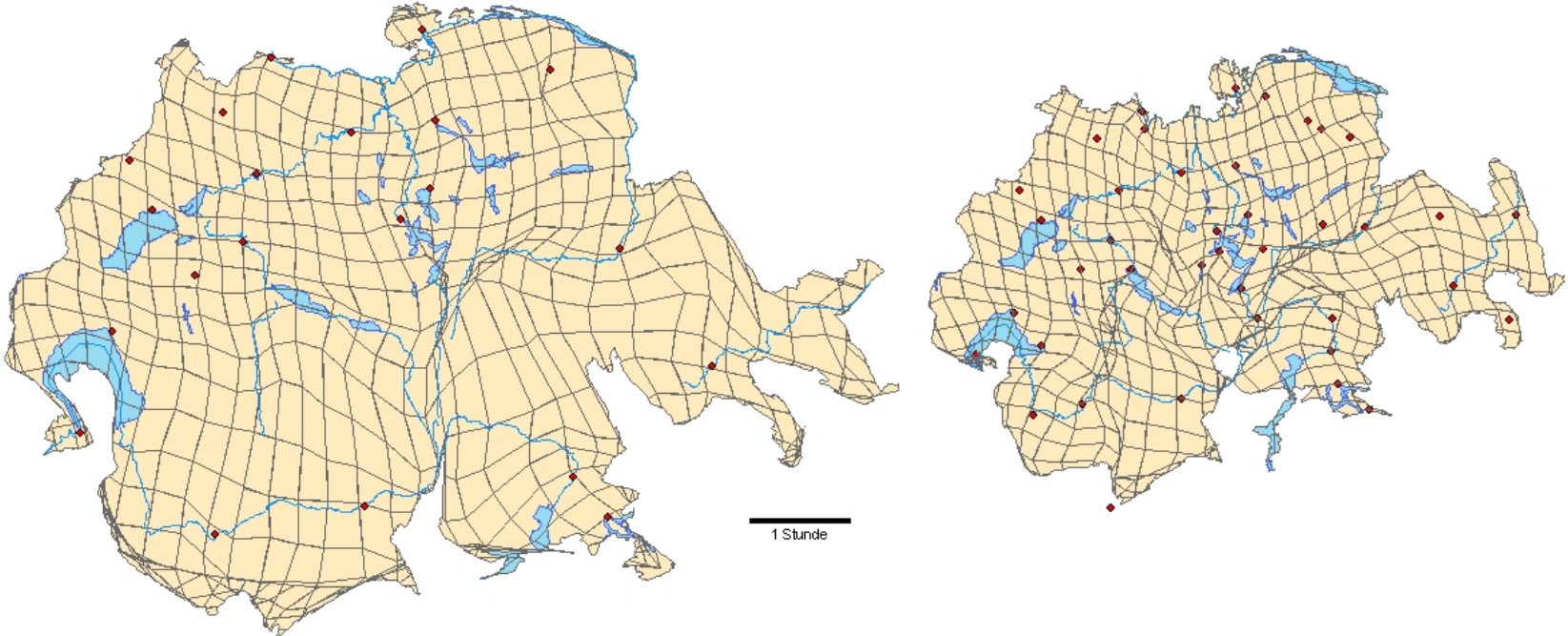
 Institut für Verkehrsplanung und Transportsysteme
Institute for Transport Planning and Systems

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

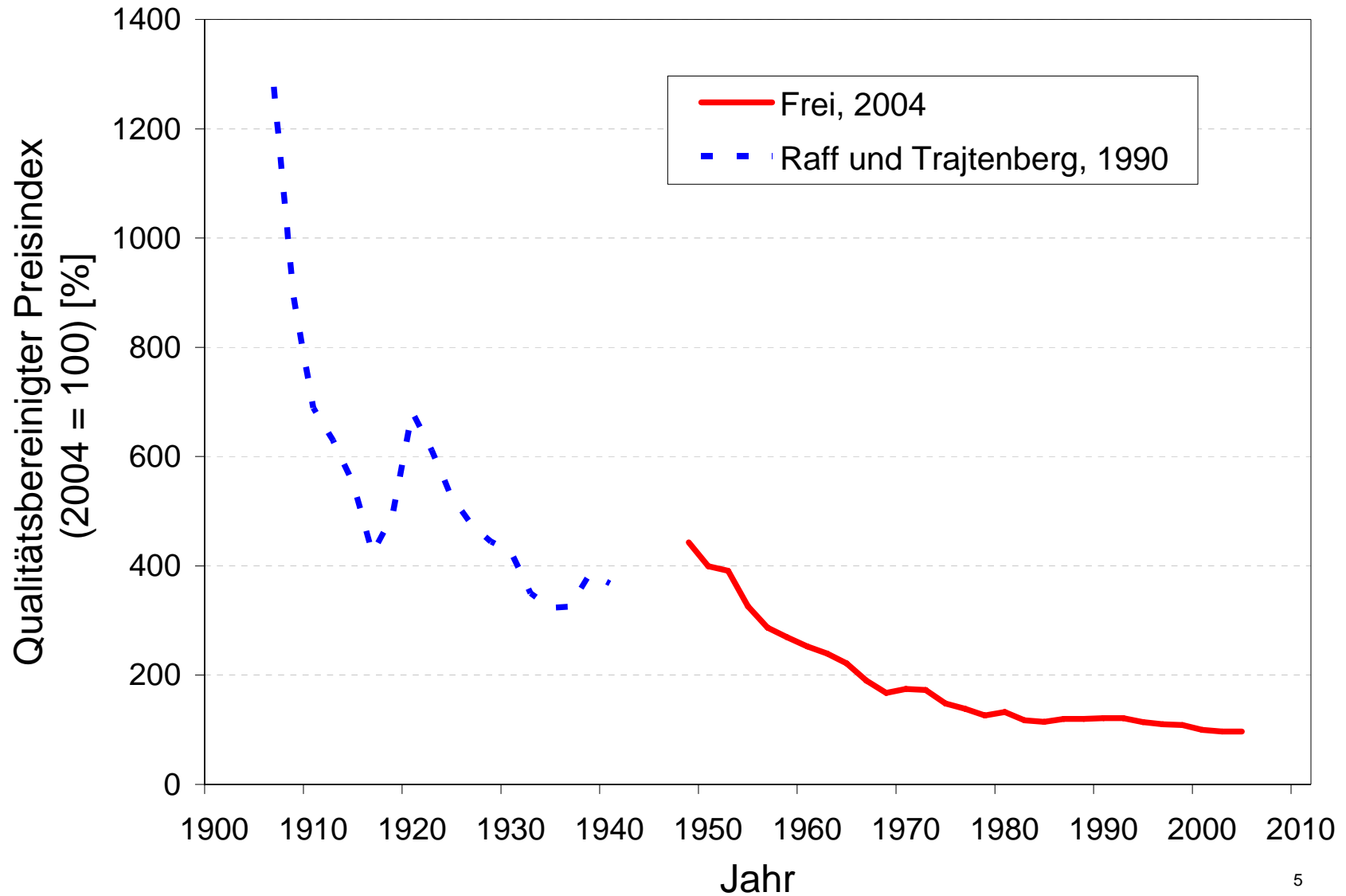
Part 1: Hypotheses

Markets: Time-scaled “road”-Switzerland (1950 & 2000)

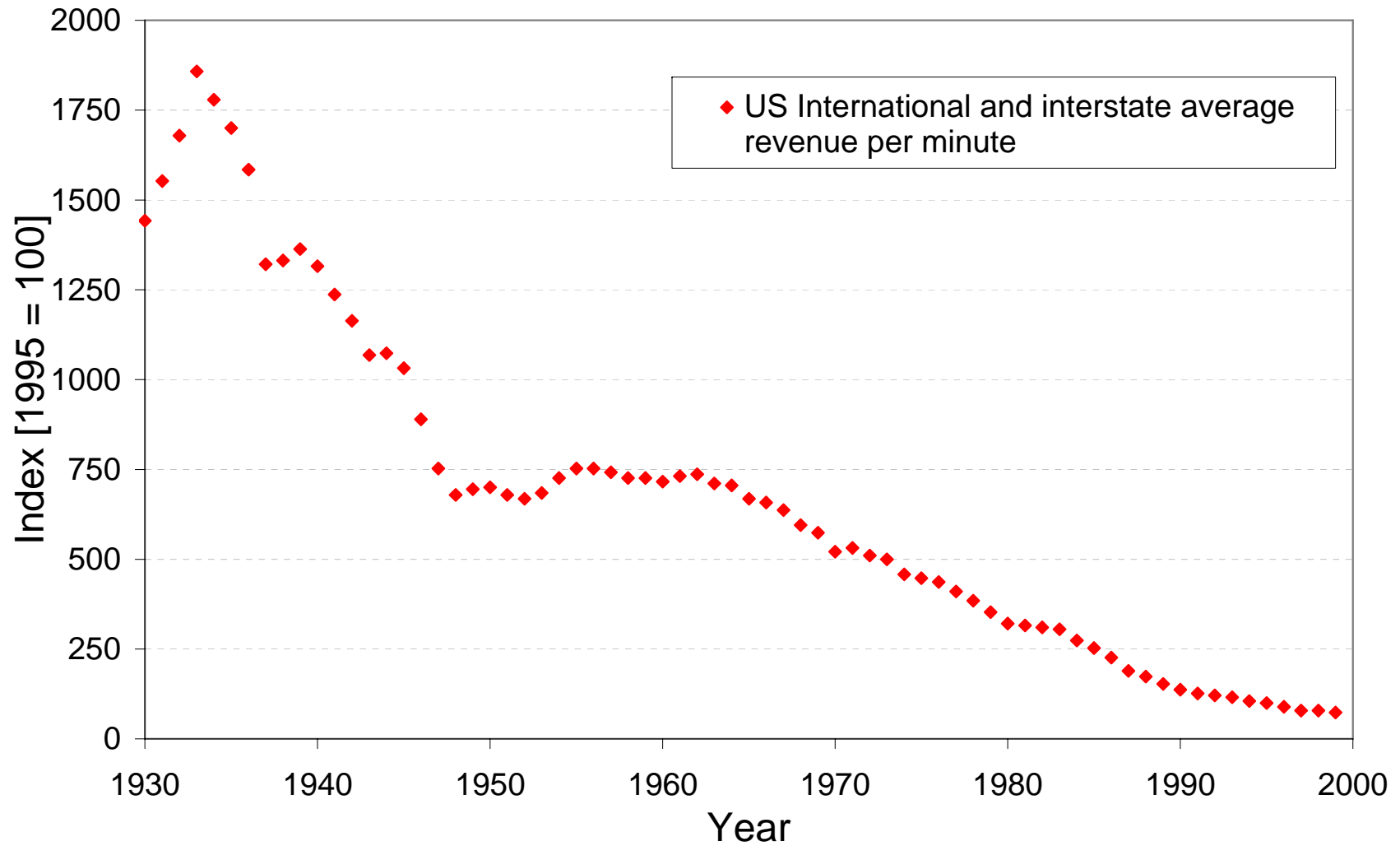


Axhausen and Hurni, 2005

Markets: Price deflation for cars

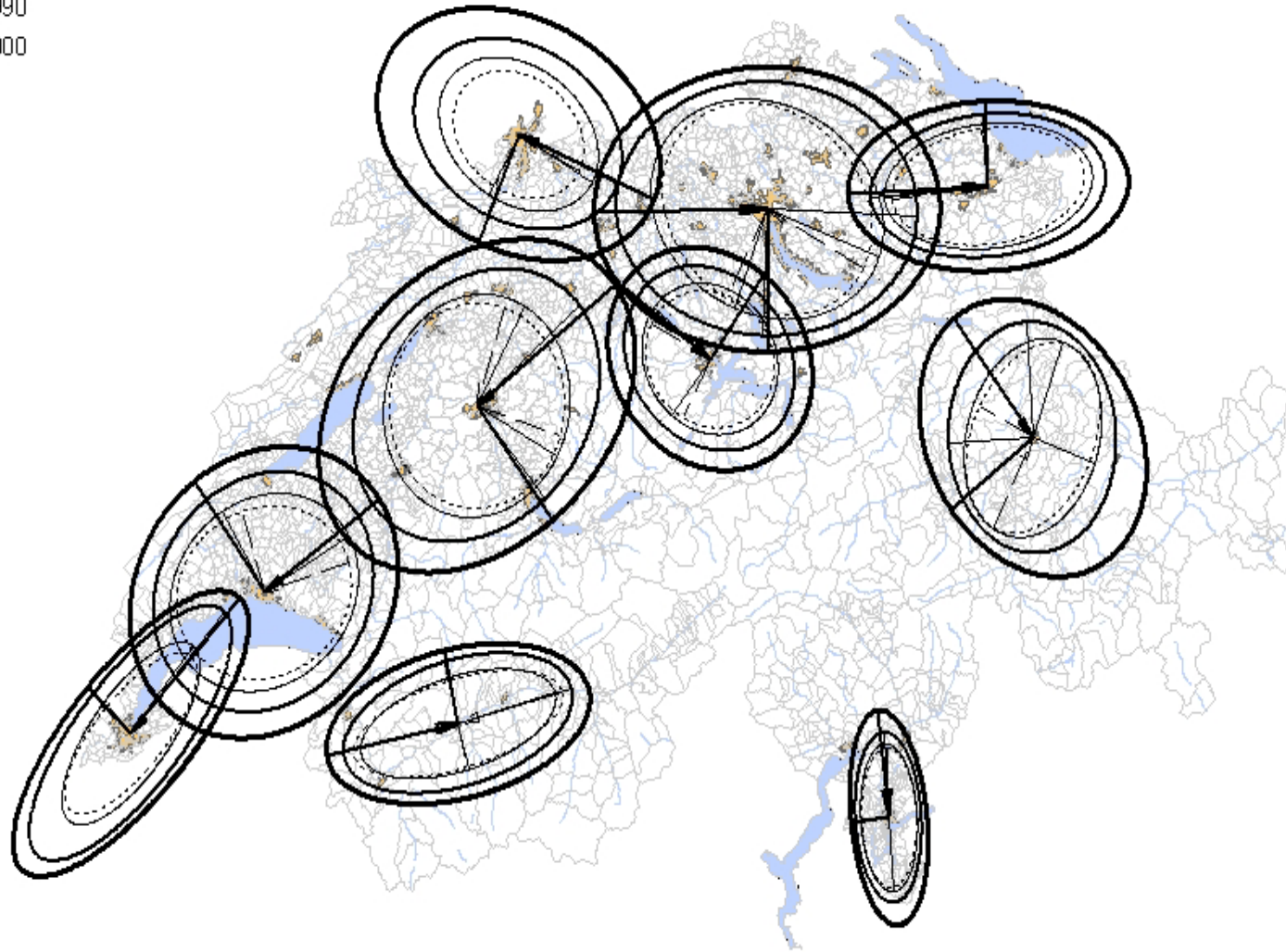


Markets: Price deflation for telecommunication

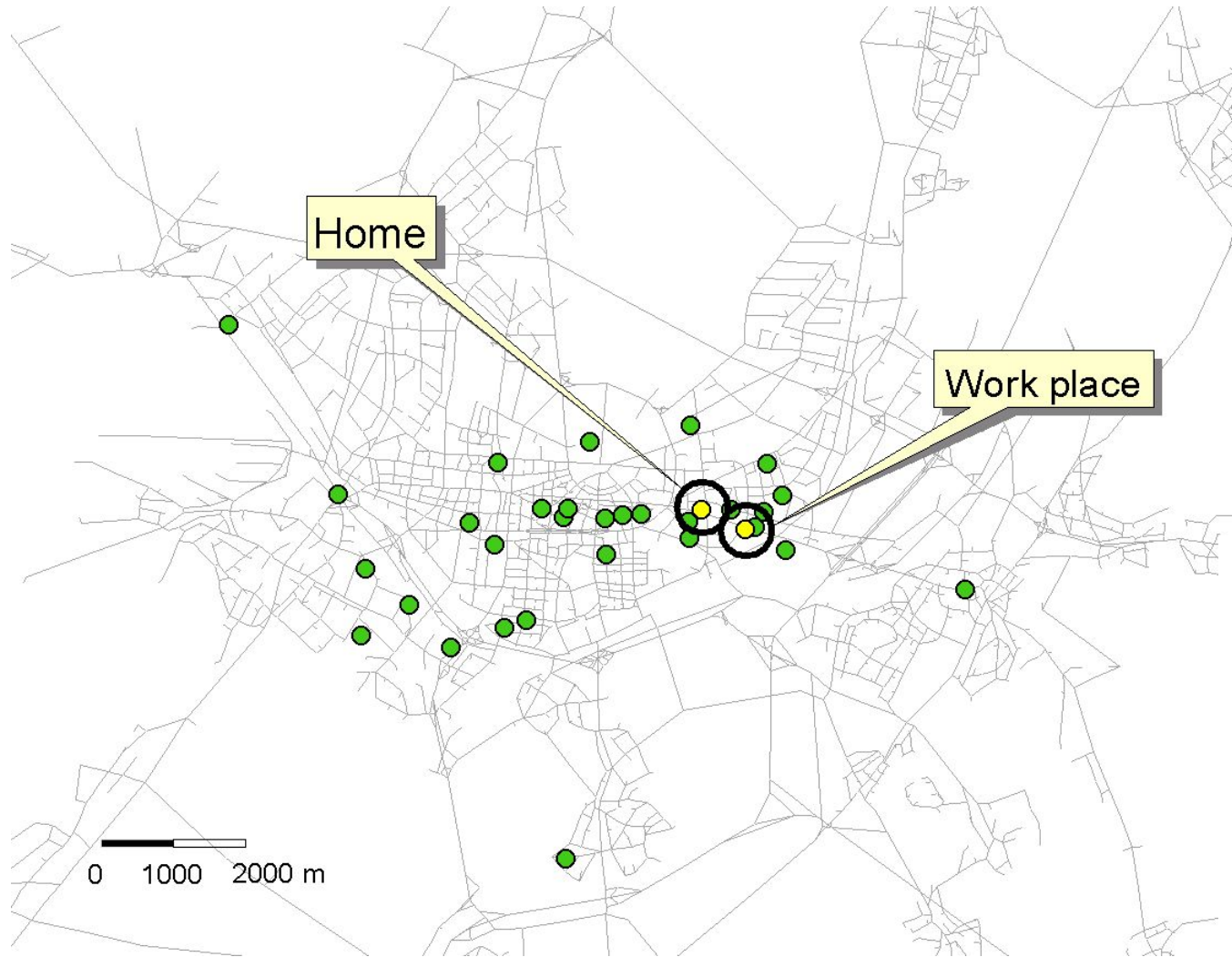


Example: Commuter sheds of the 10 largest Swiss towns

- ⋯ 1970
- 1980
- 1990
- 2000

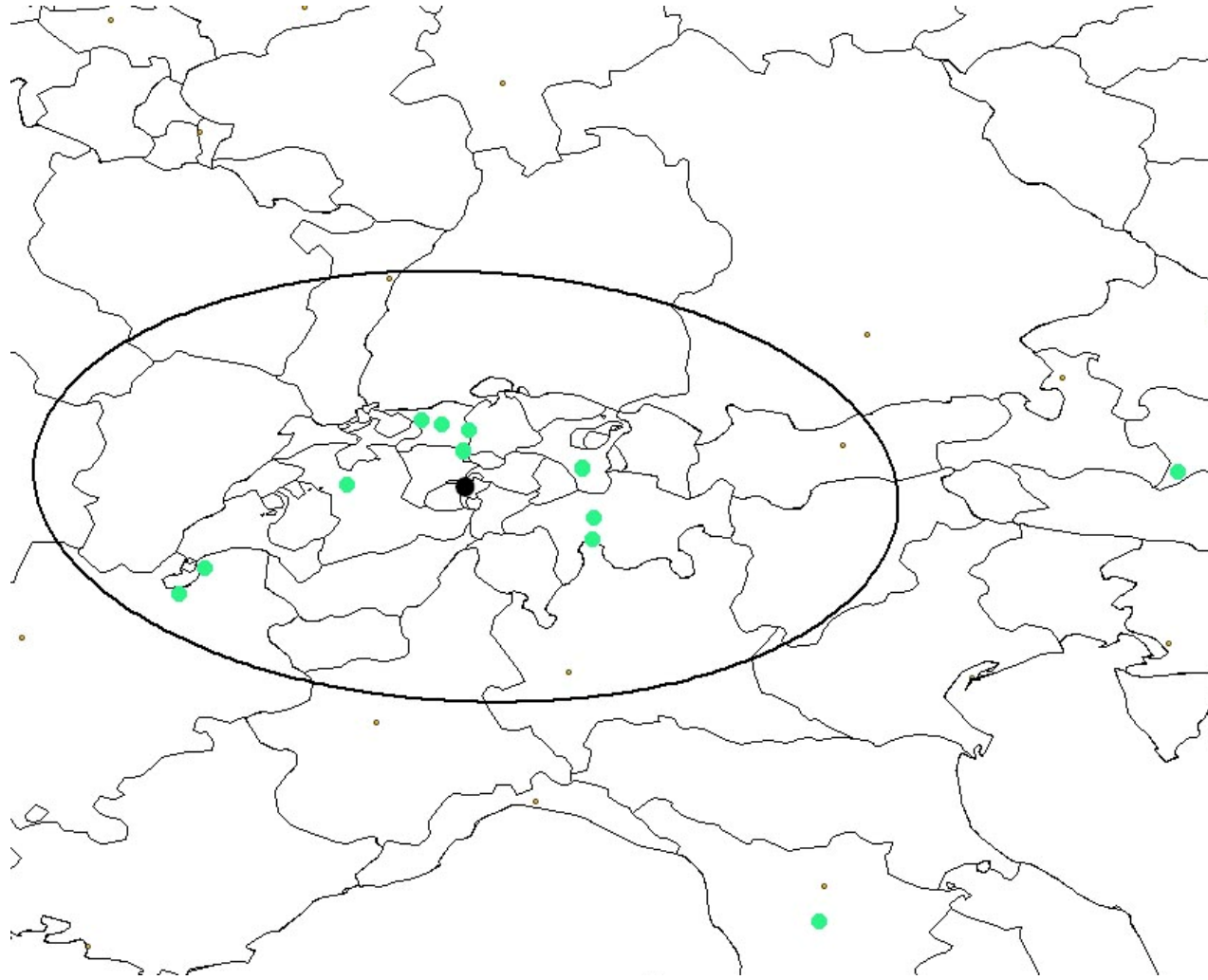


Example of a local activity space



Female, 24
Full time
Single
216 trips / 6
weeks

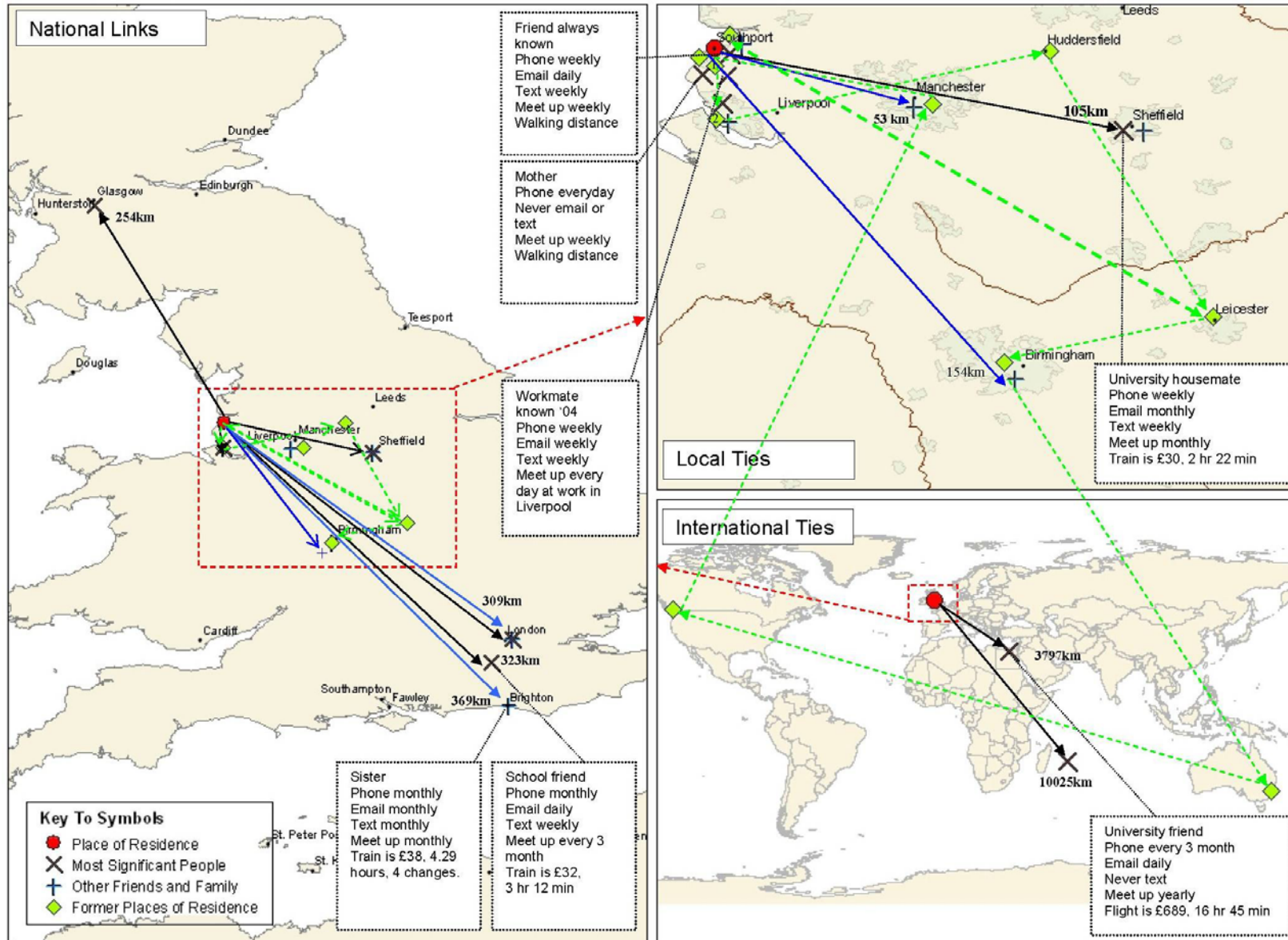
Example of a social network geography



Female, 28,
4 moves,
Public
transport user

Example: Biography of an architect

Larsen, Urry and Axhausen, 2006

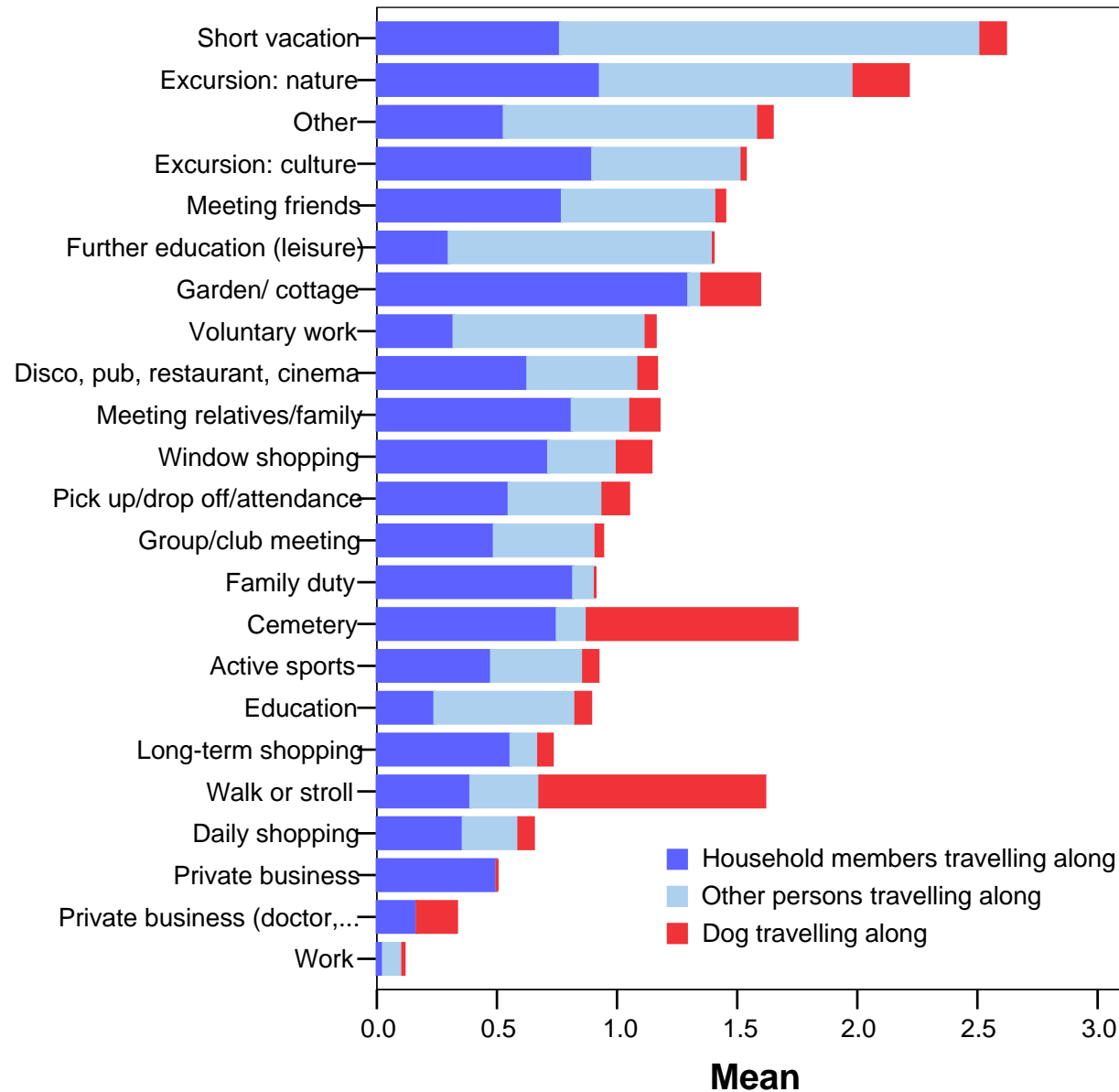


How to explain travel ?

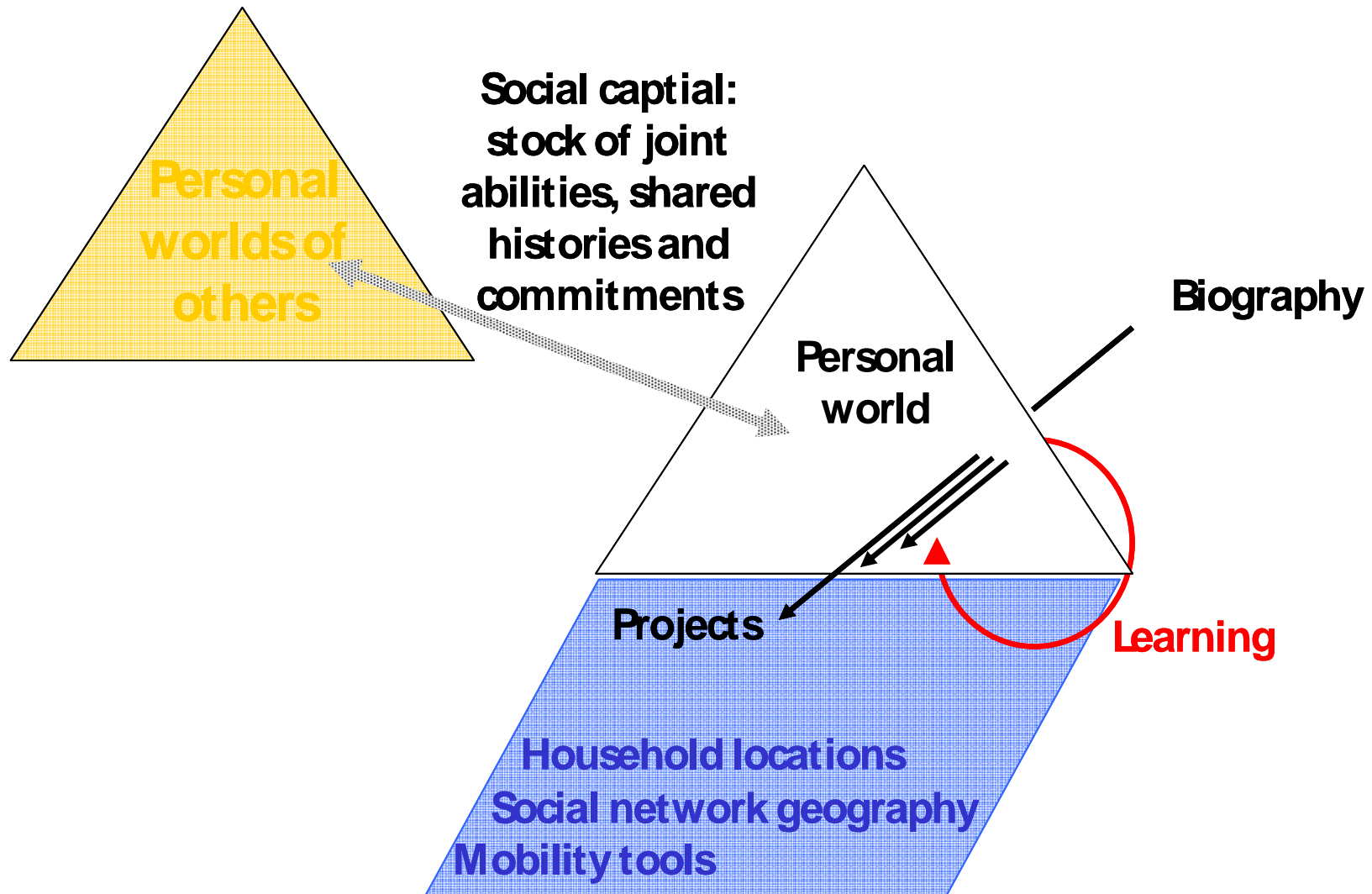
- Budget constraints
- Capability constraints

- Generalised costs of the schedule
 - Generalised cost of travel
 - Generalised cost of activity participation
 - Risk and comfort-adjusted weighted sums of time, expenditure and social content

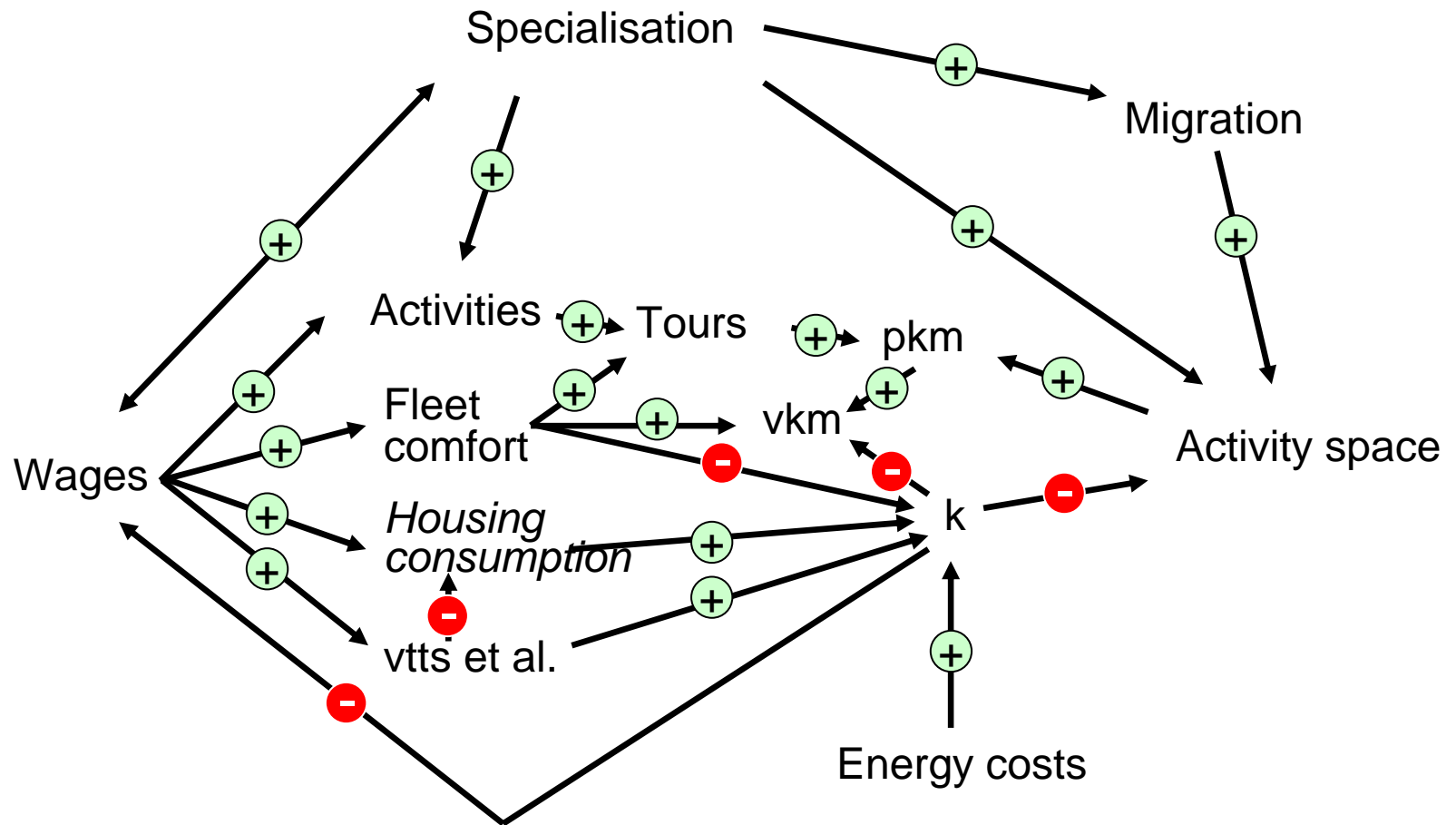
Number of accompanying travellers (2003 Thurgau)



How to understand the traveller ?



Size of activity spaces: A hypothesis



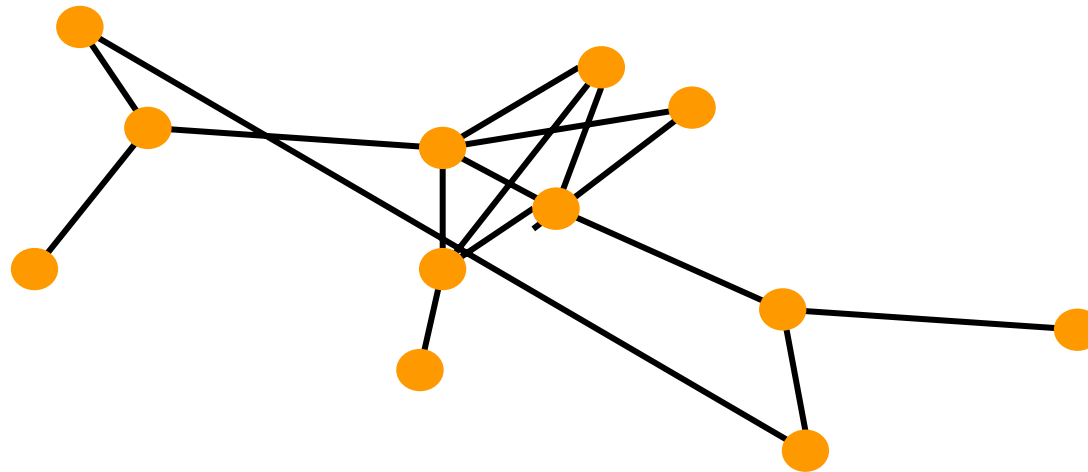
⊕ Elasticity > 0
 ⊖ Elasticity < 0

k: personal short term generalised costs of travel

Definition of a social network

The topology of a social network describes

- Which person/firm (node) is linked to which other persons/firms
- By contacts (links) of a certain quality (impedance or cost)



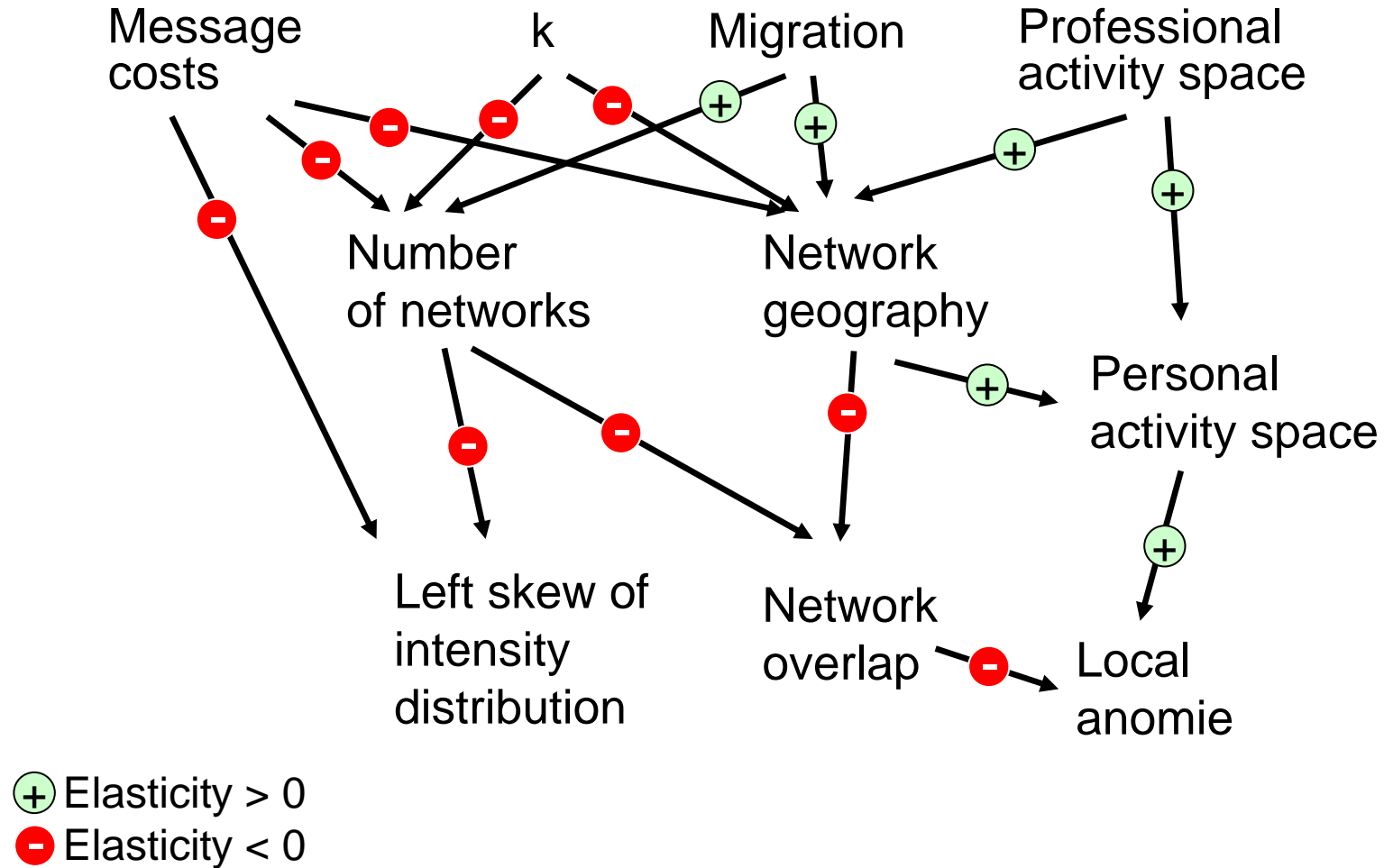
Closeness $\sim 1/\text{Impedance}$

Travel and social networks

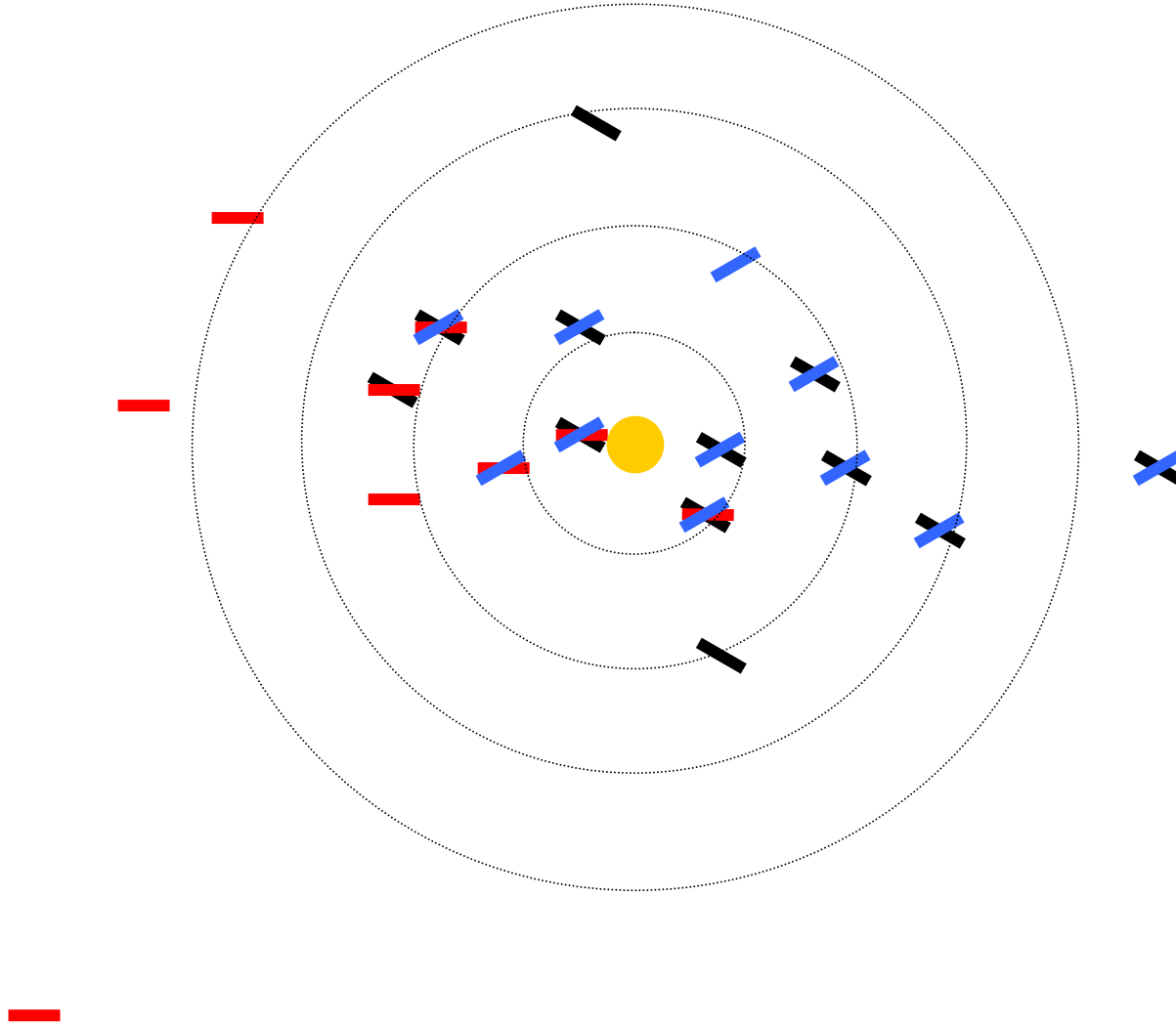
Maintenance of the network requires:

- Face to face contacts
- Balanced by other forms of contacts
- Travel ~ Physical spread of the contacts
- Trade-off between losing contacts and “social” capital and investing in new contacts closer to home

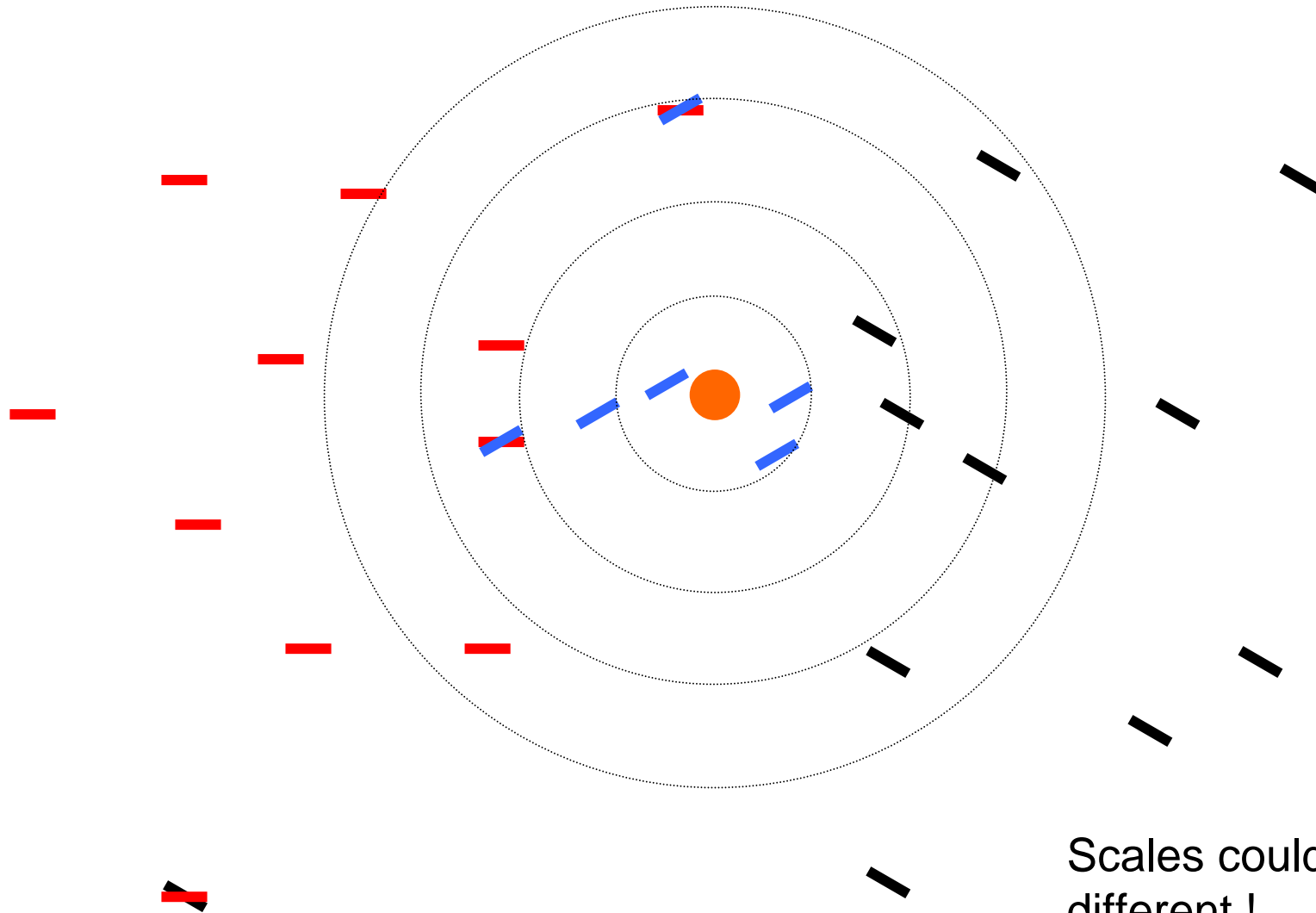
Hypotheses



Expected impacts: Spare versus dense networks



Expected impacts: Spare versus dense networks



Scales could be different !

Expected impacts: Improved welfare

The social networks should be more homogeneous and therefore more productive for their members

But, the selectivity excludes the „less attractive“ persons who are disadvantaged through a reduced ability to travel or a reduced ability to participate in activities

But, the dependence on commercial or state-provided services for “care” increases

Data needs

- Measurement of the activity spaces (geographies, markets)
- Estimate of historical activity spaces
- (Local) level of trust
- Strength and object of attachment to a locality

Part 2: Survey work

Contributors

- ifmo, Berlin – T. Ohnmacht, A Frei and KW Axhausen
- UK DfT – J Larsen, J Urry and KW Axhausen
- COST 355/ifmo – A. Frei and KW Axhausen

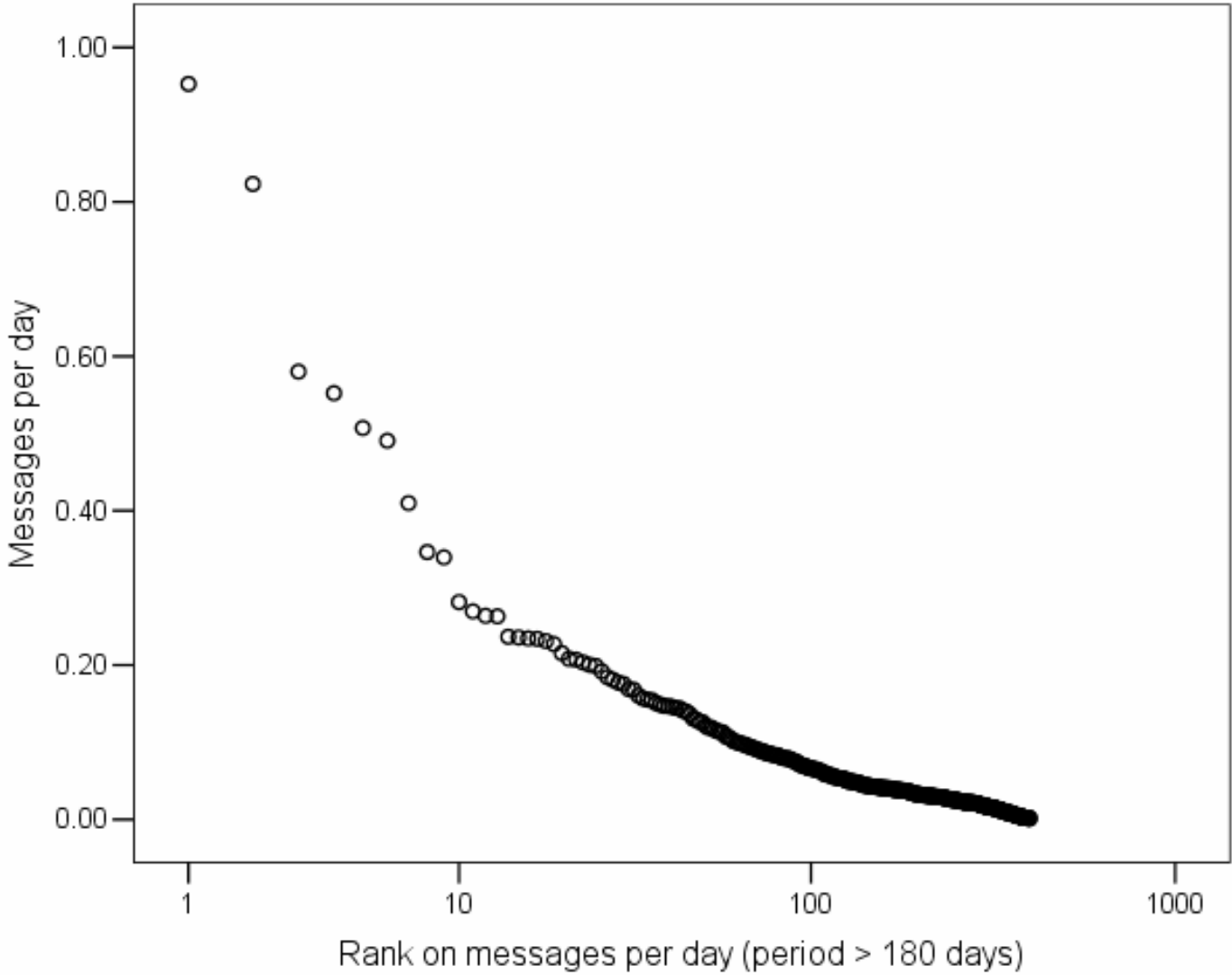
Items to capture social content

- Detailed purpose coding
 - Social purpose and obligations fulfilled with it
 - Beneficiaries of the activity
 - Composition of the party
 - Prior locations
 - Distribution of the travel and activity costs
-
- Planning horizon
 - Number of previous visits to that location
 - Secondary activities

Items to capture the social network geographies

- Name generators
- Name interpreters
 - Type and length of contact
 - Frequency by mode of contact
 - Home location
 - Second homes
- Detailed descriptions of face-to-face contacts

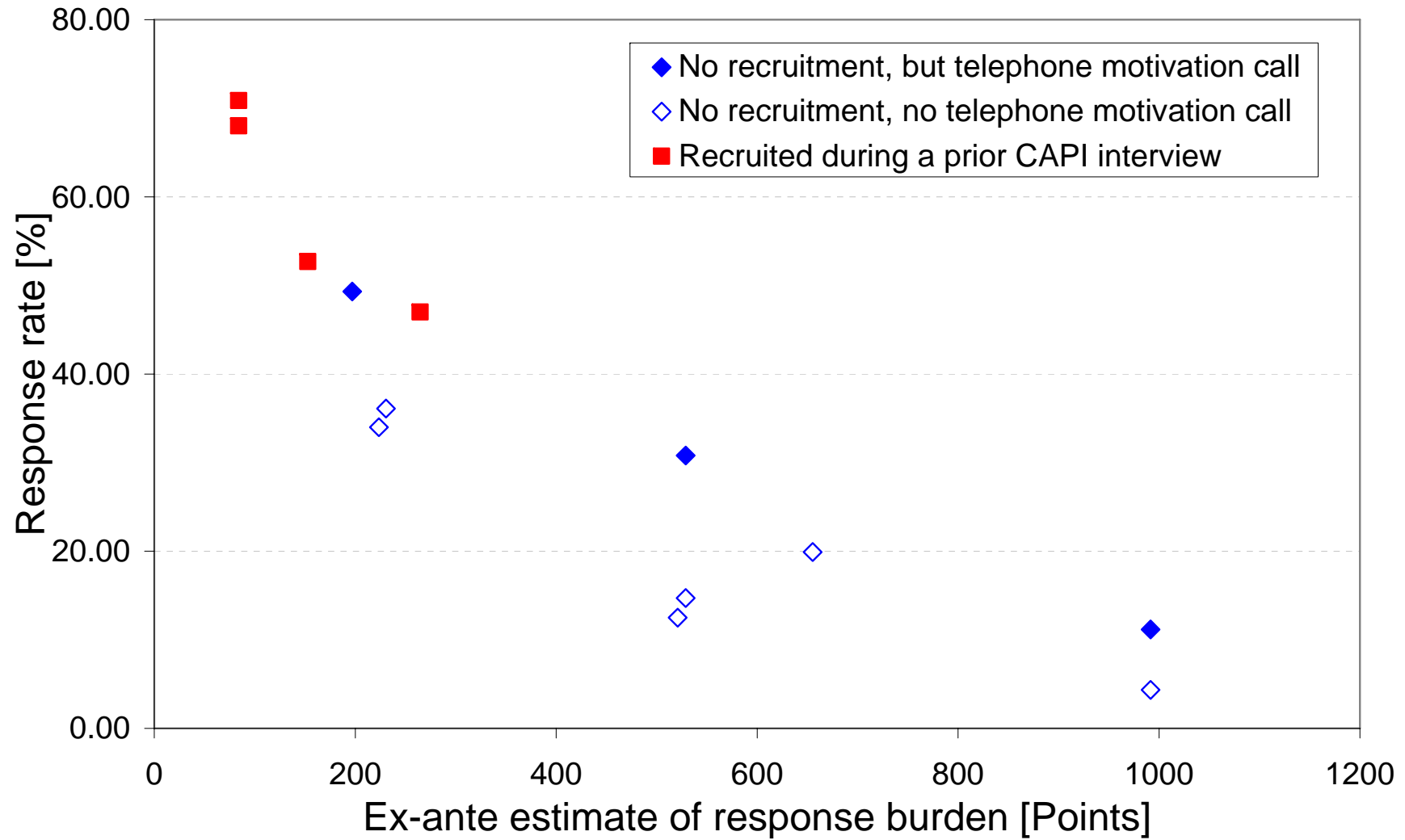
Contact frequencies: E-Mail messages to kwa



Items to characterise the mobility biography

- Home and second home locations
- Work and school locations
- Household composition
- Mobility tools
- Main mode (to work/school)
- (Major holidays)
- Personal income
- Household income

Response burden and response rate



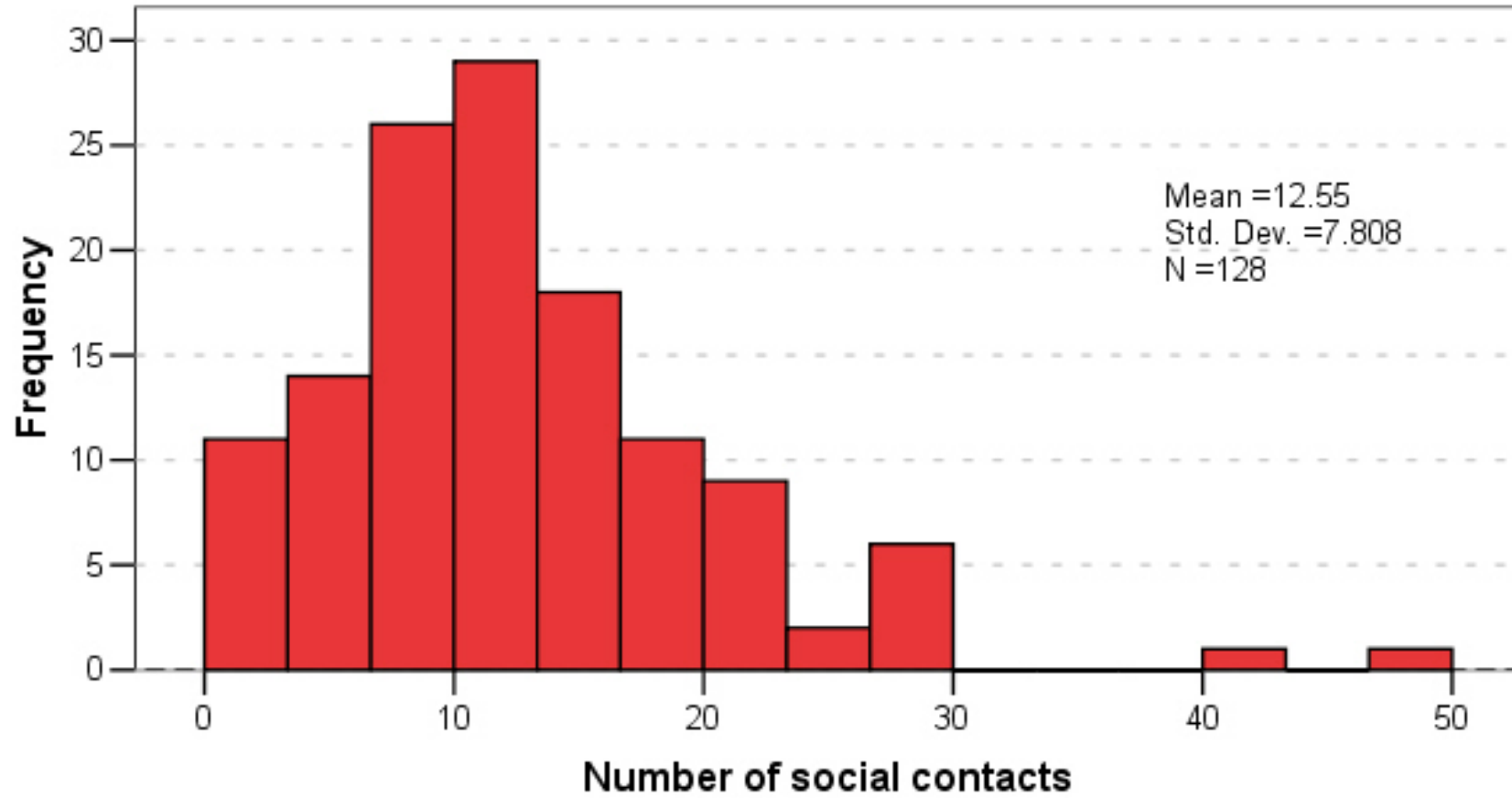
Zürich experiment: Response behaviour

Phase	Pretest	On-going main study	Share of total	Share of reached by phone
Sample	150	2'400	100%	
Wrong address	0	28	1.2%	
Not reachable by phone	36	706	29.4%	
Reached by phone	113	1'673	69.7%	100%
Recruited	14	179	7.5%	10.7%
Interviewed	13	172	7.2%	10.3%
Post-interview questionnaire returned	13	154	6.4%	9.2%

Data available

- ifmo:
 - “Persons with whom you had contact”
 - (f-to-f frequency, location, mobility biography)
- DfT:
 - Family, non-local friends, most important persons
 - (location, frequency by mode, mobility biography)
- COST 355:
 - Important people, people with leisure contacts
 - (location, frequency by mode, mobility biography)

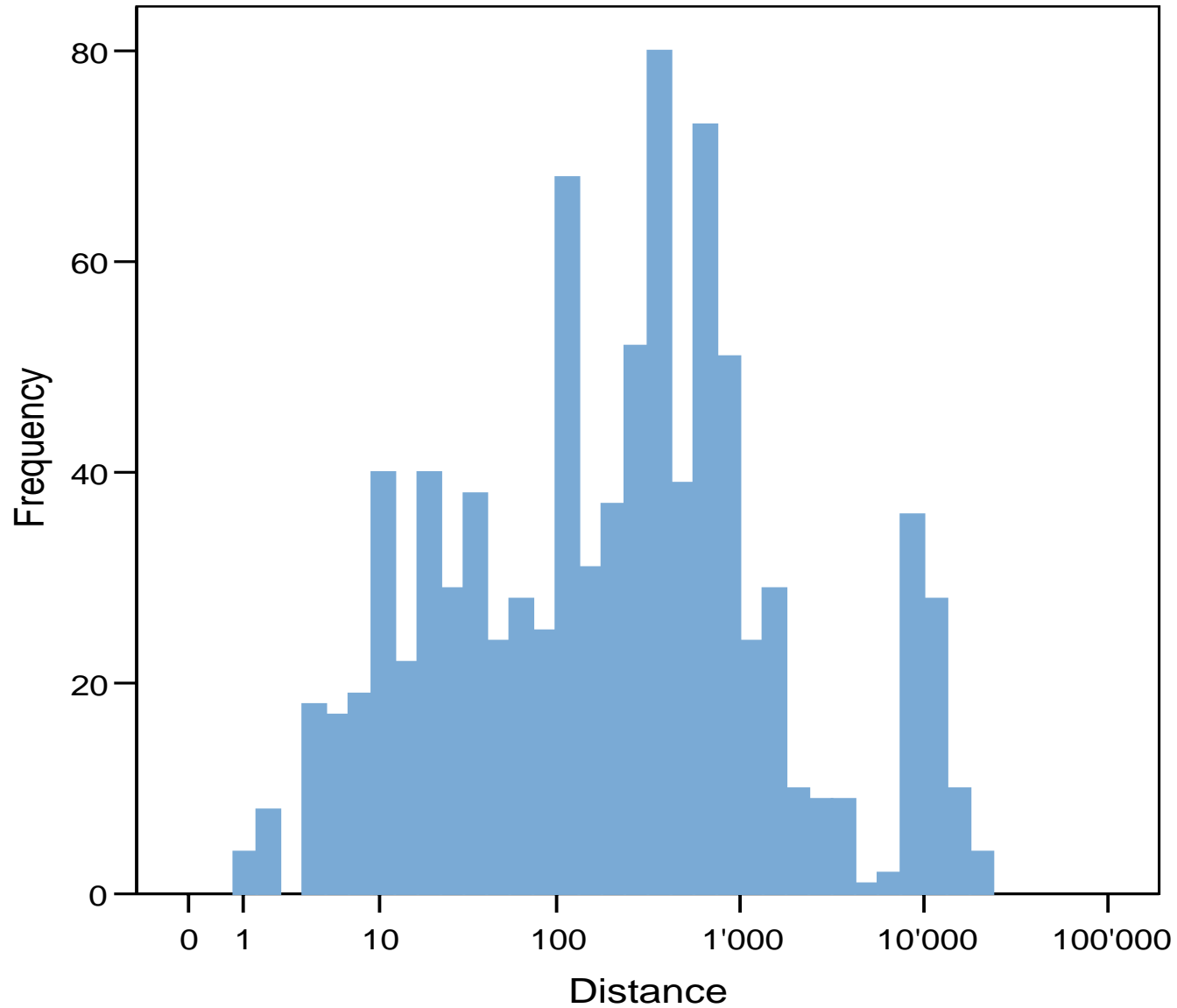
Contacts



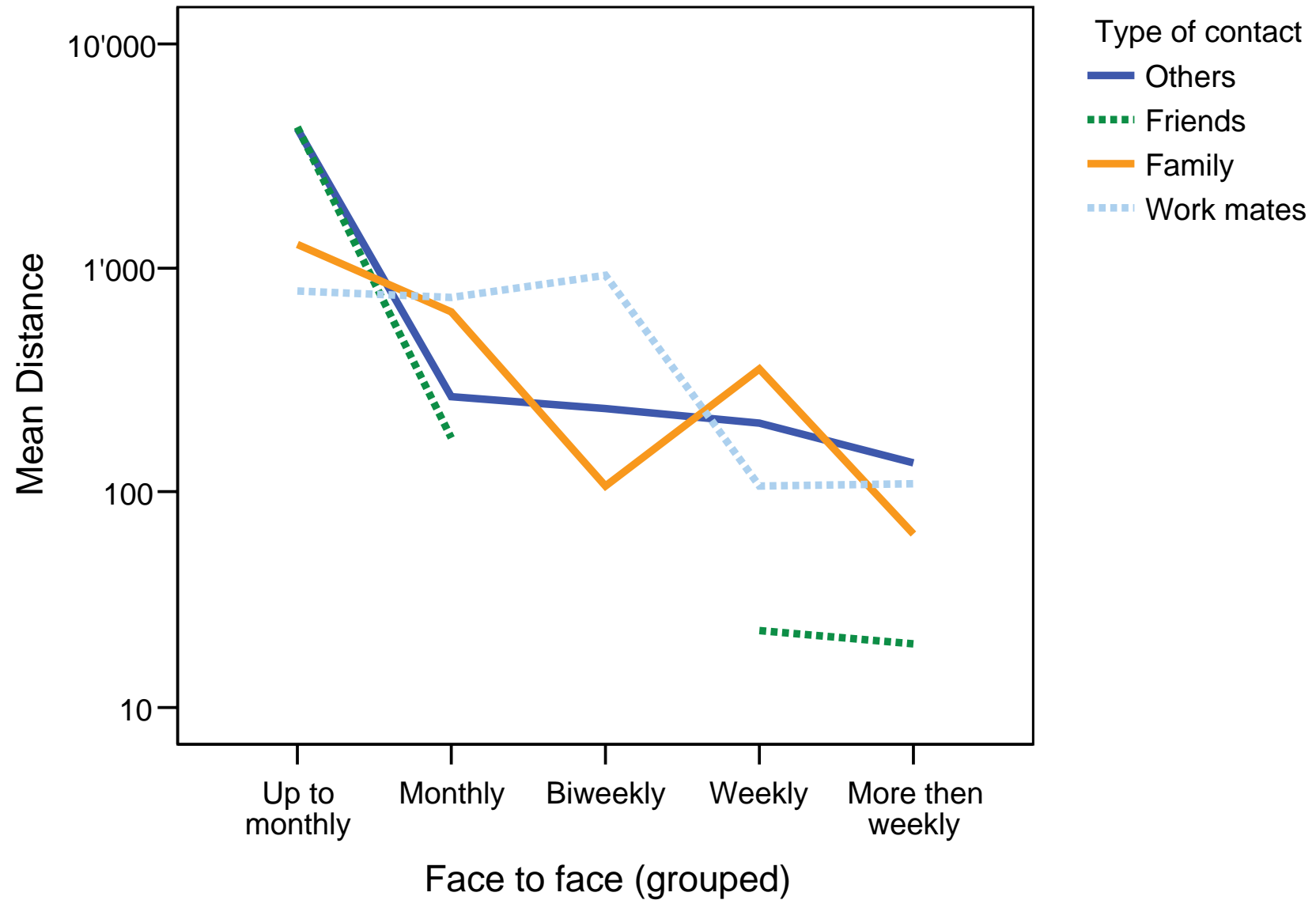
Poisson regression of the number of social contacts

Variable	Mean	St. dev	Beta	Standard-ised beta	Sign.
Constant	-	-	3.753	-	0.000
Age [years]	45.68	19.08	-0.051	-0.124	0.000
Age ² /1000 [years ² /1000]	2.44	0.09	0.401	0.102	0.000
Data_horizon [y/n]	0.19	0.39	-0.289	-0.015	0.000
Data_COST 355 [y/n]	0.57	0.50	-0.256	-0.016	0.000
Number of relocations [n]	5.82	2.74	0.037	0.013	0.000
University degree [y/n]	0.28	0.45	0.116	0.007	0.045
N	128				
Adjusted R ²	0.16				

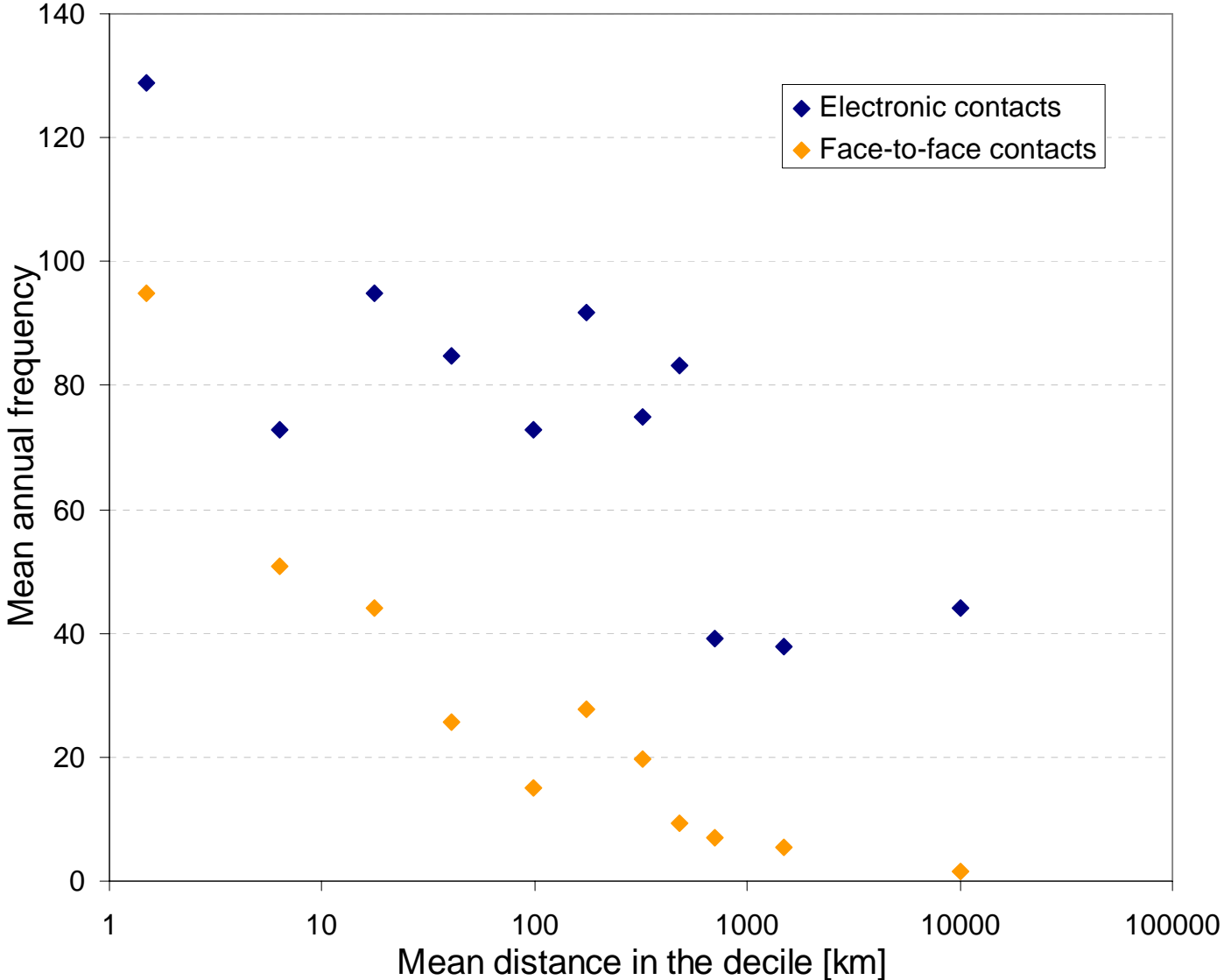
Distance distribution between home locations



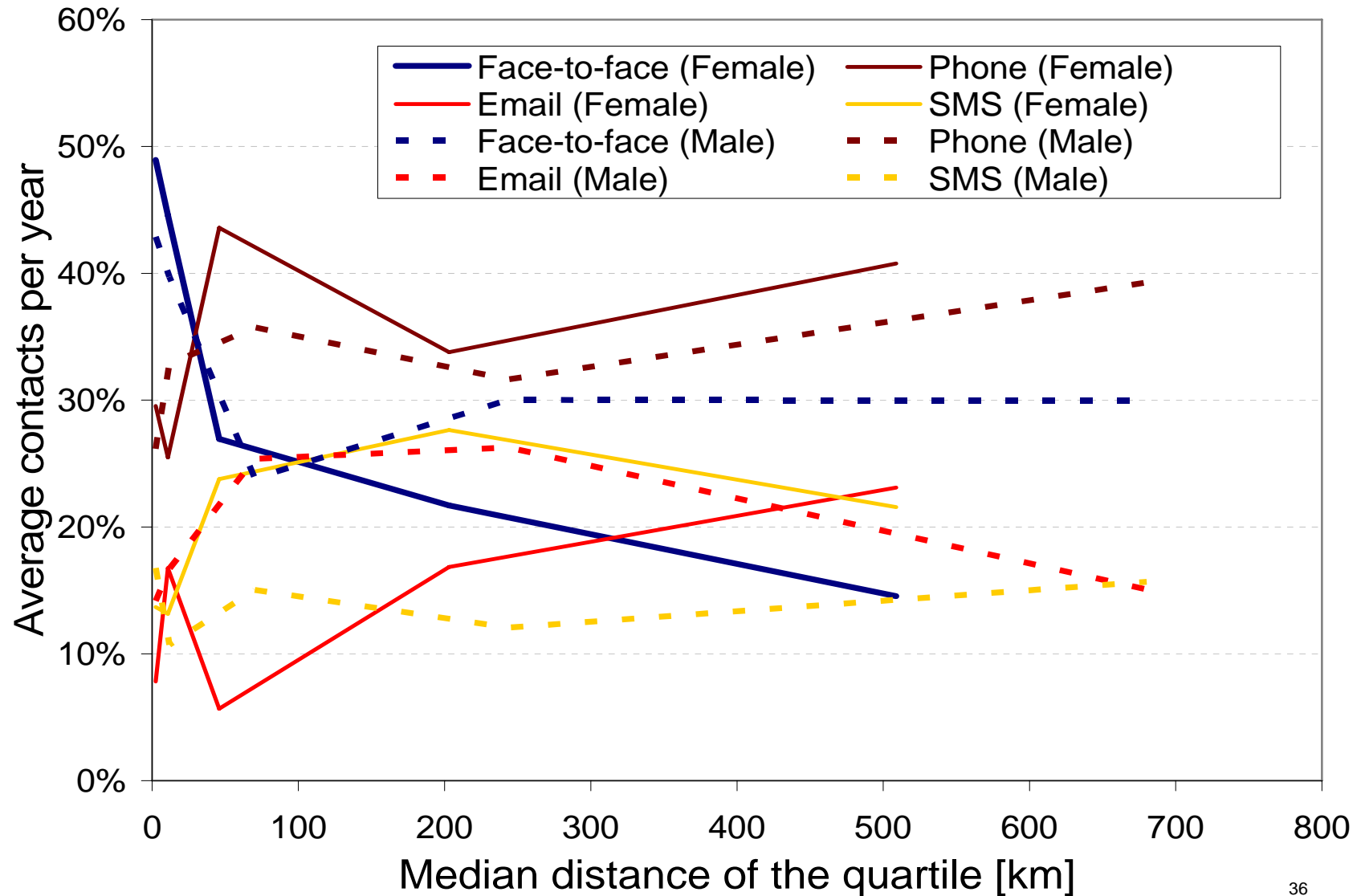
Distance by type of contact



Contact frequency by mode



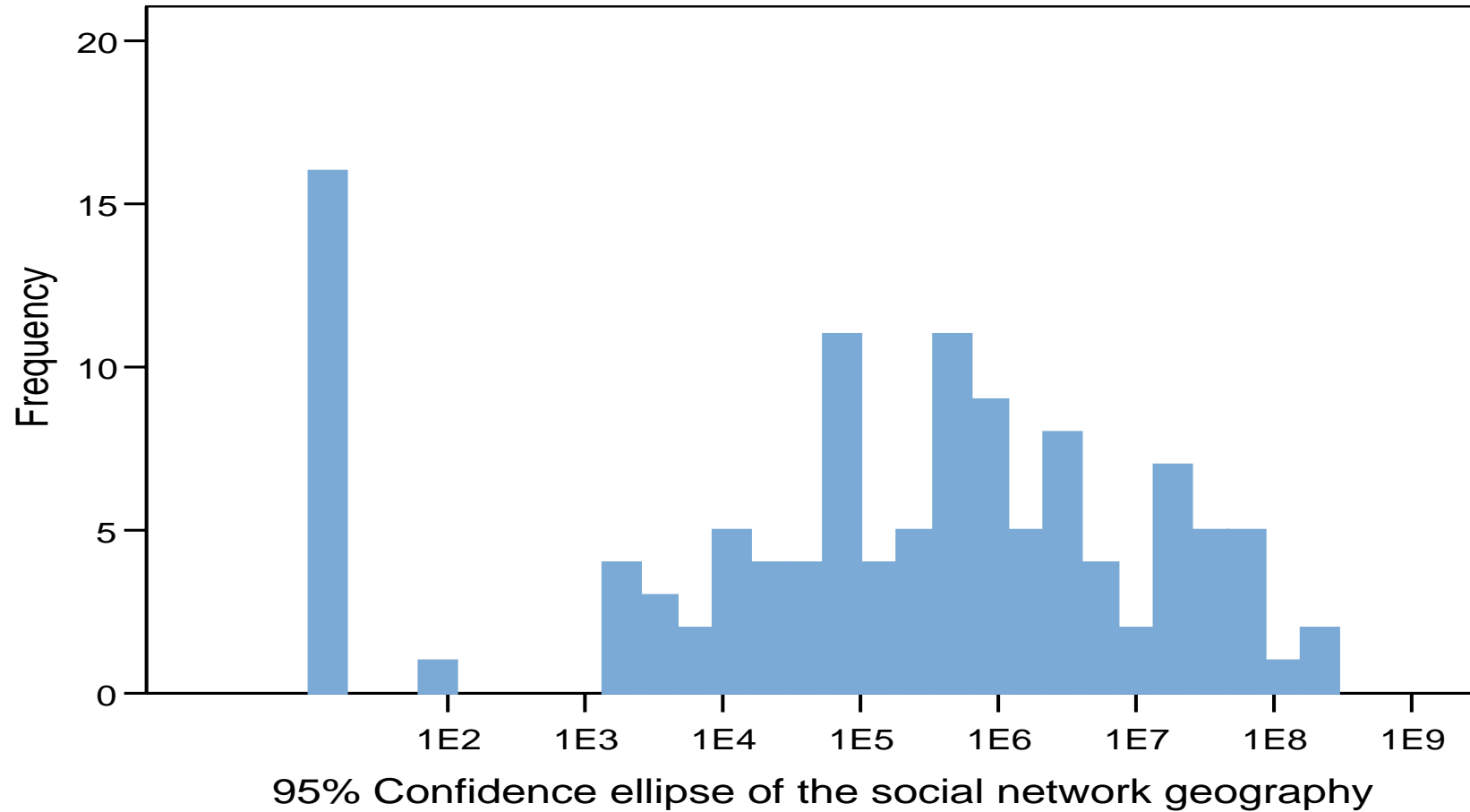
Market share by contact mode



Probit results

Variable		Market shares of contact modes			
Category		Face-to-face	Phone	Email	SMS
Age		-.004	.004	.006	-.007
Sex: Male		-.127	-	.624	-.526
Education	Compulsory school	-.251	.186	.306	-.481
	Apprenticeship	-.171	.254	-.278	.086
	Baccalaureat	Reference	Reference	Reference	Reference
	Professional tertiary	-.384	.329	.106	-.092
	University degree	-.628	.915	-	-.587
Type of contact	Others and friends	.197	-.625	-2.126	-.459
	Family and partner	-	-.402	-2.344	-.355
	Work mates	.600	-1.055	-1.907	-.779
Ln (distance)		-.108	-	.132	0.31
Income		.028	-.048	.075	-.053
Income * Male		.048	-.021	-.138	.106
Adjusted R ² /Chi ²		10046	10235	13548	11690
N		381	381	381	381

Size distribution of the social geographies



Japan: 378; U.S.A: 9'629 [10^3 km^2]

Tobit results

Variable	Mean	St. dev	Beta	Standard-ised beta	Sign.
Data_ifmo [y/n]	0.26	0.43	2.309	0.184	0.048
Male [y/n]	0.57	0.50	2.293	0.212	0.021
Age [years]	44.72	18.92	-0.078	-0.277	0.002
University degree [y/n]	0.28	0.45	2.286	0.192	0.047
Car ownership [y/n]	0.52	0.50	3.842	0.358	0.000
Annual or monthly public transport ticket [y/n]	0.90	0.32	6.585	0.398	0.000
Number of relocations [n]	5.87	2.74	0.634	0.325	0.000
N	117				
Adjusted R ²	0.48				

Assessment: Survey work

- Combined face-to-face interviews and self administered questionnaire an expensive but practicable survey method
- Respondents participation is very selective
- Small number of contacts (See “Connected Lives – Study in Toronto for larger numbers)
- Detailed information on “meetings” still missing in this protocol

Results from the initial models

- Biography has an impact on the number of contacts given
- Strong distance decay of contact frequency
- Strong distance and income effects on contact mode share
- Biography affects the size of network geography

Part 3

Research issues

- Measurement of the activity spaces (geographies, markets)
 - Number and kind of contacts
 - Measurement methods
- Estimate of historical activity spaces
- Use of written or electronic records

- Taste differences in network form and geography
- Social/cultural preferences for network form and geography

- Stability of the geographies under pressure
- Elasticities to policy (or environmental) change

Policy questions

- Is „happiness“ still growing ?
- How large are the social externalities ?
- How stable is the overall system under pressure ?

Appendix

References

- Axhausen, K.W. (2003) Social networks and travel: Some hypotheses, *Arbeitsberichte Verkehr- und Raumplanung*, **197**, Institut für Verkehrsplanung und Transportsysteme (IVT), ETH Zürich, Zürich.
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- Ohnmacht, T. (2004) Soziale Netze und persönliche Mobilität: Grundlagen für eine empirische Erhebung, *Arbeitsbericht Verkehrs- und Raumplanung*, **250**, IVT, ETH Zürich, Zürich.
- Rai, R.K., M. Balmer, M. Rieser, V.S. Vaze, S. Schönfelder and K.W. Axhausen (2006) Capturing human activity spaces: New geometries, *Arbeitsberichte Verkehrs- und Raumplanung*, **378**, IVT, ETH Zürich, Zürich.

Social networks: Hypotheses

- [1] The size of the social network geography is inversely proportional to the generalised costs of travel and communication
- [2] The number of contacts individuals maintain is inversely proportional to the generalised costs of travel and communication
- [3] The probability of being linked to a member of one's network through multiple networks increases with the spatial density of one's contacts
- [4] The distribution of effort on non-household members will become more left skewed as the spatial social network tightness decreases
- [5] The knowledge about the contacts of contacts in a social network is proportional to the generalised costs of travel and communication

Social networks: Hypotheses (2)

- [6] The activity space of an individual is proportional to its social network geography
- [7a] The size of the local activity space of an individual stabilises after an initial exploration.
- [7b] The size of the total activity space will grow in line with the growth of social network geographies.
- [8] The reliance on commercial or publicly funded personal services increases proportionally with the geography of social networks
- [9] The welfare of the individuals should increase inversely proportional to the generalised costs of travel

Measurement approaches: Inclusion geometries

