Preferred citation style

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Spatial patterns of social networks and social contacts

KW Axhausen

IVT
ETH
Zürich

April 2008

Institut für Verkehrsplanung und Transportsysteme
Institute for Transport Planning and Systems

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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Collaborators:

- Andreas Frei, ETH Zürich
- Timo Ohnmacht, HSW Luzern

- Jonas Larsen and John Urry, Lancaster University

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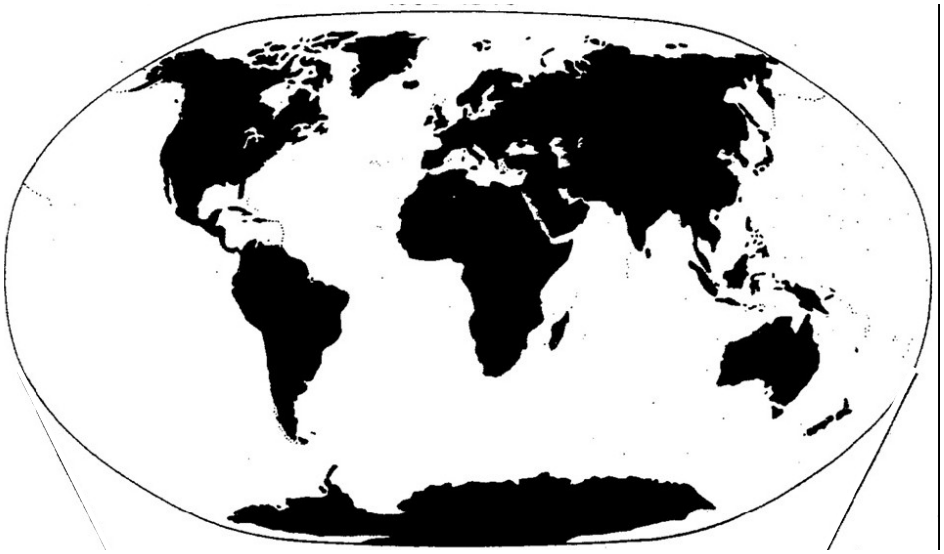
- BBW, Bern
- ifmo, Berlin

- UK Department for Transport, London

A shrinking world



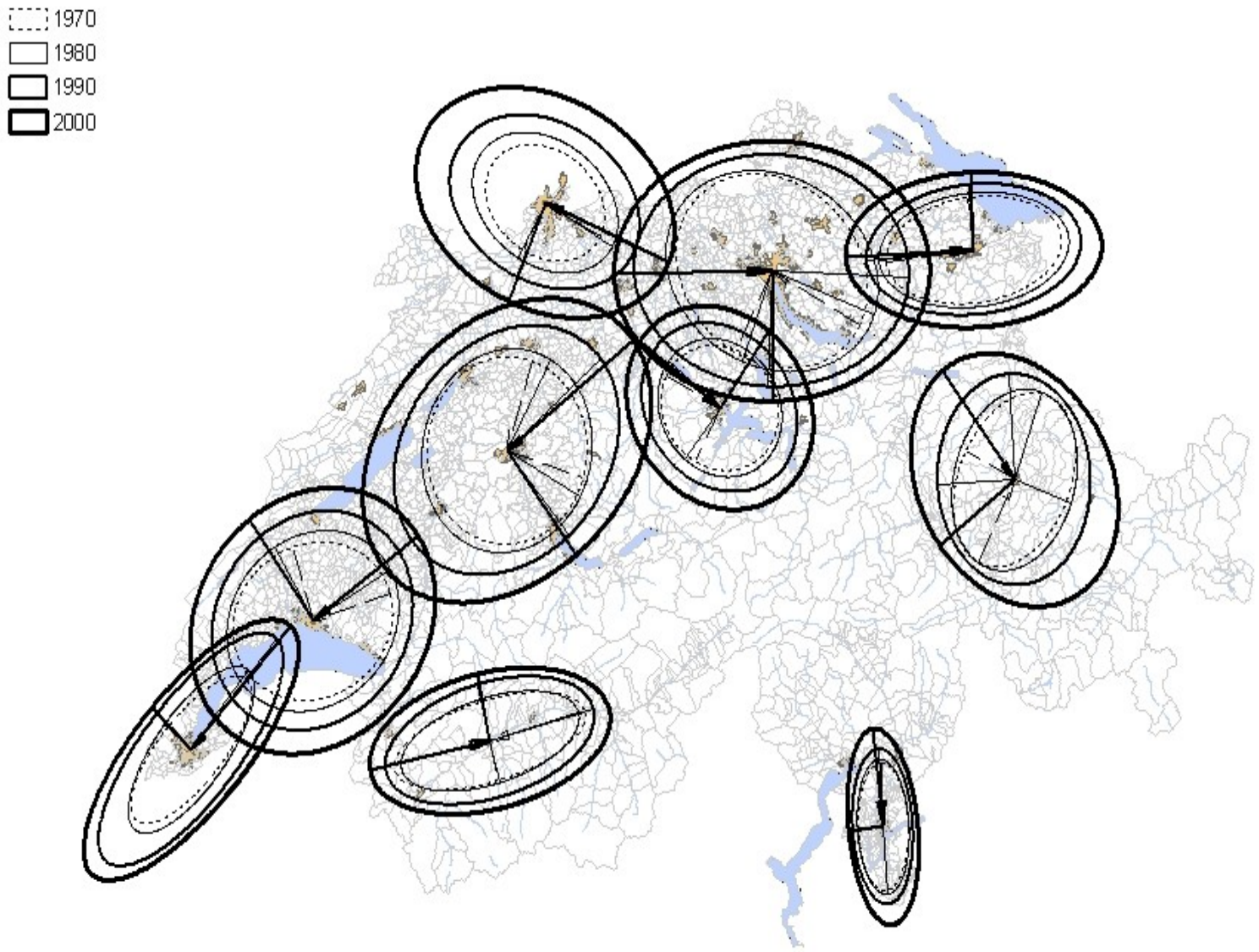
Coach and sailing boat until 1840

Steam ship and locomotive, 1840 - 1930

Propeller aircraft, 1930-1950 

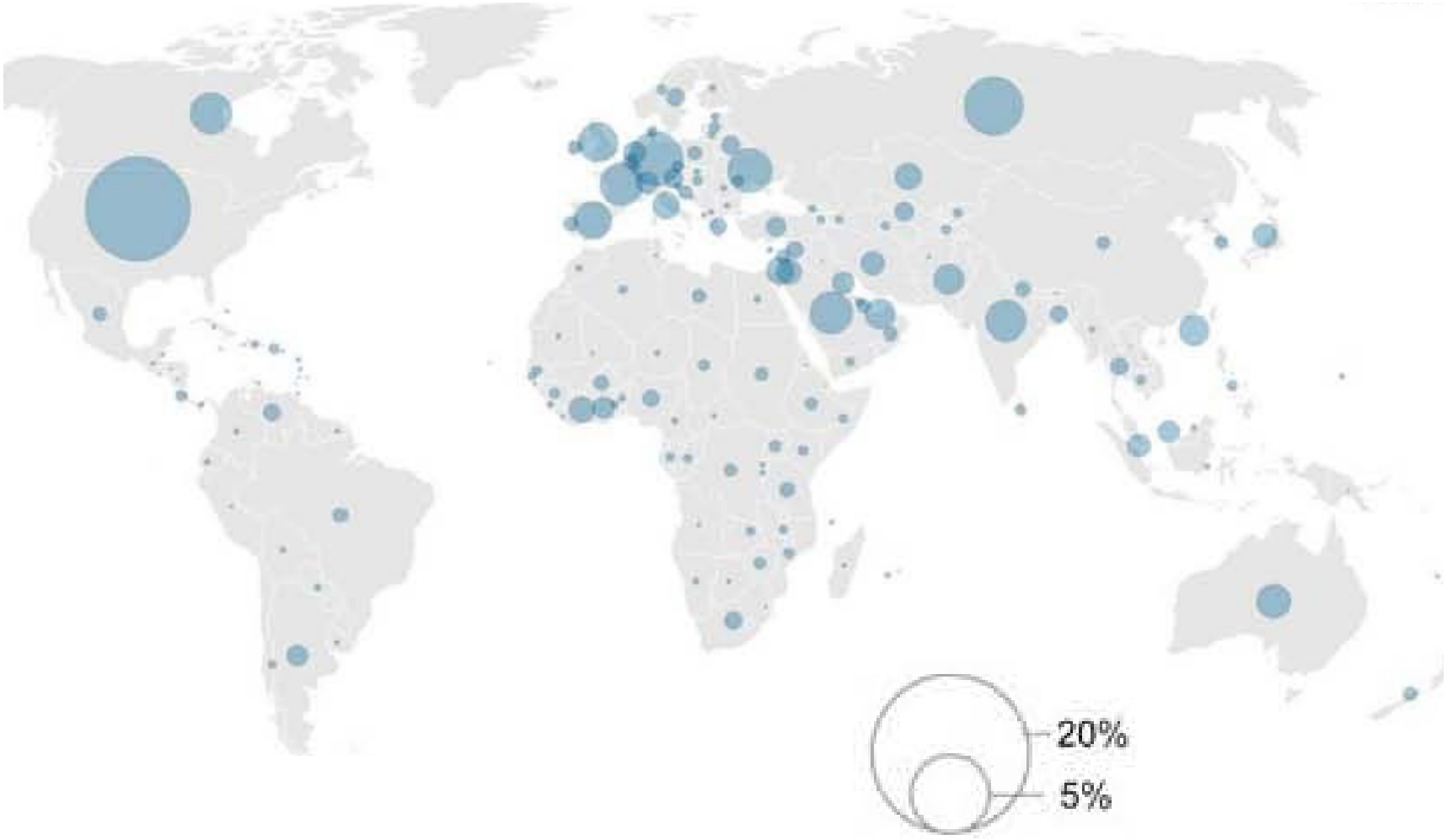
Jets, from 1950 

In-commuter sheds of the ten largest Swiss towns



Nach Botte, 2003

Worldwide flows: 2005 Share of world's migrants



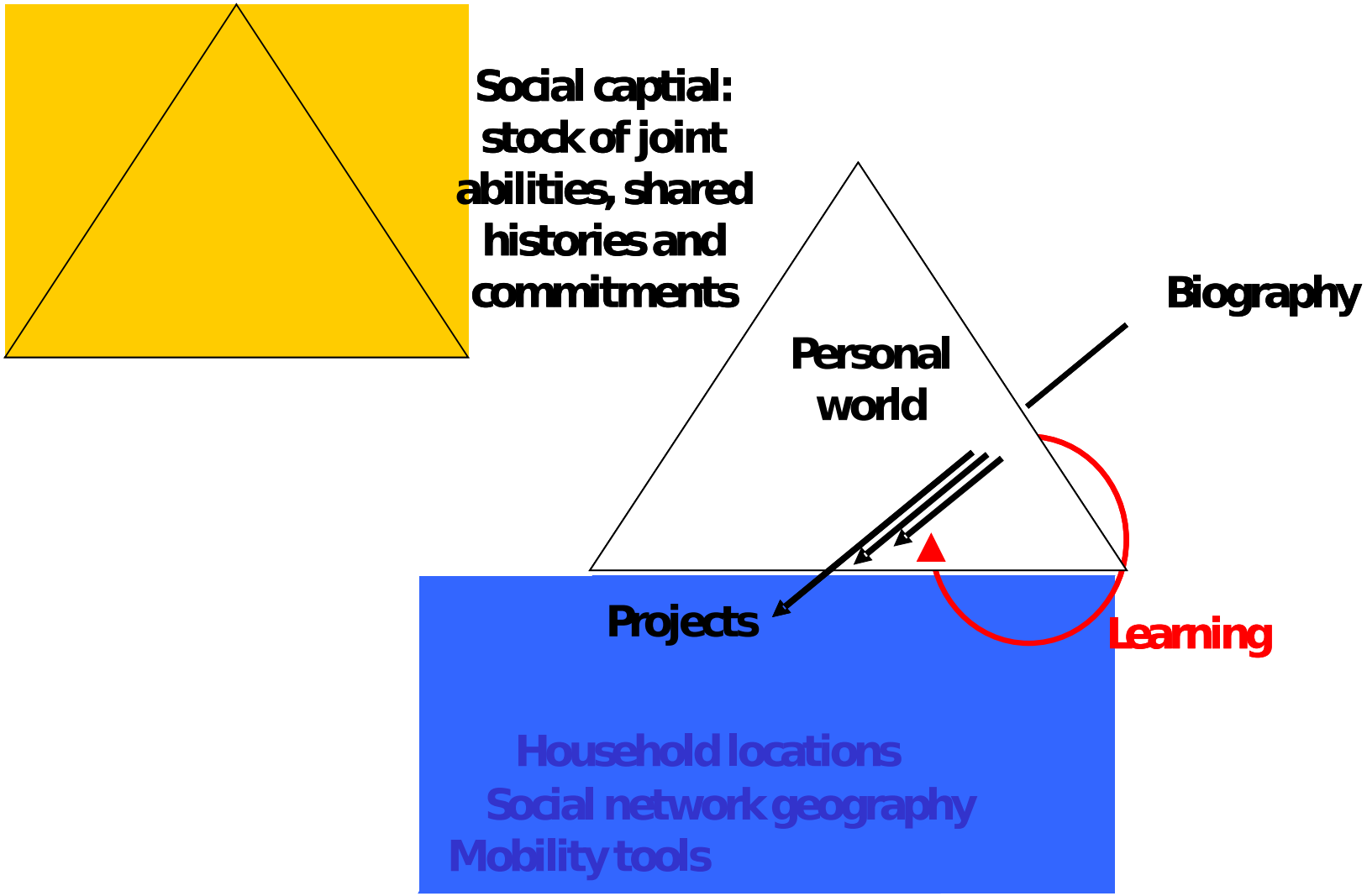
How to explain travel ?

- Distribution of activities
- Distribution of land uses

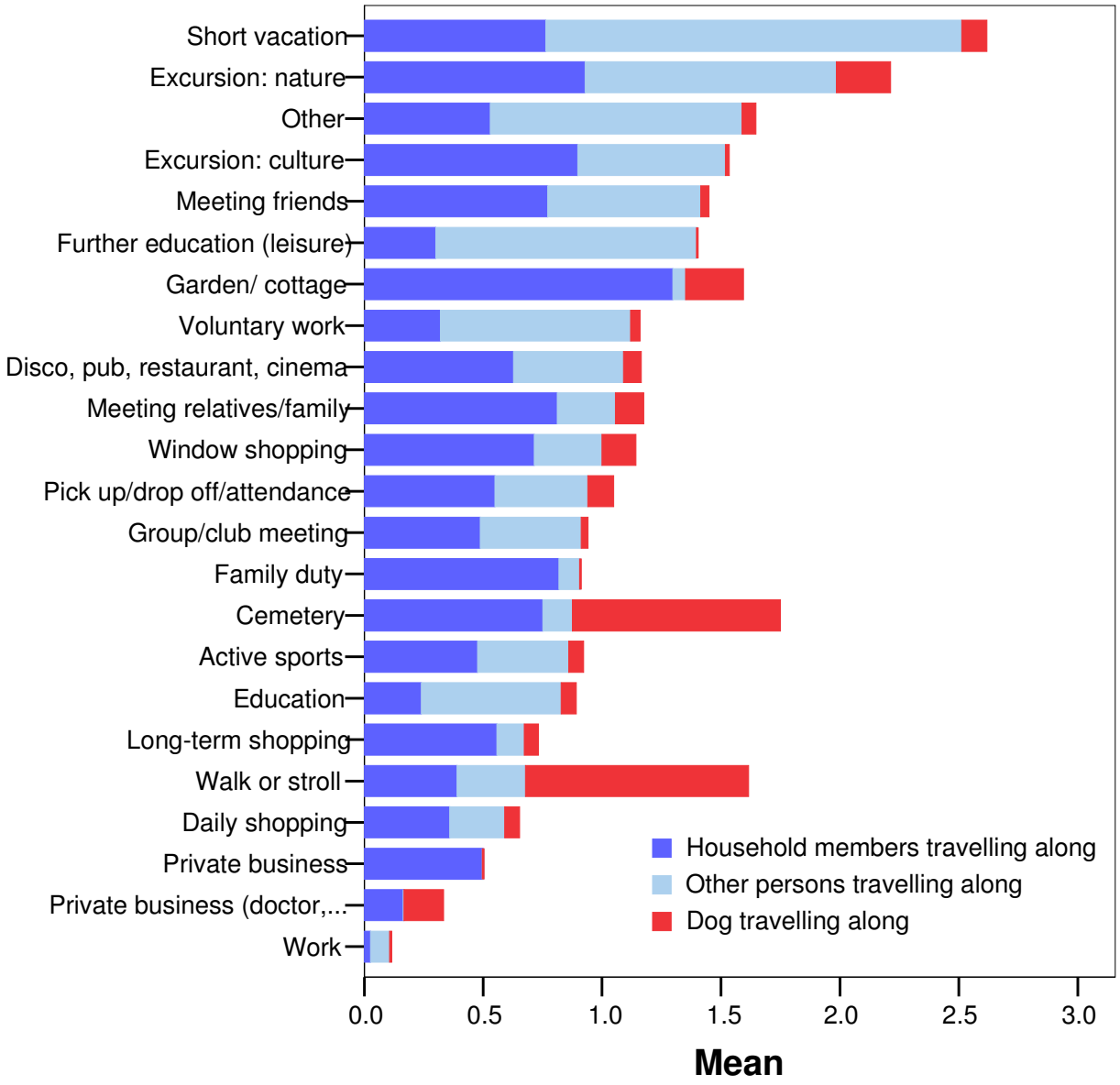
- Generalised costs on the available infrastructure
- Generalised costs of the activity (time, money, social content)

- Budget constraints
- Capability constraints

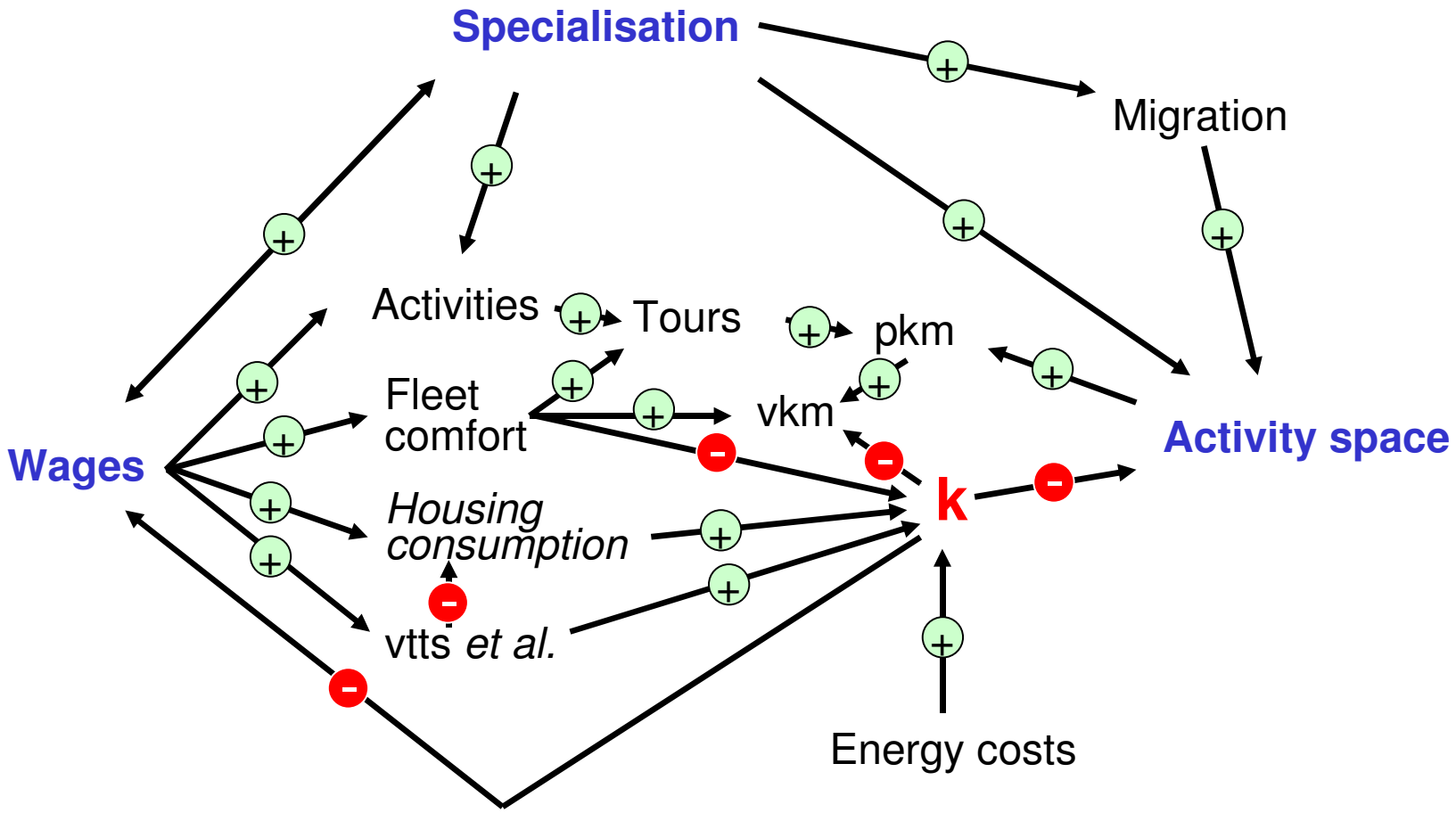
Context: Networked actor



Number of accompanying travellers (2003 Thurgau)



Activity spaces inc. network geographies: A hypothesis



+ Elasticity > 0

− Elasticity < 0

k: personal short term generalised costs of travel

Travel and social networks

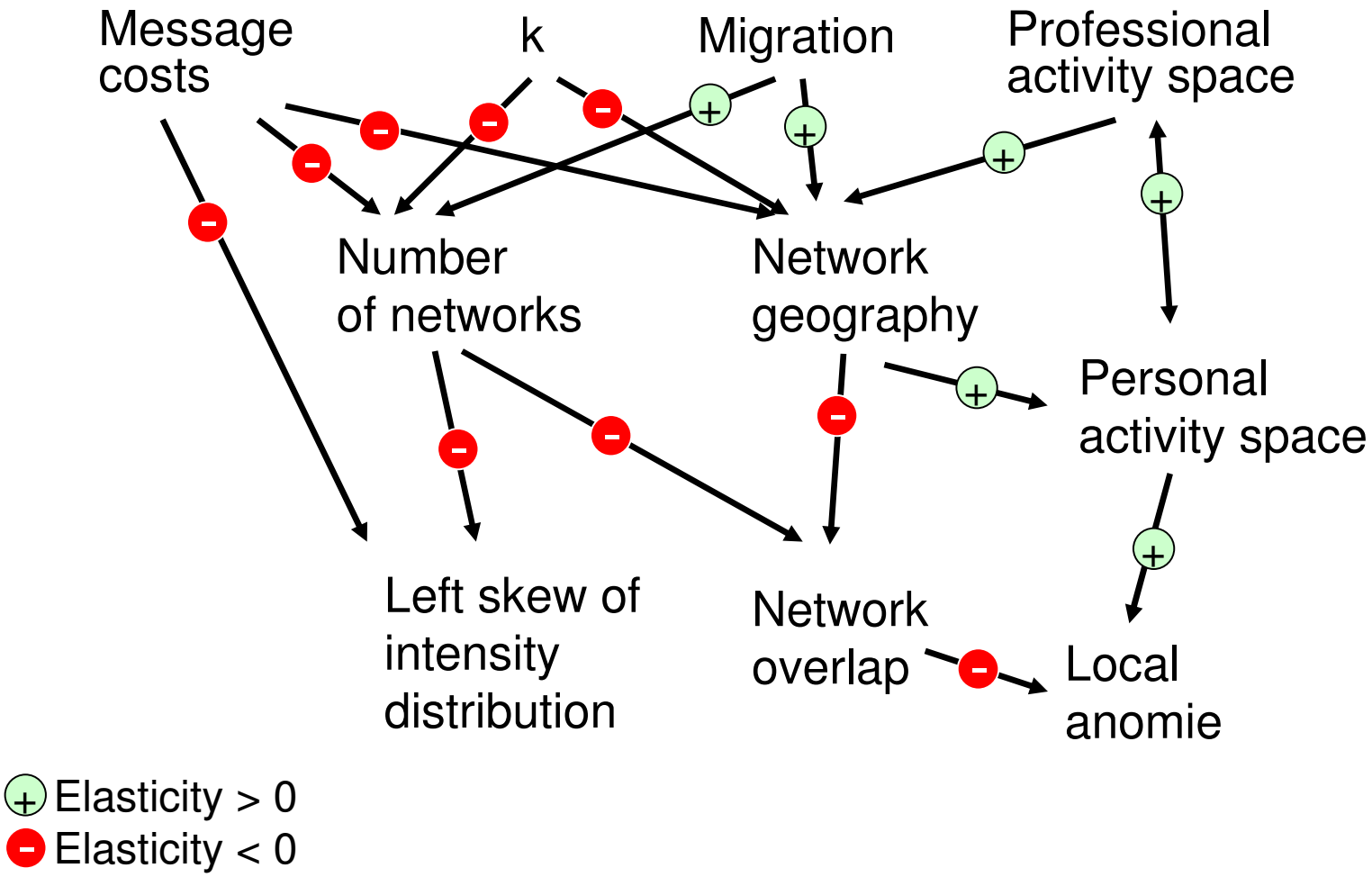
Maintenance of the networks requires:

- Face to face interaction
- Balanced by other forms of interaction

- Travel ~ Physical spread of the contacts

- Trade-off between loosing contacts and “social” capital and investing in new contacts closer to home

Hypotheses


Message costs
k
Migration
Professional activity space
Number of networks
Network geography
Personal activity space
Left skew of intensity distribution
Network overlap
Local anomie
+ Elasticity > 0
- Elasticity < 0

First set of research issues

Benchmarking the current state:

- Numbers of contacts
- Distance distributions
- Geographies
- Frequency and mode of contact

- Productivity
- Levels of local anomie
- Levels of local trust
- Level of place attachment

Items to capture the social network geographies

- Name generators
- Name interpreters
  - Type and length of contact
  - Frequency by mode of contact
  - Home location
  - Description of the last face-to-face contact

Items to characterise the mobility biography

- Home and second home locations
- Work and school locations
- Household composition
- Mobility tools
- Income

Representativeness of the data

Variable	Survey Mean	Population Mean	Difference
Age	50.76	46.90	+8.2%

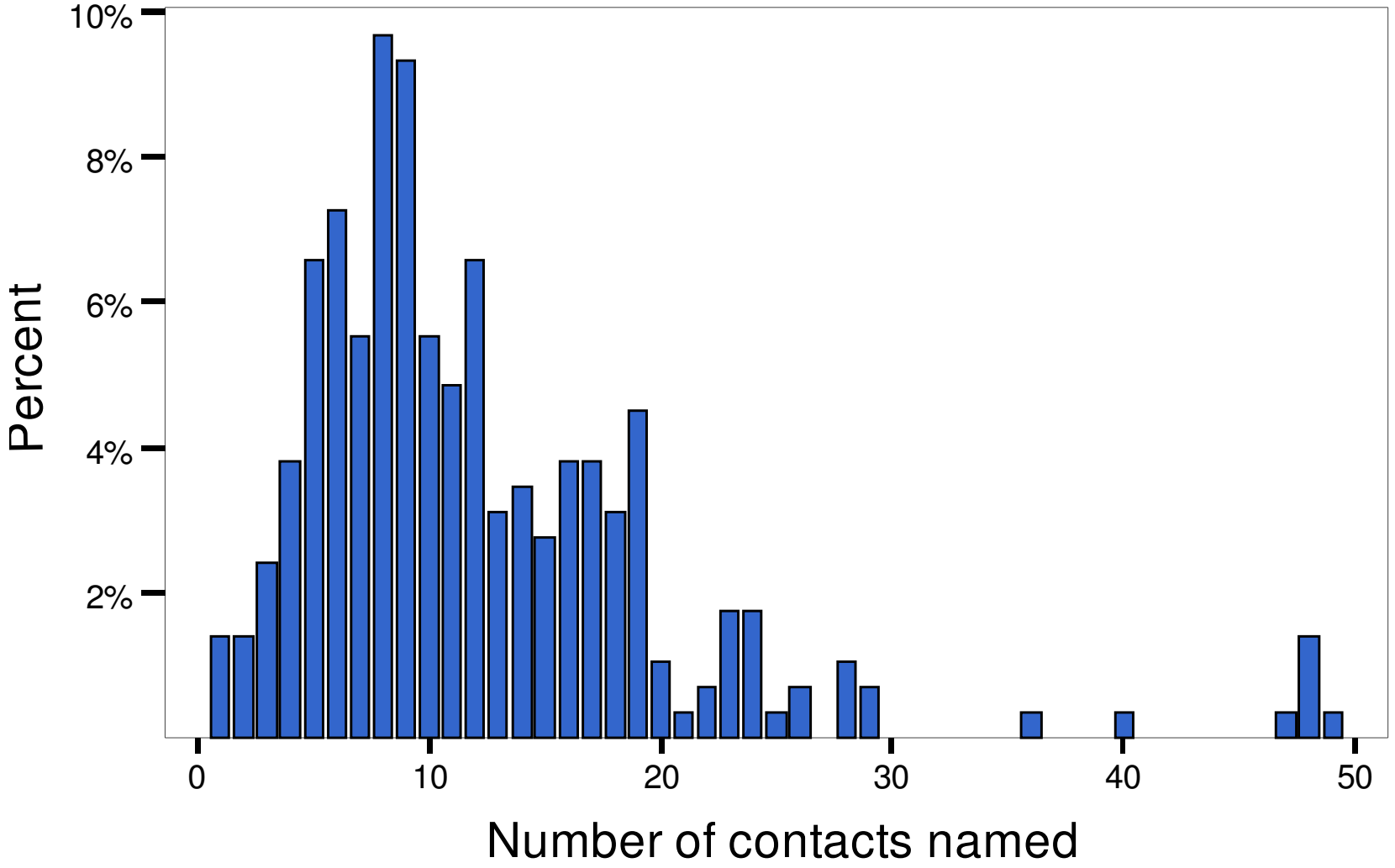
Variable	Survey Share	Population Share	Difference
Males	43.6%	46.4%	-2.80%
Education			
N.A.	5.2%	2.6%	2.60%
Obligatory schooling	8.0%	12.5%	-4.50%
Vocational training	31.8%	42.3%	-10.50%
Highschool diploma	8.3%	9.2%	-0.90%
Further technical training	20.8%	15.6%	5.20%
University degree	26.0%	17.8%	8.20%
Car available			
Always	44.6%	42.8%	1.80%
Frequently and rarely	17.0%	18.4%	-1.40%
Public transport season tickets			
50% discount card (Halbtax)	49.5%	37.9%	11.60%
National season (GA)	24.6%	14.2%	10.40%
Regional season	13.8%	18.7%	-4.90%

As observed in the Microcensus Travel 2005 (Bundesamt für Statistik und Bundesamt für Raumentwicklung, 2007)

Comparison of the instrument

Variable	East York	NCCS	GSS	IVT
Instrument				
Name-generator	1 prompt (feel close to)	11 prompts	1 prompt (discuss important matters)	4 prompts
Generator limitation	6	No limitation	5	No limitation
Ego-centric network				
Size (Ø)	4.70	18.48	3.01	12.35
Share of relatives (Ø)	0.50	0.44	0.61	0.31
Share of weak ties (Ø)	0.18	0.32	0.23	0.48
Duration (Ø)	>10 for 57%	16	-	20.6
Contact freq. per year (Ø)	150.4	-	194.6	59.0

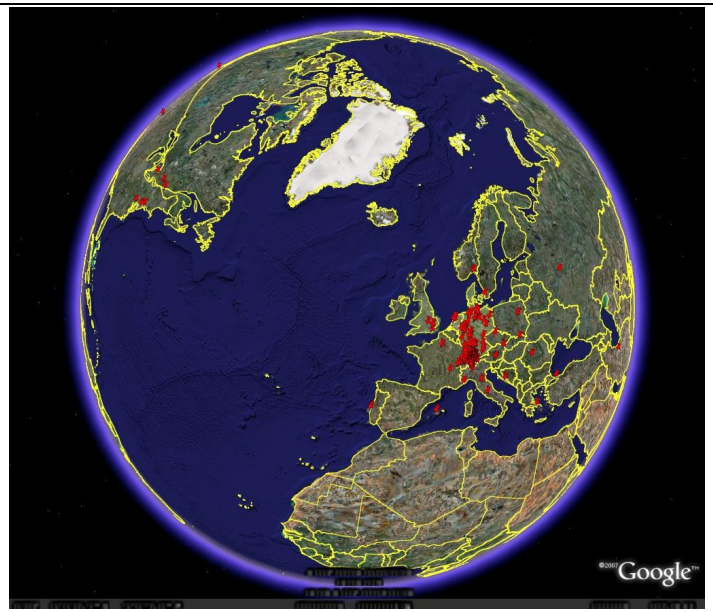
Number of contacts reported

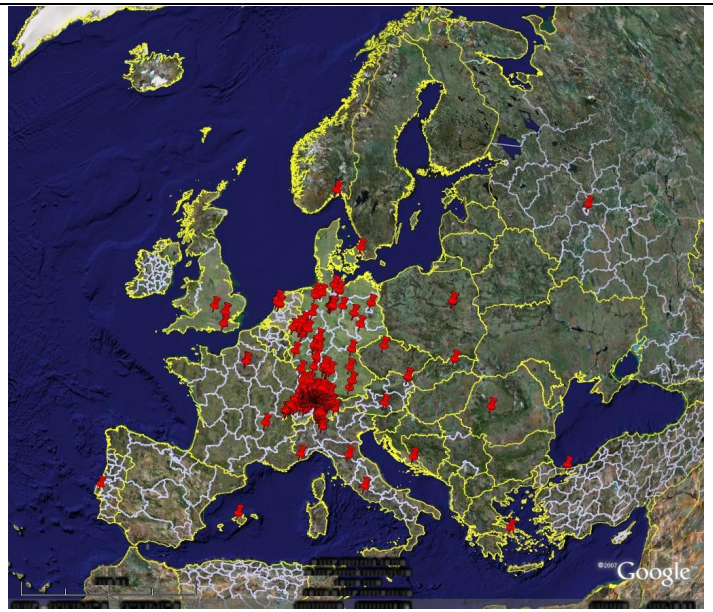


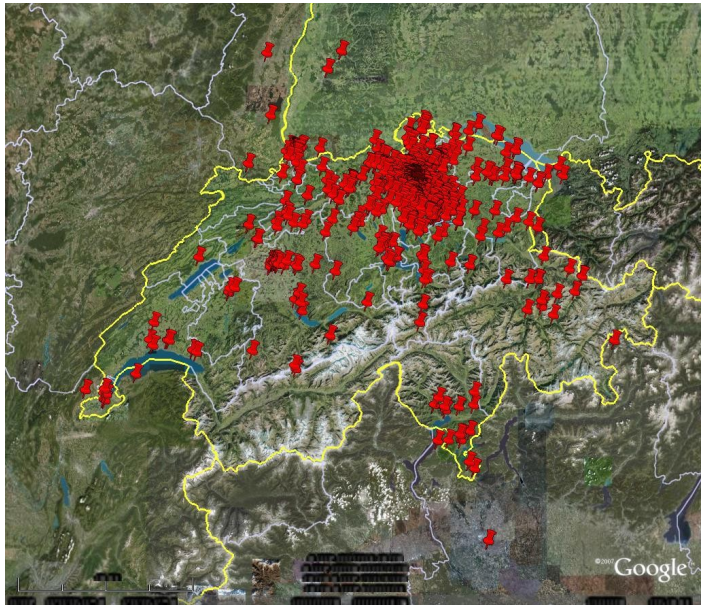
Negative binominal regression (Number of contacts)

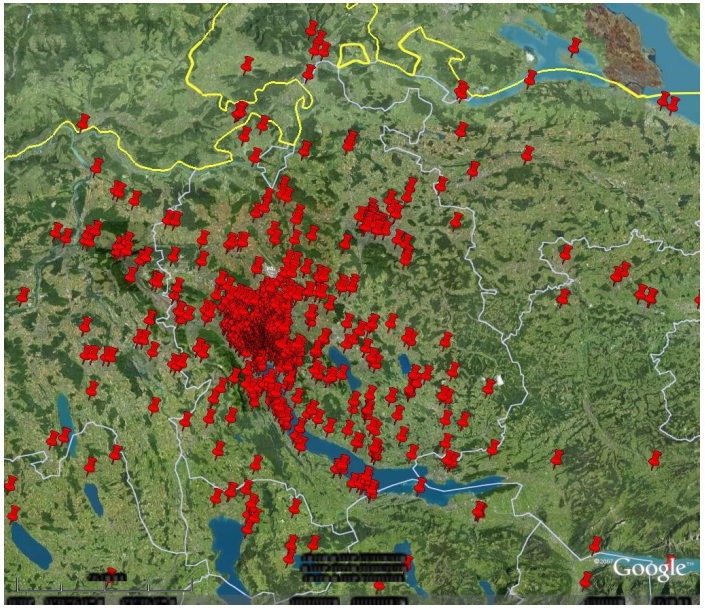
Variable	Mean	St.dev.	Beta	Sign.
Constant			3.092	0.000
Age [years]	53.283	19.163	-0.040	0.002
$Age^2/1000$ [$years^2/1000$]	3.208	2.081	0.352	0.005
Annual or monthly public transport ticket [y/n]	0.853	0.893	0.242	0.042
Number of relocations []	5.963	3.116	0.038	0.003
University degree [y/n]	0.247	0.430	0.178	0.055
Part time employed [y/n]	0.170	0.382	-0.256	0.020
Retiree [y/n]	0.327	0.469	-0.302	0.045
Children < 18 y [y/n]	0.250	0.434	0.177	0.021
N	300			

Geocoded home locations

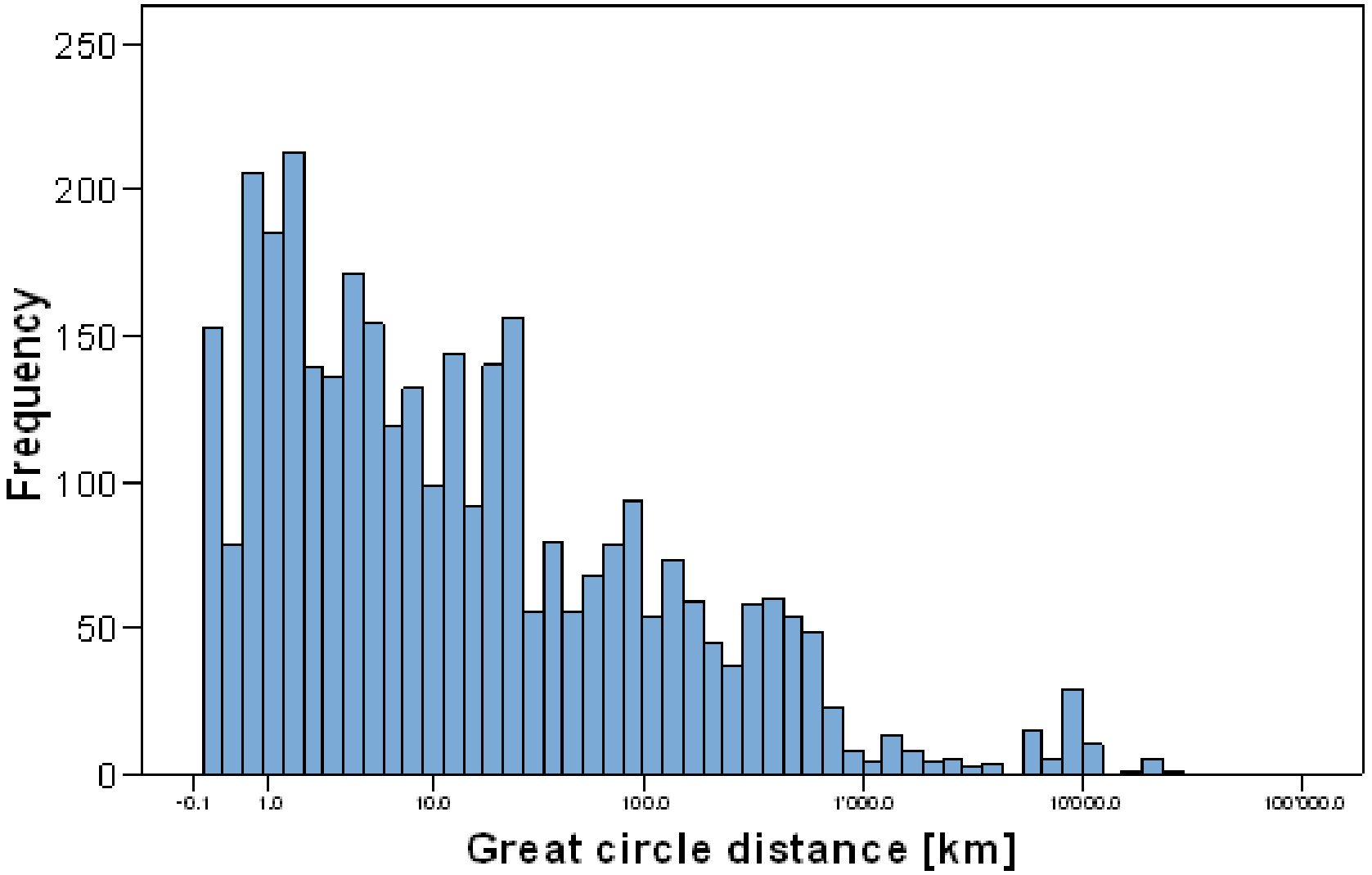




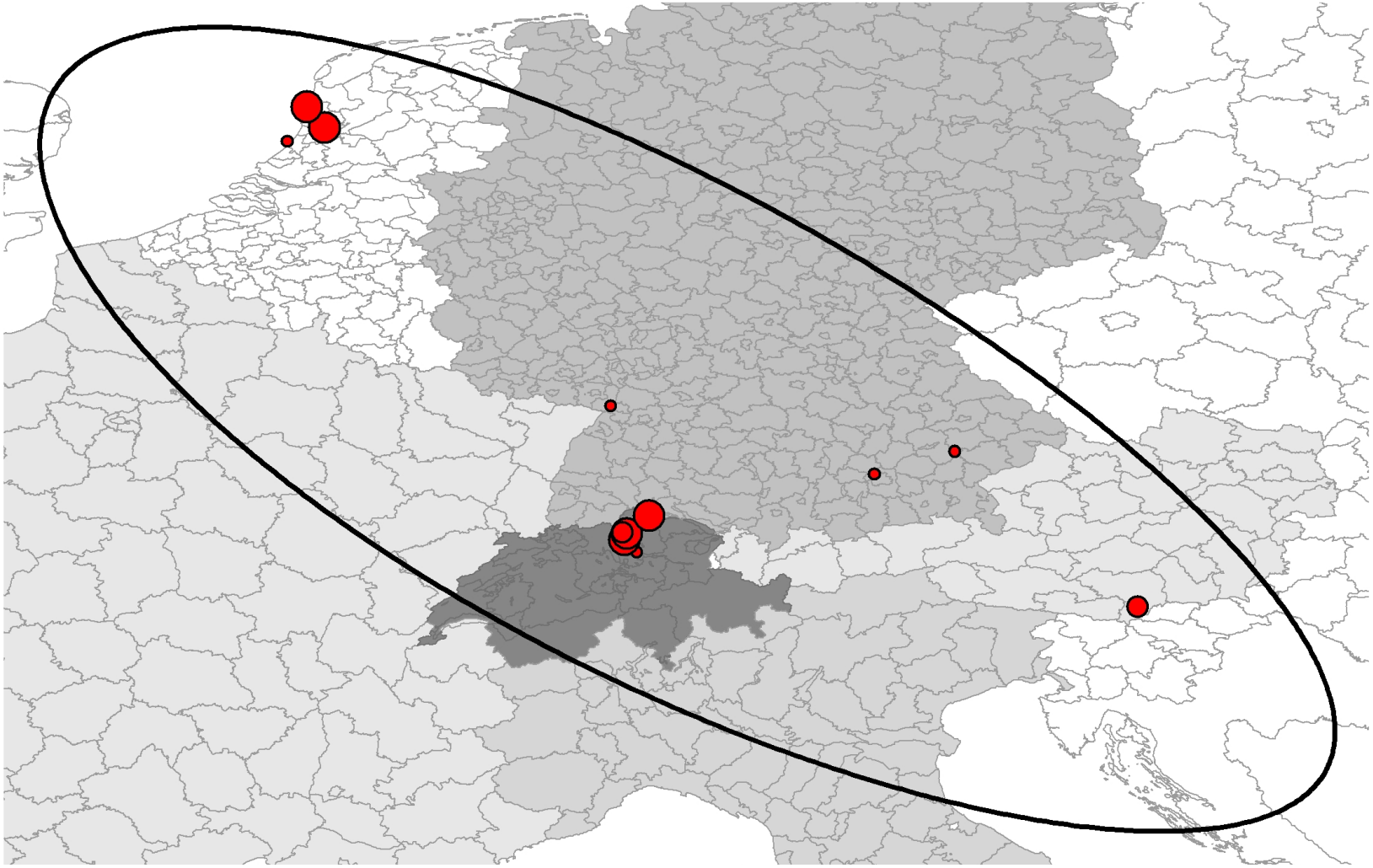




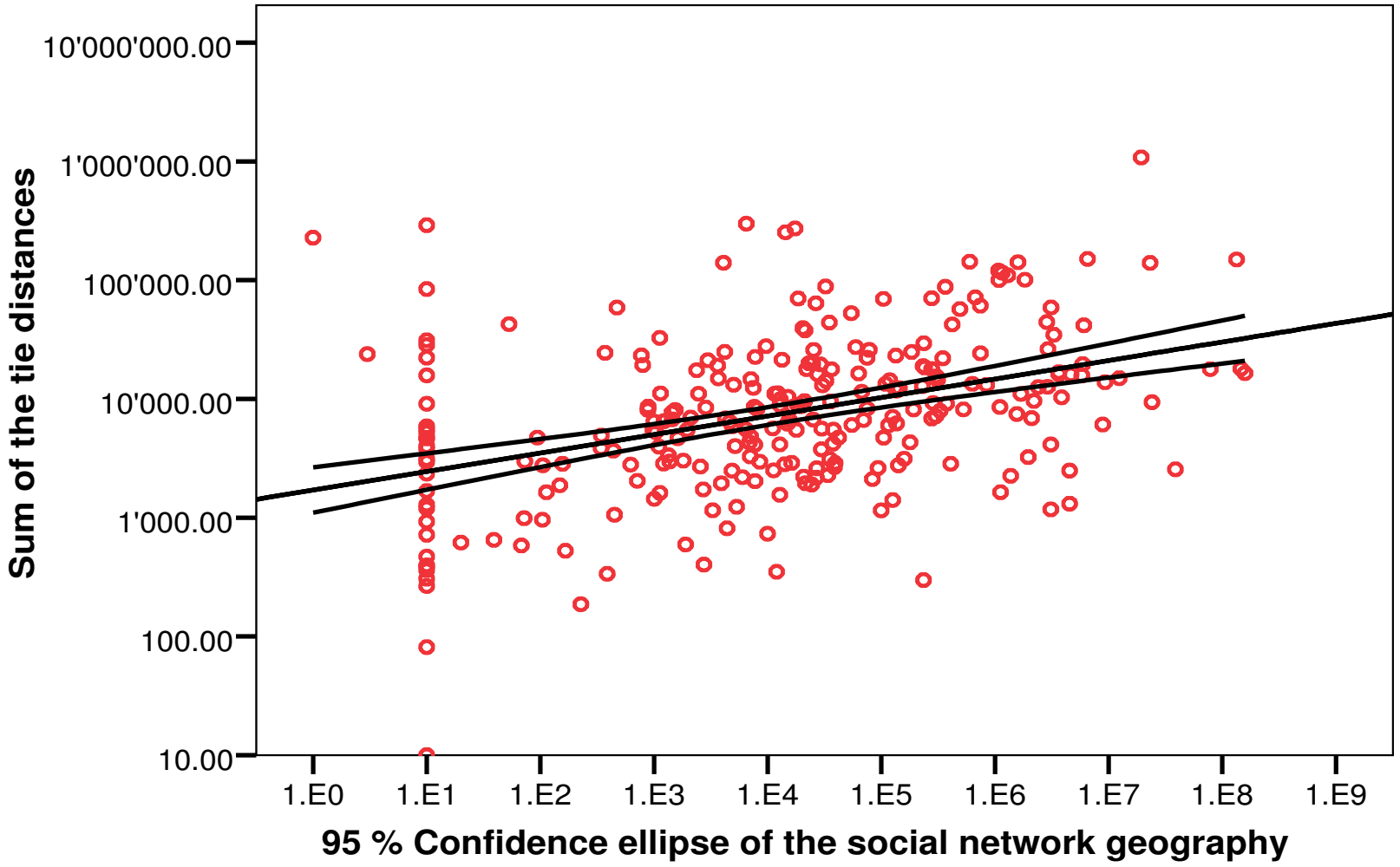
Distances between home locations



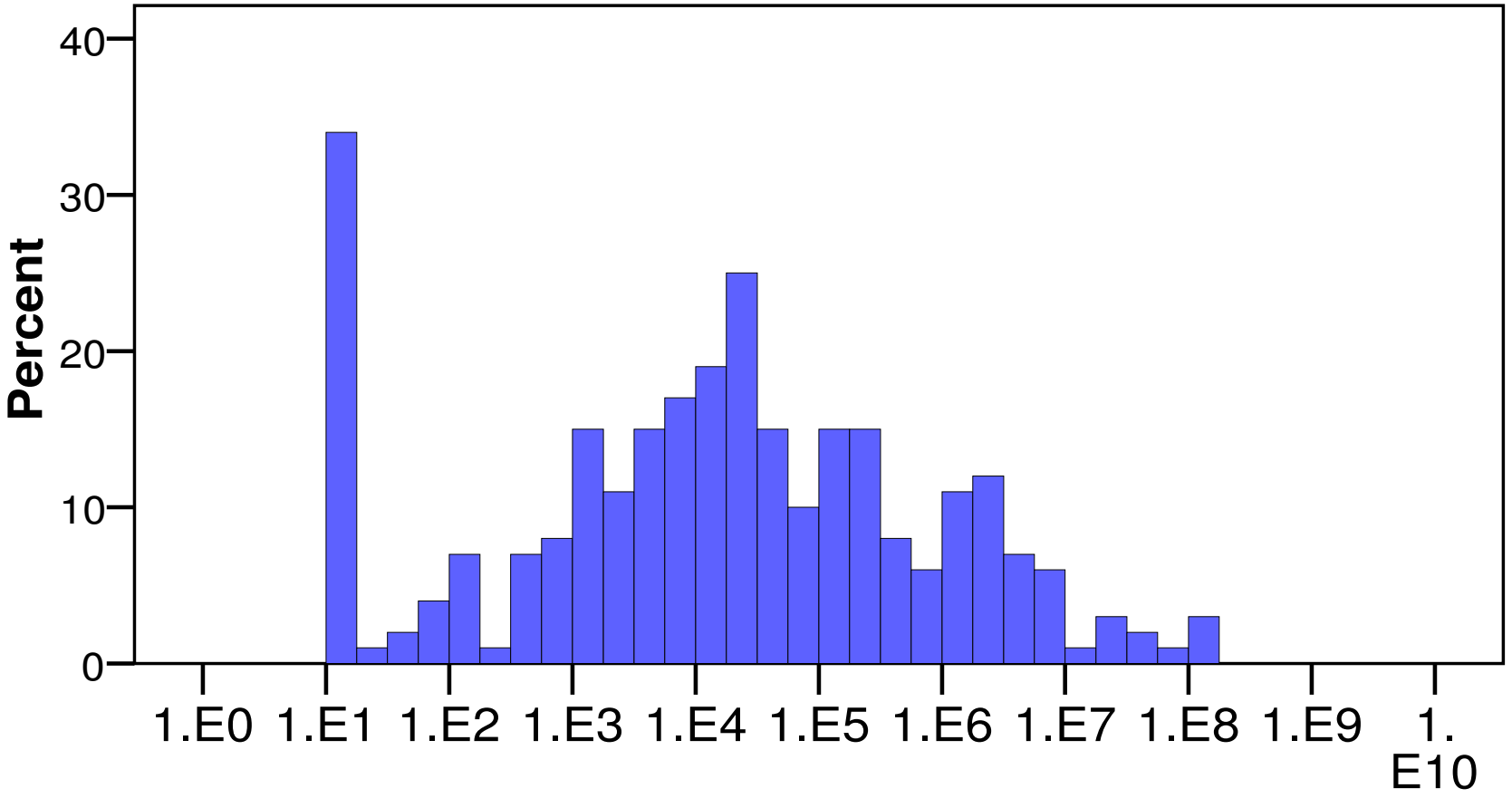
Example of a social network geography



Size of social geographies vs. sum of distances

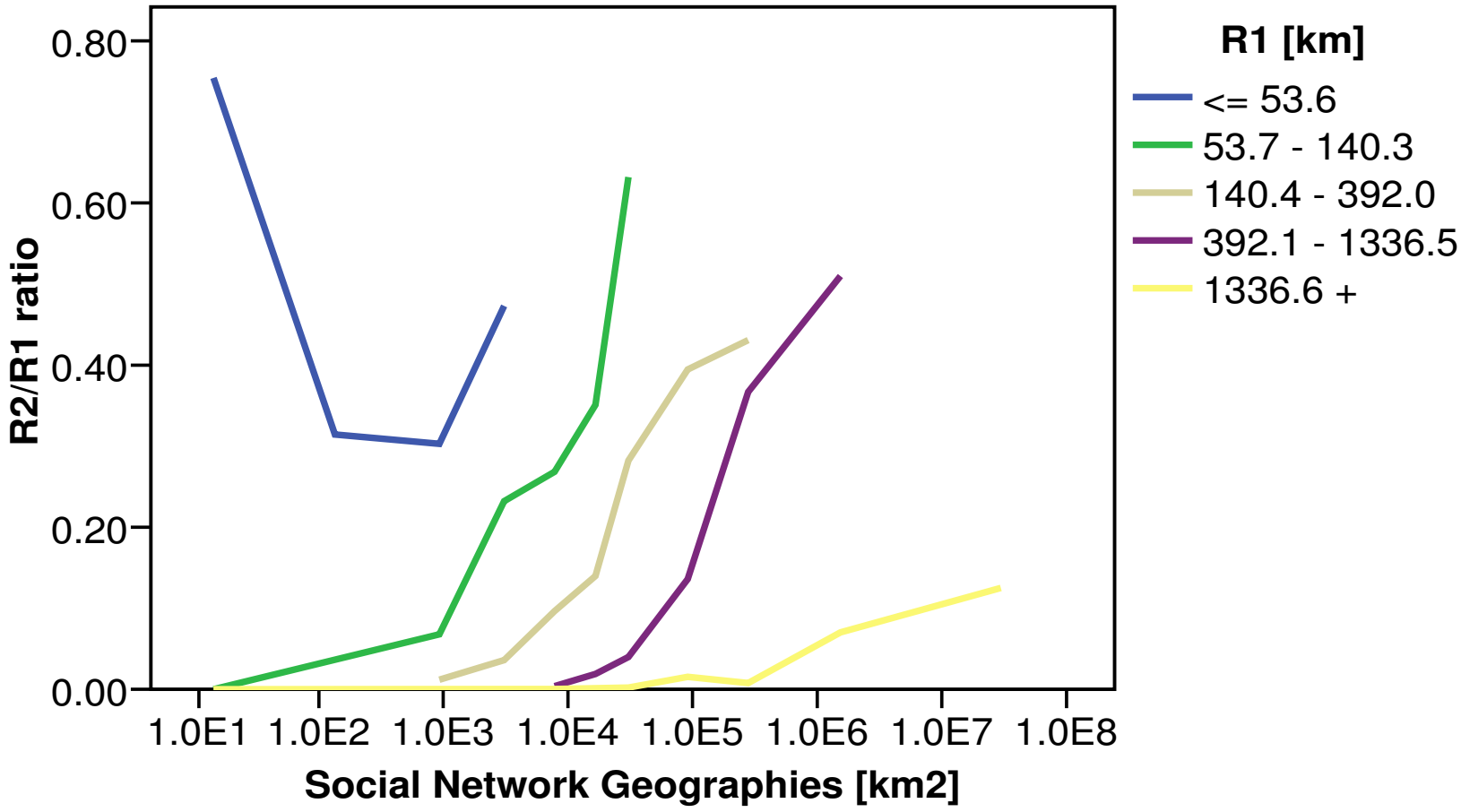


Size of network geometries

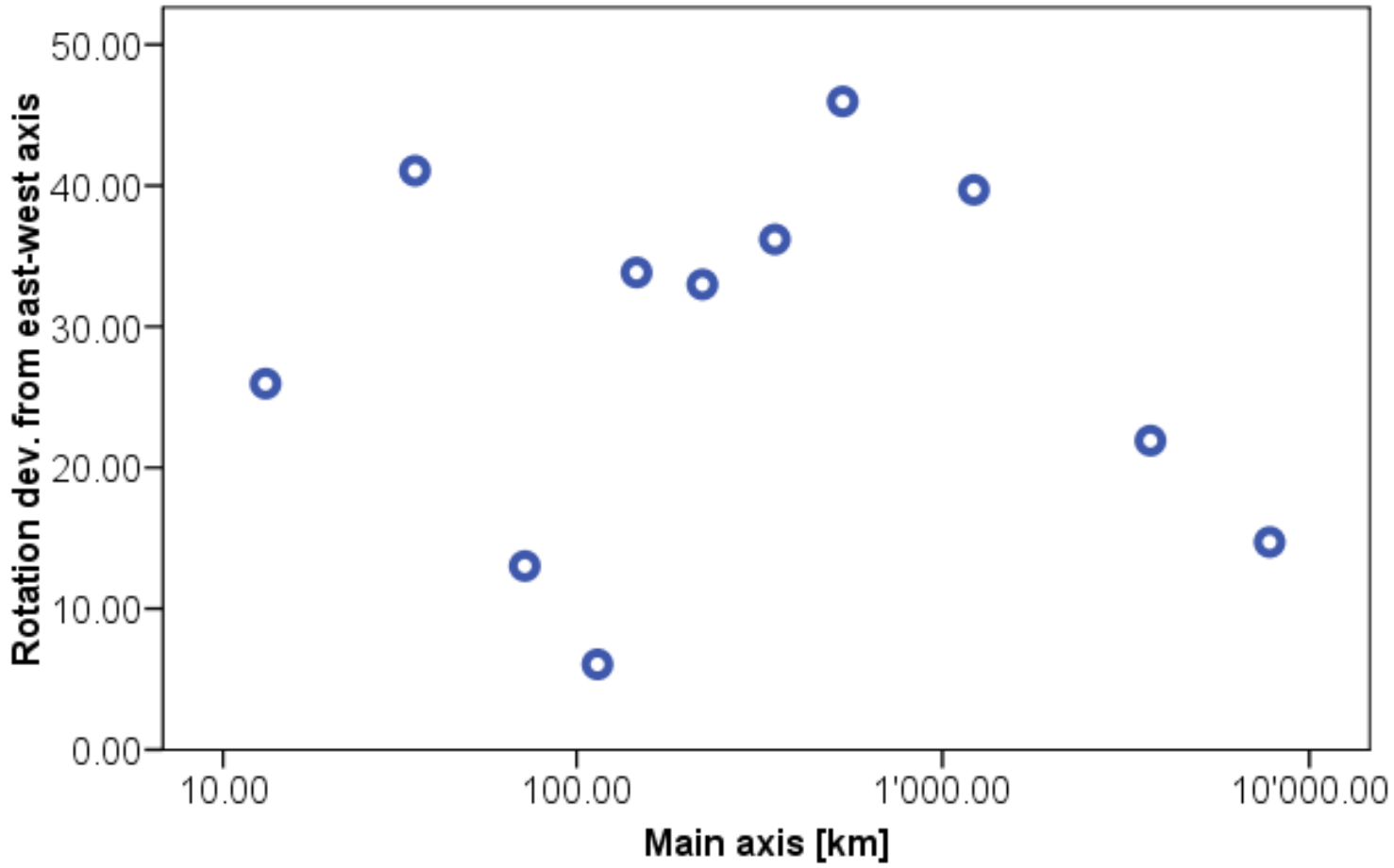


95%-confidence ellipse of the social network geography

Size vs. main/minor axis (R1/R2) ratio



Orientation of the social geographies

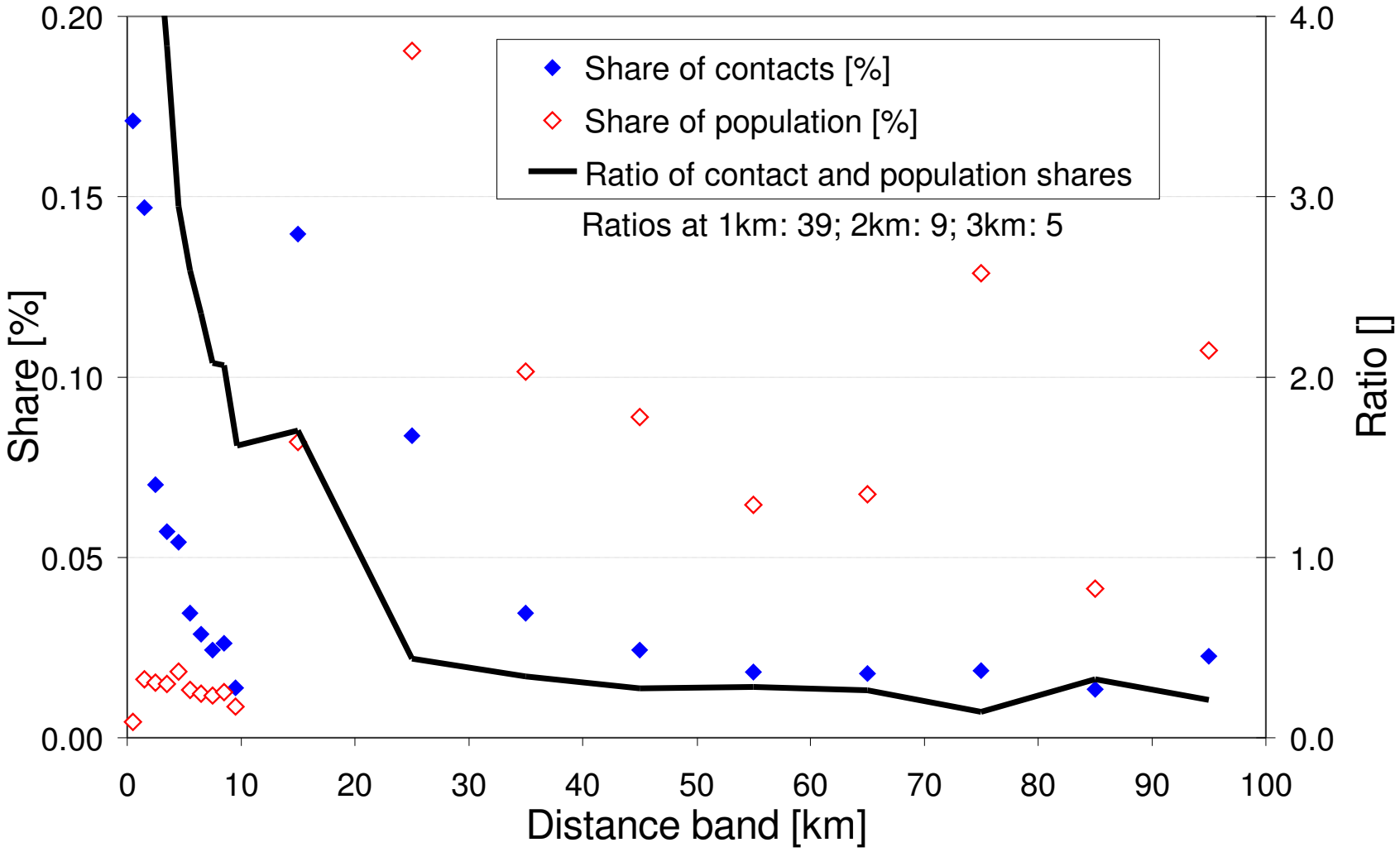


Only values from the 1st thirtile of the axis-ratio are shown (< 0.09).

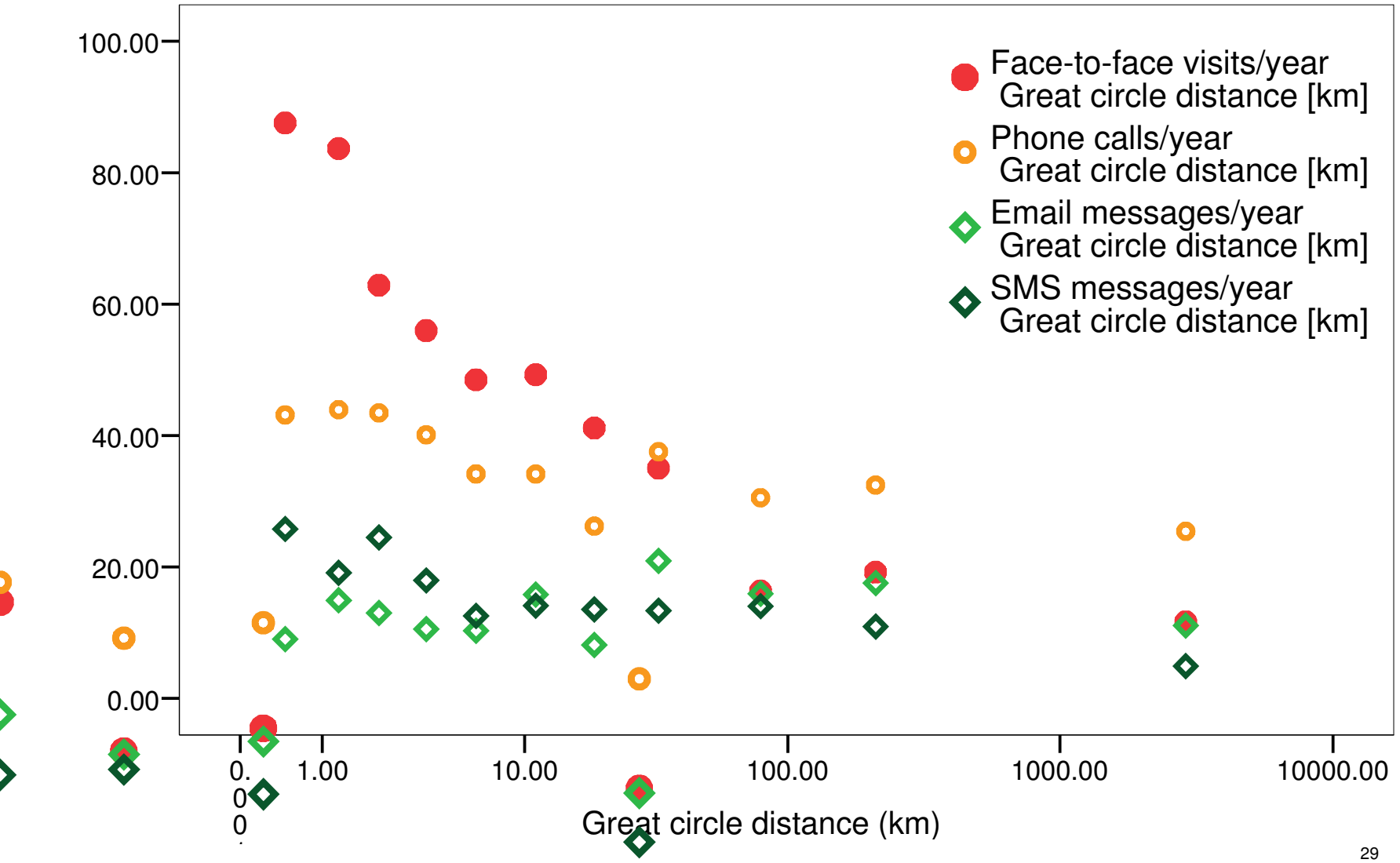
Tobit regression of the Ln (social geographies)

			Tobit model	
Variable	Mean	St .dev.	Beta	Sign.
Constant	-	-	9.929	0.00
Age [years]	53.430	19.305	-0.296	0.00
$Age^2/1000$ [$years^2/1000$]	3.226	2.099	2.946	0.00
Car ownership [y/n]	0.472	0.500	1.609	0.01
Number of relationships []	12.406	8.454	0.201	0.00
Education/workplace changes []	3.336	2.475	0.289	0.02
Further technical training [y/n]	0.213	0.410	2.485	0.00
University degree [y/n]	0.245	0.431	2.617	0.00
Income >6000 sFr./month [y/n]	0.262	0.441	-1.643	0.028
N				286
Goodness-of-fit			Adjusted R^2=0.25	

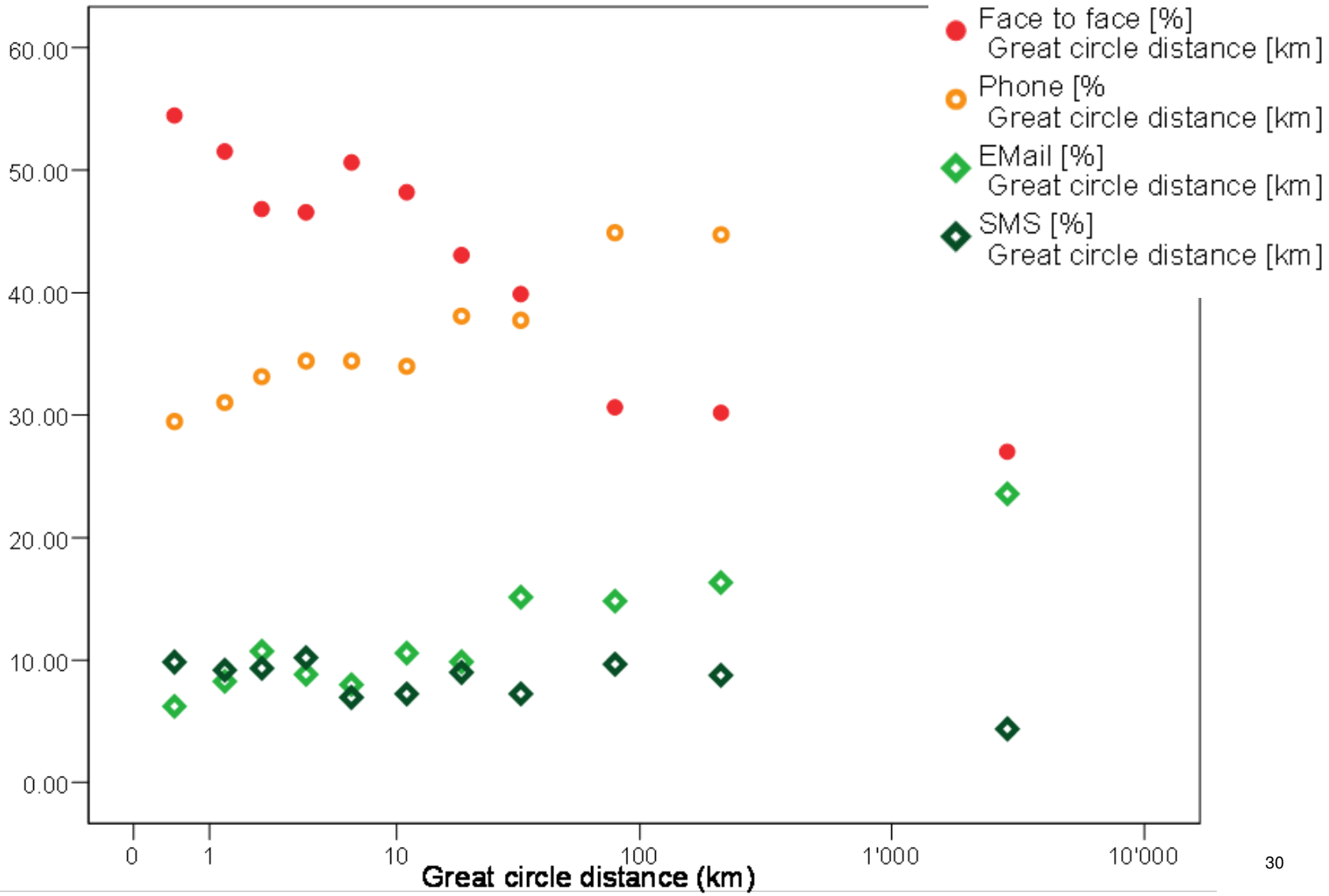
Ratio of contacts to population



Interactions by mode and distance between homes



Market share by contact mode



Marginal effects/market share elasticities

Variables	Face-to-face	Phone	SMS	Email
Duration of contact	-0.01	0.15	**-0.34**	**-0.43**
Within 2.5km of respondent	**0.04**	0.00	**-0.12**	**-0.09**
Ln(Great circle distance)	**-0.19**	0.09	**-0.35**	**0.34**
Workmate	**-0.06**	0.00	0.04	**0.10**
Family member	**-0.06**	**0.05**	0.01	-0.03
Under 30 years	0.00	-0.01	**0.08**	**-0.08**
30 to 44 years	-0.02	0.03	0.03	-0.04
60 years and older	**0.05**	**0.02**	**-0.29**	**-0.38**
Number of moves	**0.23**	-0.02	**-0.58**	**-0.41**
High school	**0.01**	**-0.03**	-0.01	0.02
Vocational training	0.05	**-0.06**	0.05	**-0.11**
More then 6000 sFr/month	0.05	-0.02	**-0.11**	**-0.12**
Driving licence	**0.13**	**-0.13**	-0.04	-0.04
Car always available	-0.04	**0.05**	-0.08	0.00
National season ticket	-0.03	0.01	-0.03	**0.07**

Second set of research issues

- Reconstruction of historical/prior activity spaces

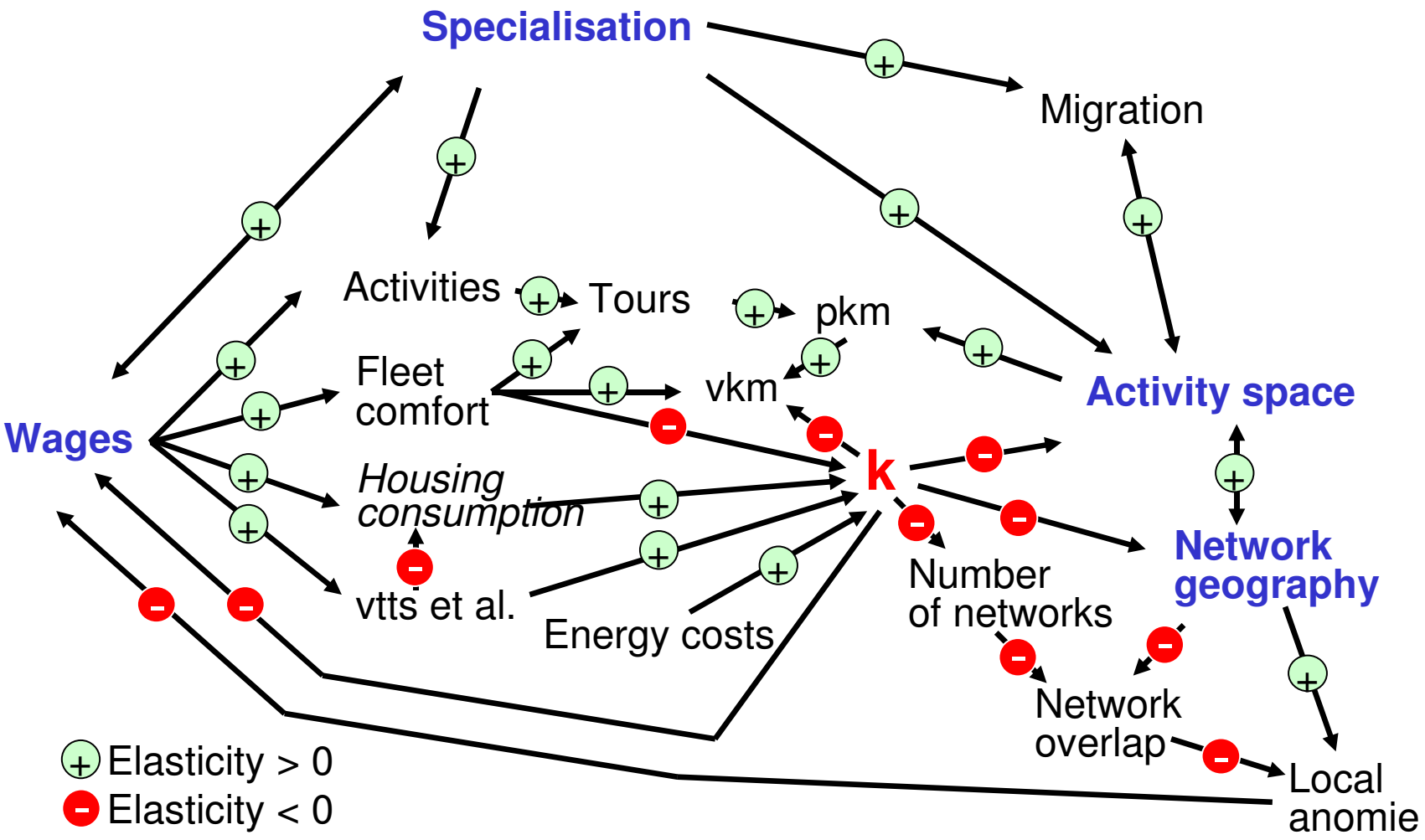
- Taste differences in network form and geography
- Social/cultural preferences for network form and geography

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

Policy questions

- Is „happiness“ still growing ?
- How large are the social externalities ?
- How stable is the overall system under pressure ?
- How can public policy support a possible need to reconstruct the networks ?

The hypotheses summarized



For more information see

www.ivt.ethz.ch

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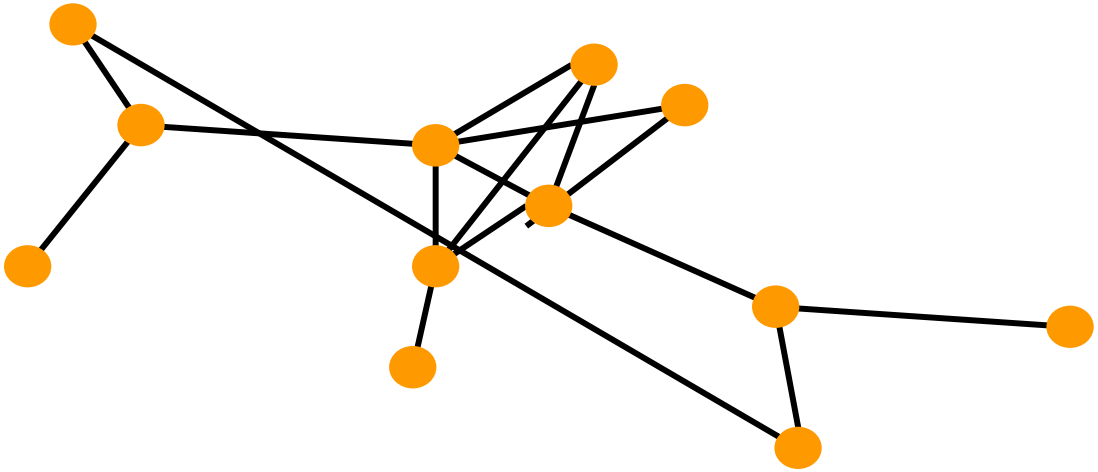
Definition of a social network

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 ~ 1/Impedance

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