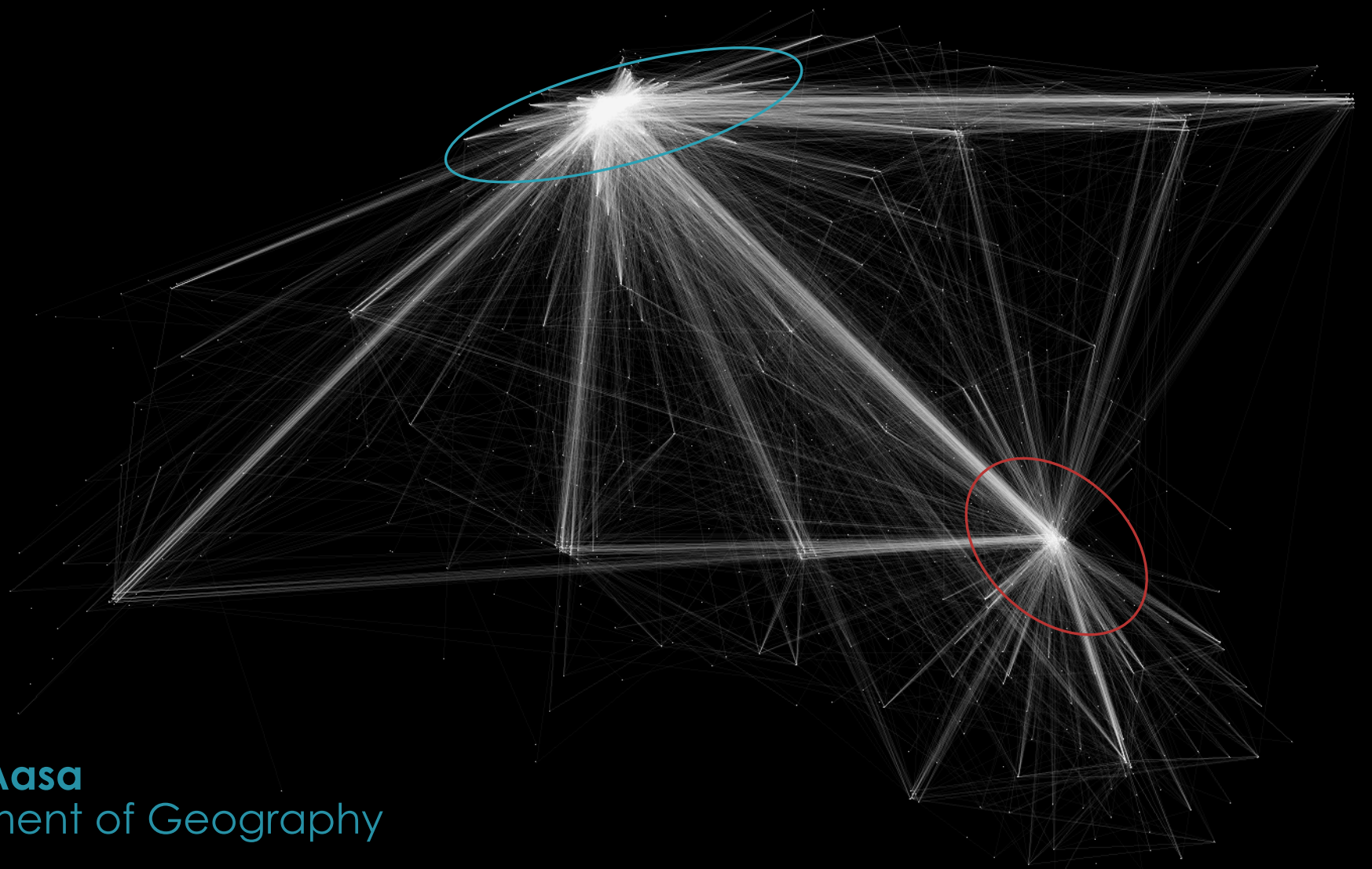


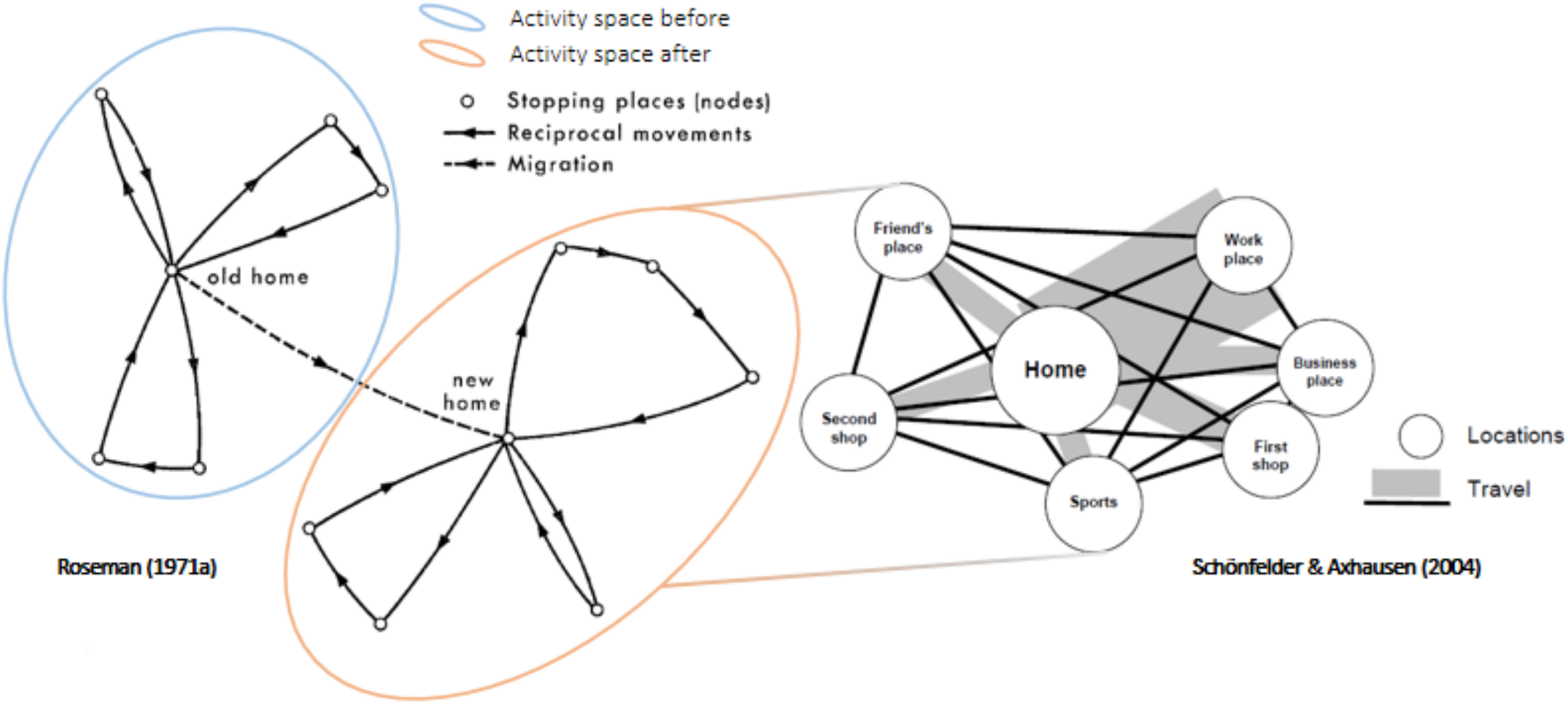
Pilleriine Kamenjuk, Anto Aasa
University of Tartu, Department of Geography

PASSIVE MOBILE POSITIONING AS A WAY TO MAP THE CONNECTIONS BETWEEN CHANGE OF RESIDENCE AND DAILY MOBILITY: THE CASE OF ESTONIA

INTRODUCTION

- Migration is one of the main processes that affects the distribution of population and daily moving patterns.
- Importance of activity spaces in determining the migration decision.
- Question of data.
  - Longitudinal data: census, questionnaire/travel diary, mobile positioning.
- What does it mean to change residence?

BASIC IDEA OF THE STUDY



RESEARCH QUESTIONS

- **What are the connections between change of residence and daily activity spaces?**
- What affects the parameters of daily activity spaces? (area, number of activity locations, distance between home & work location)
- How does change of residence change the parameters of daily activity spaces?
- Does change of residence elicit the change in work location (and *vice versa*)?

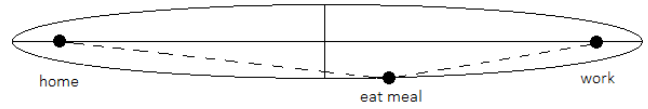
MOBILE DATA TO STUDY SOCIAL PROCESSES

- Estimates of applicability of mobile phones to gather demographic data (Palmer *et al*. 2013).
- Seasonal migration (Ahas & Silm 2010), commuting in Estonia (Ahas jt 2010), ethnic segregation (Silm, Ahas 2014), tourism (POSITIUM Barometer), activity spaces (Järv *et al*. 2014).
- Migration in developing countries (Blumenstock 2012; Wesolowski, Eagle 2010).
- Mobile data and other datasets – comparison (Simini *et al*. 2012, Wesolowski *et al*. 2013).

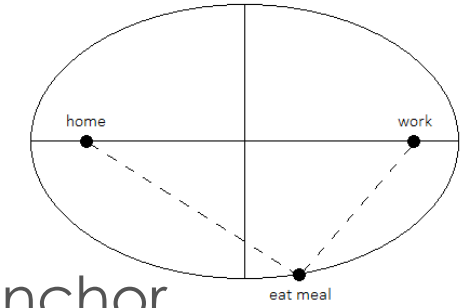
DATA & METHODS

- Passive mobile positioning data & anchor point model (Ahas *et al*. 2010).
- Anonymity of respondents.
- Time-series from Jan 2007–Dec 2013
  - different types of anchor points (mobile site level).
- Socio-demographic information.
- Sample: 1.4 mln different respondents (every month ~420 000 respondents). 100 000 migrants (Jan 2008–Dec 2012)
- Assumptions:
  - where people have made calls, these are the places they have visited,
  - continuous **time series** of home anchor points for at least 7 months during the 13-month period are defined as **stable home areas** and are interpreted as usual place of residence,
  - change in the stable home area is defined as **change of residence**.

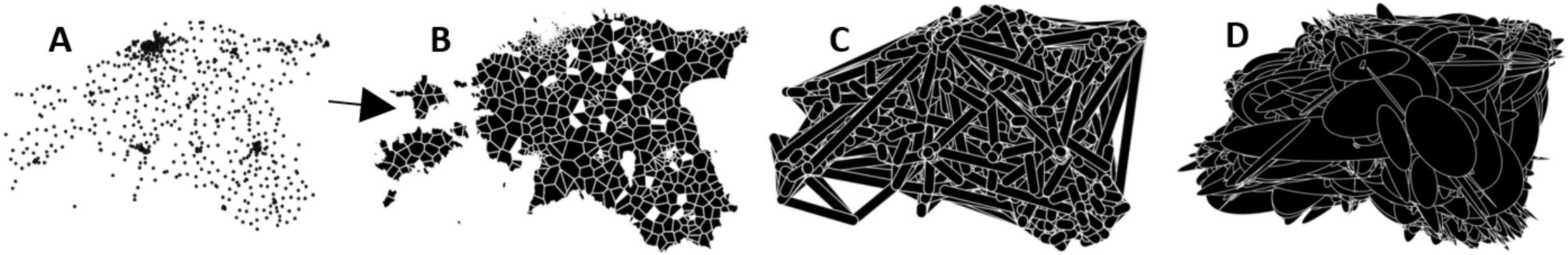
Adopted from Newsome et al. (1998)



ACTIVITY SPACES



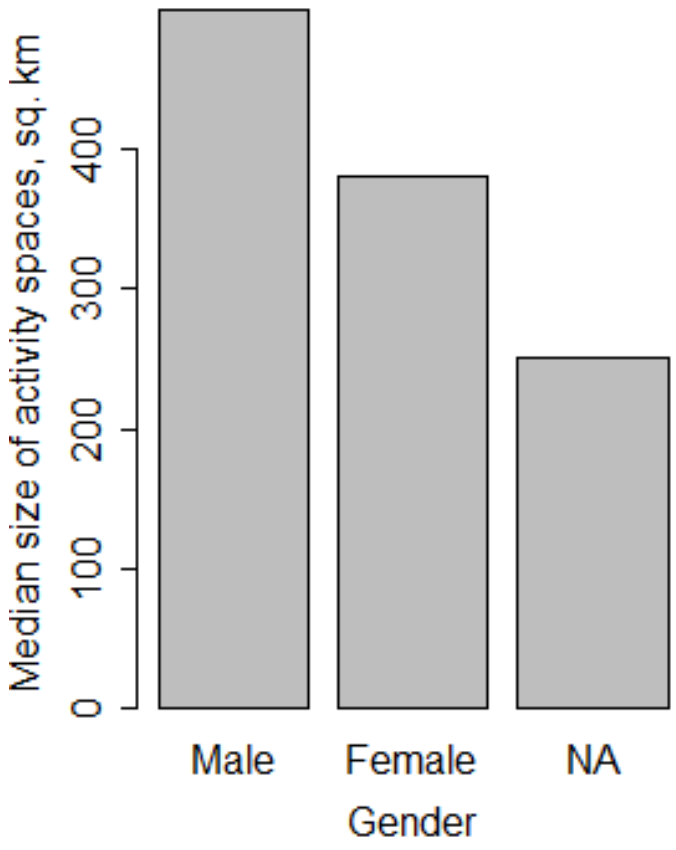
- Estimate daily activity spaces based on the results of the anchor point model → **6 months before and after**
  - Activity ellipses, buffers, theoretical radio coverage area (**size**), activity locations (**anchor points**), home & work location (**distance**)

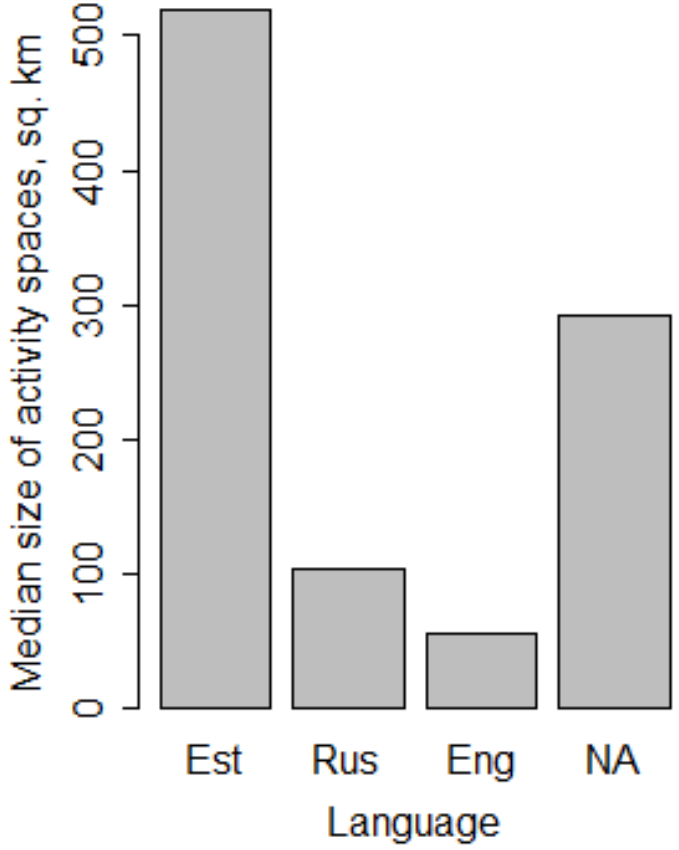


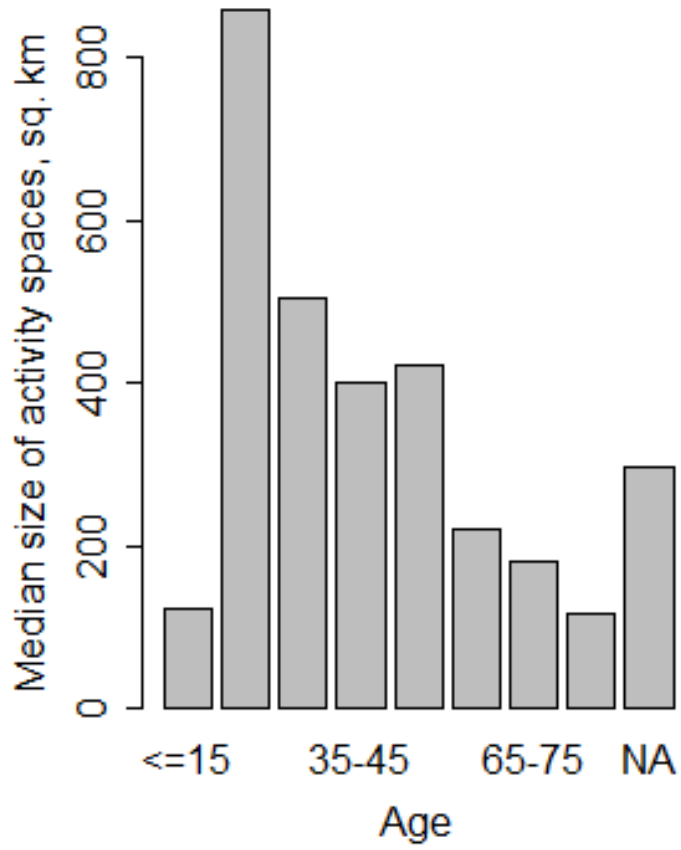
Possible expressions of activity spaces: 1 anchor point AS (0.5%), 2 anchor points AS (1%), 3 and more anchor points AS (98.5%)

- Non-parametrcial tests to analyse differences.

WHAT AFFECTS THE SIZE OF ACTIVITY SPACES?

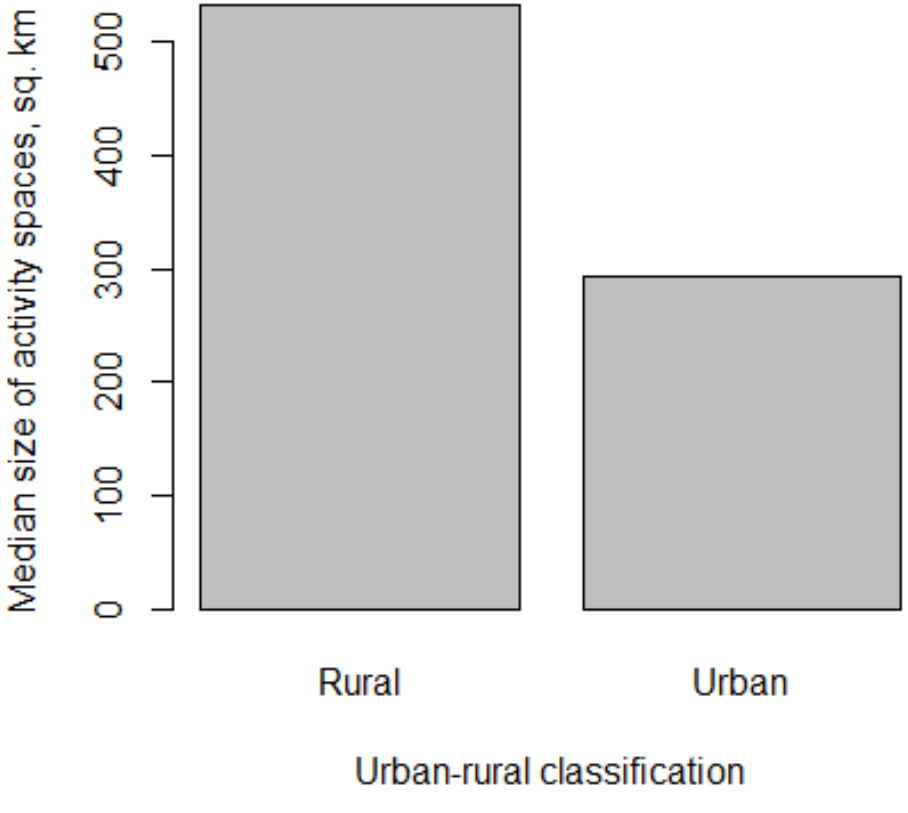


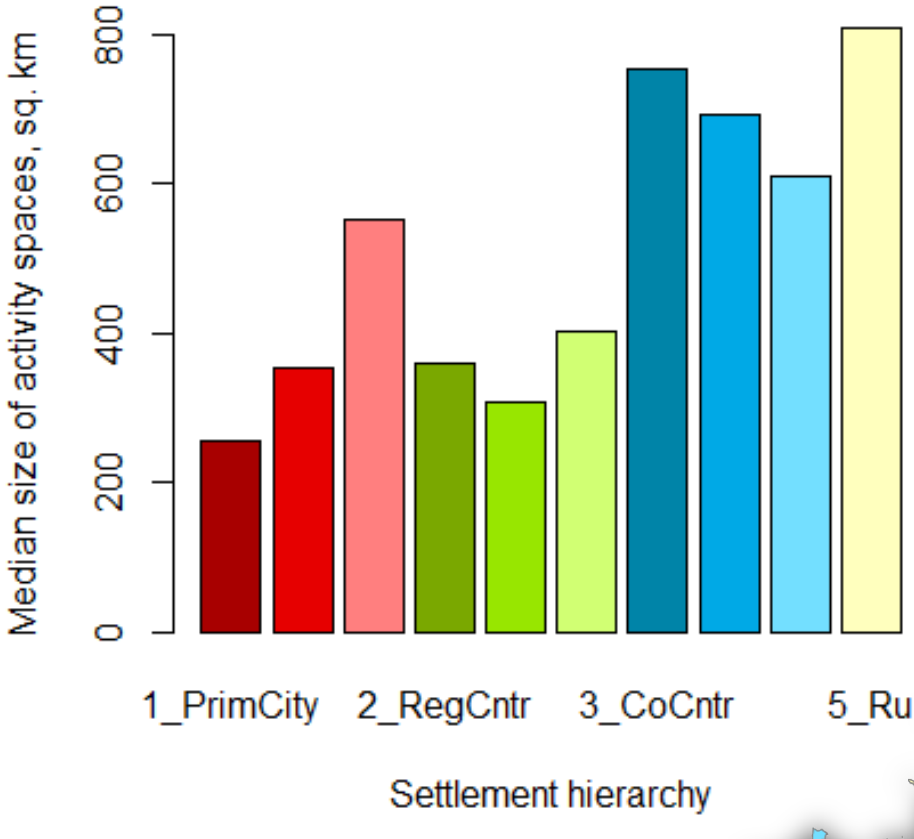




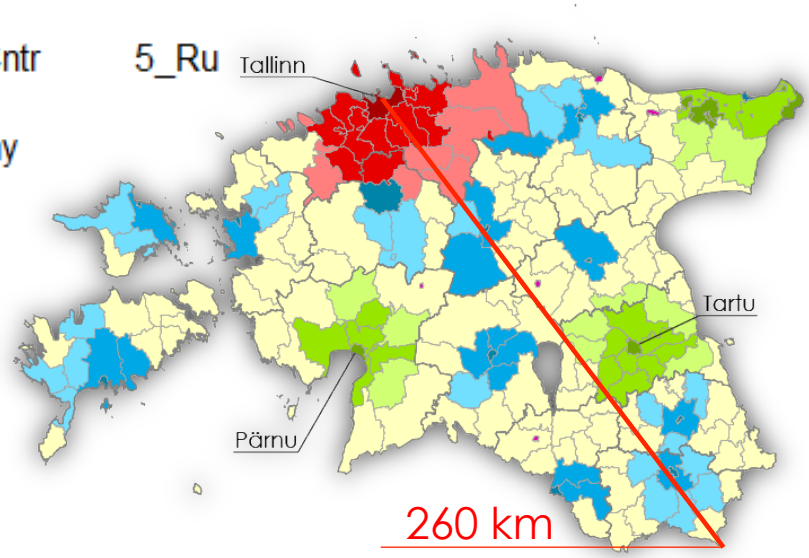
- Gender
- Language
- Age

WHAT AFFECTS THE SIZE OF ACTIVITY SPACES?



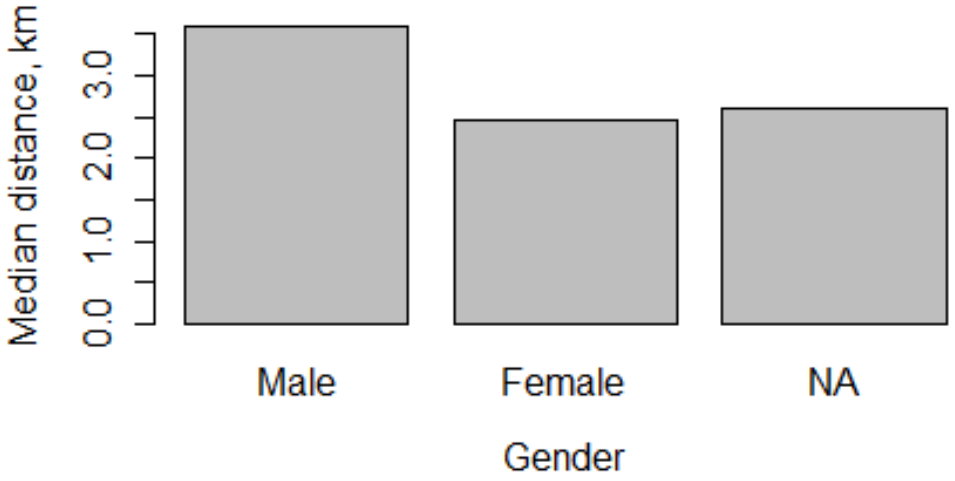


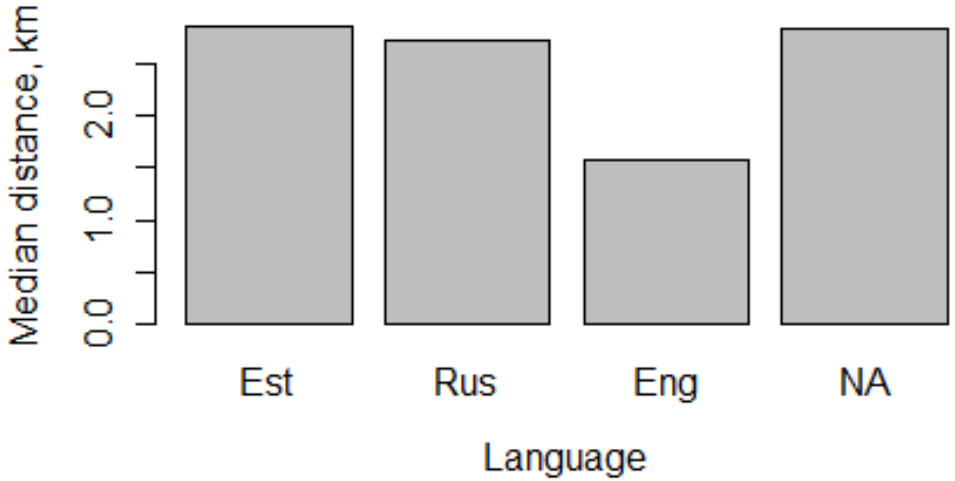
- Urban-rural classification
- Settlement hierarchy

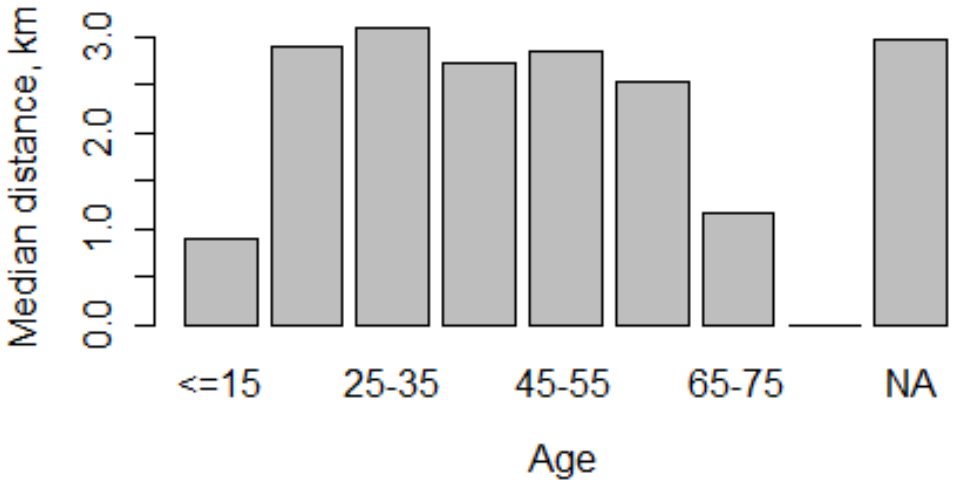


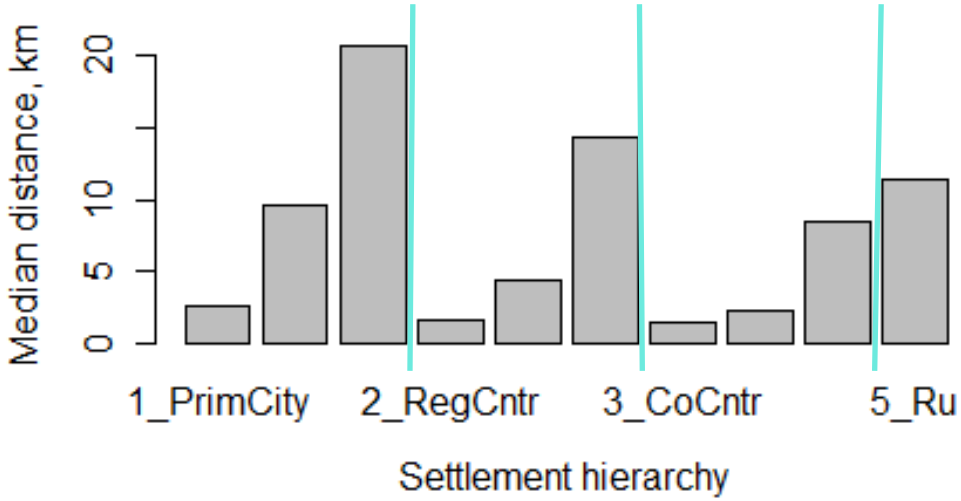
WHAT AFFECTS THE SIZE OF ACTIVITY SPACES?

DISTANCE BETWEEN HOME AND WORK-TIME LOCATION







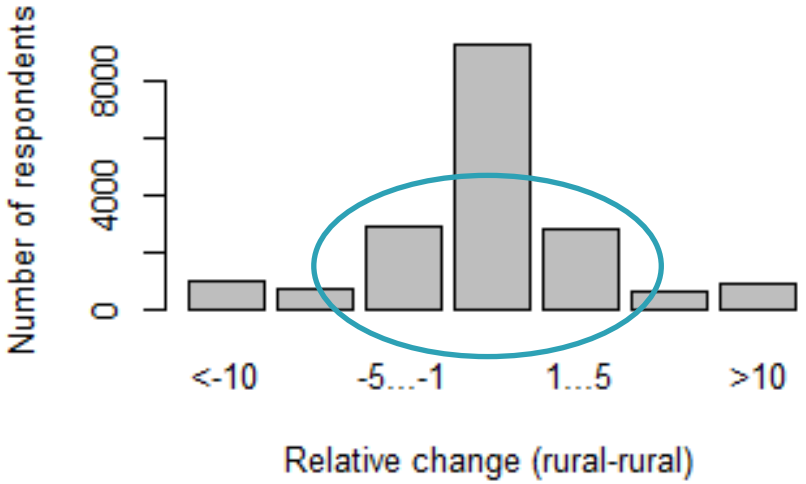


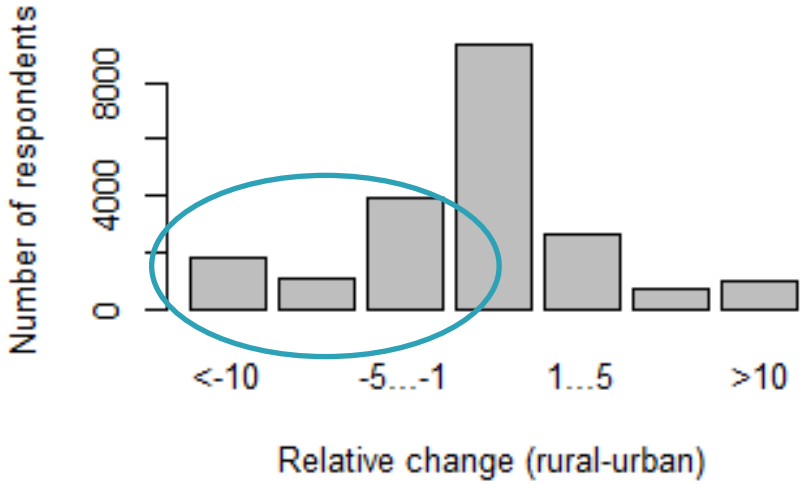
HOW DOES CHANGE OF RESIDENCE AFFECT THE SIZE OF ACTIVITY SPACES?

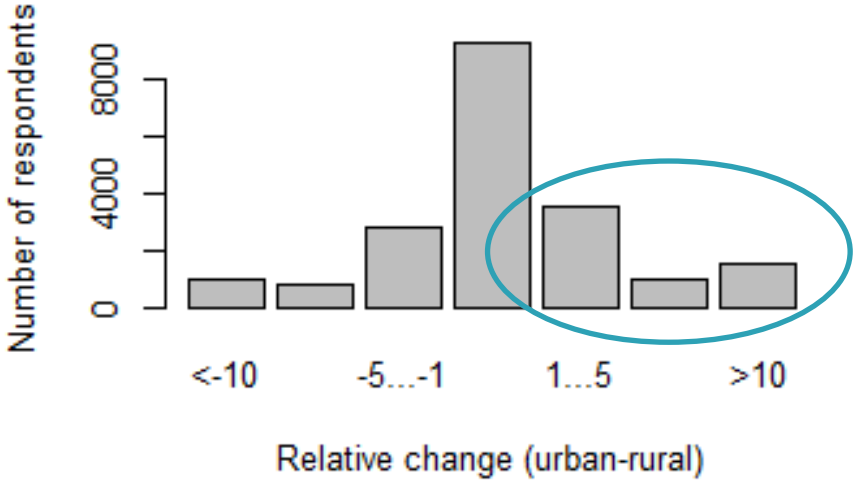
- Before: median = 382 km^2.
- After: median = 352 km^2.
- Migration direction:

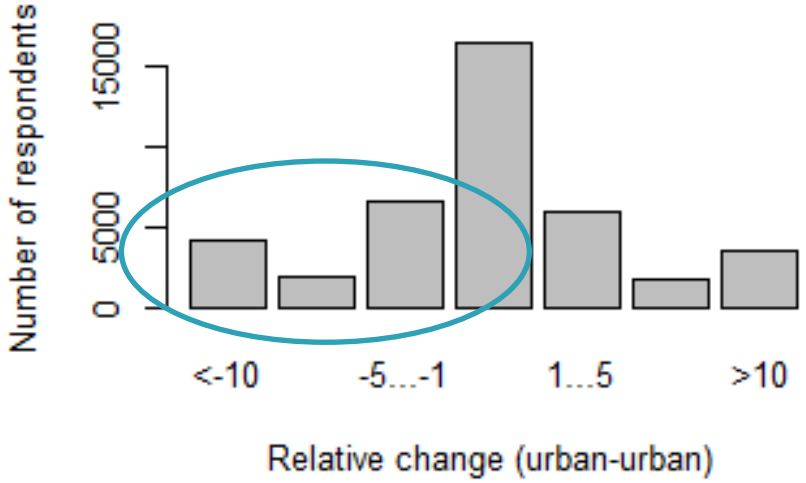
Direction of the move	Median km^2		Dif	
	Before	After		
Rural-Rural	496	488 ↓	-8	-1.6%
Rural-Urban	**573**	**428** ↓	-145	-25.3%
Urban-Rural	**408**	**460** ↑	52	12.7%
Urban-Urban	**242**	**214** ↓	-28	-11.6%

HOW DOES CHANGE OF RESIDENCE AFFECT THE SIZE OF ACTIVITY SPACES? RELATIVE CHANGE









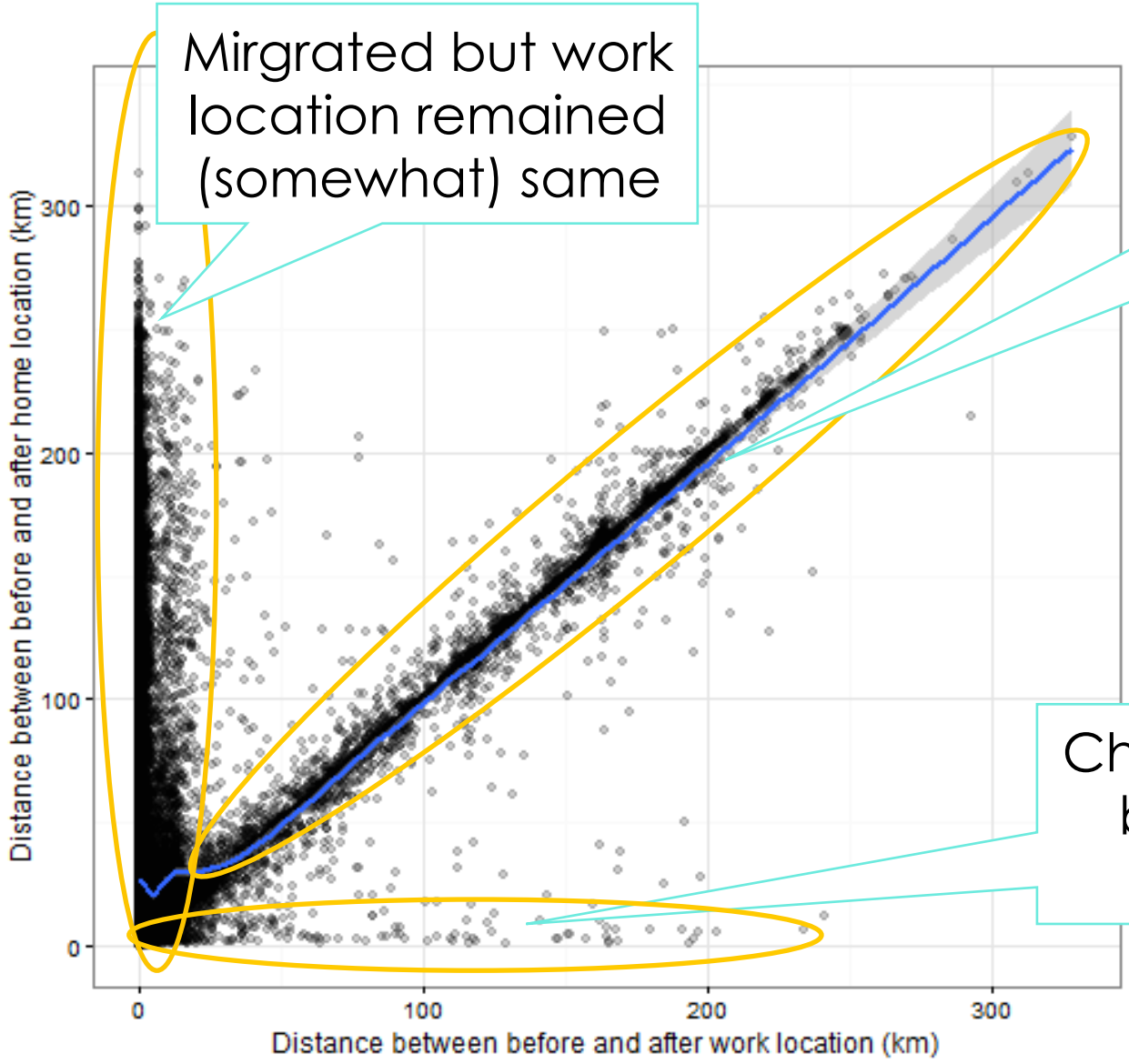
Distribution of relative change in the size of activity spaces by direction of the move.

DISTANCE BETWEEN HOME & WORK

- Before: median = 2.8 km^2.
- After: median = 3.9 km^2.
- Migration direction:

Direction of the move	Median		Dif	
	Before	After		
Rural-Rural	**6,0**	**9,7** ↑	3,7	61.7%
Rural-Urban	**8,0**	**3,2** ↓	-4,8	-60.0%
Urban-Rural	**2,4**	**9,9** ↑	7,5	312.5%
Urban-Urban	**2,2**	**2,5** ↑	0,3	13.6%

PATTERNS IN DISTANCES



Mirgrated but work location remained (somewhat) same

Change of residence and change of work location

Change in work location but minor change in home location

FURTHER ANALYSIS

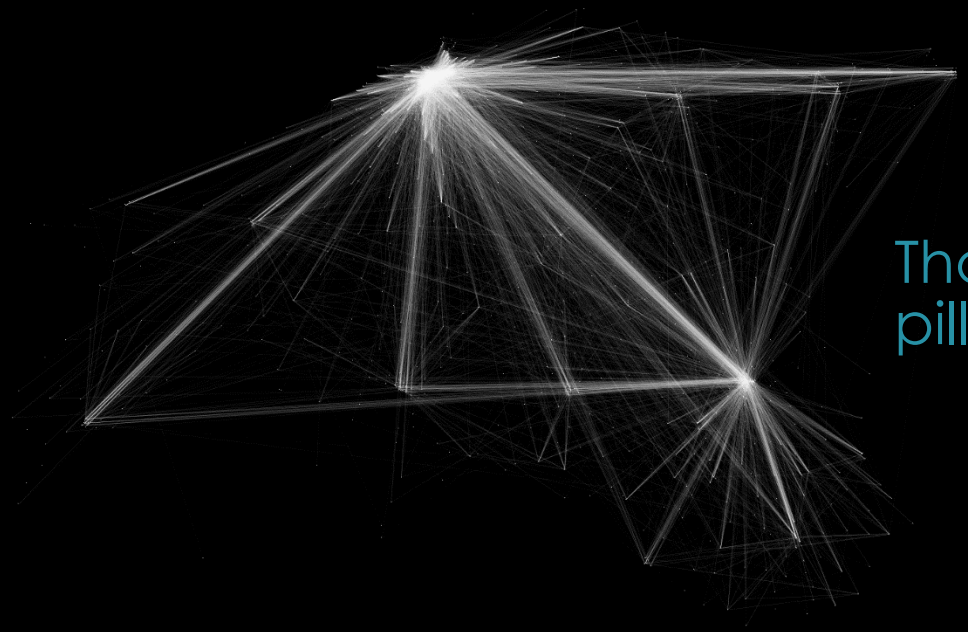
- **Model to understand concurrent effects.**
  - Include number of activity locations.
  - Adding parameters: calling activity.

- **Partial or total displacement of activity spaces.**
  - Measures and indices for coinciding activity spaces.

- **Multiple Linkage Analysis** (van Nuffel et al. 2010).

DISCUSSION & CONCLUSIONS

- Longitudinal data to understand dynamics of movements on different temporal scales.
- Socio-demographic parameters have an effect.
- Environmental-structural conditions can increase or decrease the need for mobility.
- The effect of migration is yet debatable.
- The direction of the migration has an effect, relative change is not affected.



Thank you!
pilleriine.kamenjuk@ut.ee

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ARCHIMEDES

HARIDUS- JA TEADUSMINISTEERIUM

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