UNIVERSITY OF ABERDEEN

Centre for Transport Research

Detecting mobility intensive practices

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DEMAND DYNAMICS OF ENERGY, MOBILITY AND DEMAND

Energy

Our goals

- reinstate fundamental questions about ***what car travel is for*** (Shove & Walker, 2014)

- **characterise activities in terms of their mobility and car intensity** using sequence analysis techniques
  - which practices are responsible for a disproportionate amount of (car) travel?
  - which practices might be inherently more difficult to switch away from the car? (car dependence)

- **making links between out-of-home practices, travel and (energy-relevant) related practices in the home**

	Activity-Based Approach	Our approach
Understanding of travel	Emphasis on travel as a 'means to an end' / arising from participation in activities & on the sequencing / flanking of activities and travel	
Data	Time diary data, but mostly (ad-hoc) activity-travel surveys at the local / metropolitan level	National time use dataset (British TUS 2000)
Theoretical framework	Individualistic / behaviouralist approach	Anti-individualistic, 'meso-level' approach, practices/activities as the unit of analysis
Focus	Emphasis on interdependence between travel *decisions* within the day / the household	Emphasis on interdependence in terms of flanking of activities (sequence patterns)
Activity type detail	Few policy / economically relevant activity types	Looking for as much detail / variety as possible
Output	Increasingly sophisticated models to forecast travel demand and the impact of exogenously predefined demand management policies (e.g. road pricing, etc.) on it	Variety of insights into how / why *specific practices* are responsible for more travel / energy use and/or difficult to steer in a low-energy direction – which can inform policy
Methodological context	Purely quantitative research	Fruitful exchange with interdisciplinary qualitative / historical research on the energy intensity of specific practices

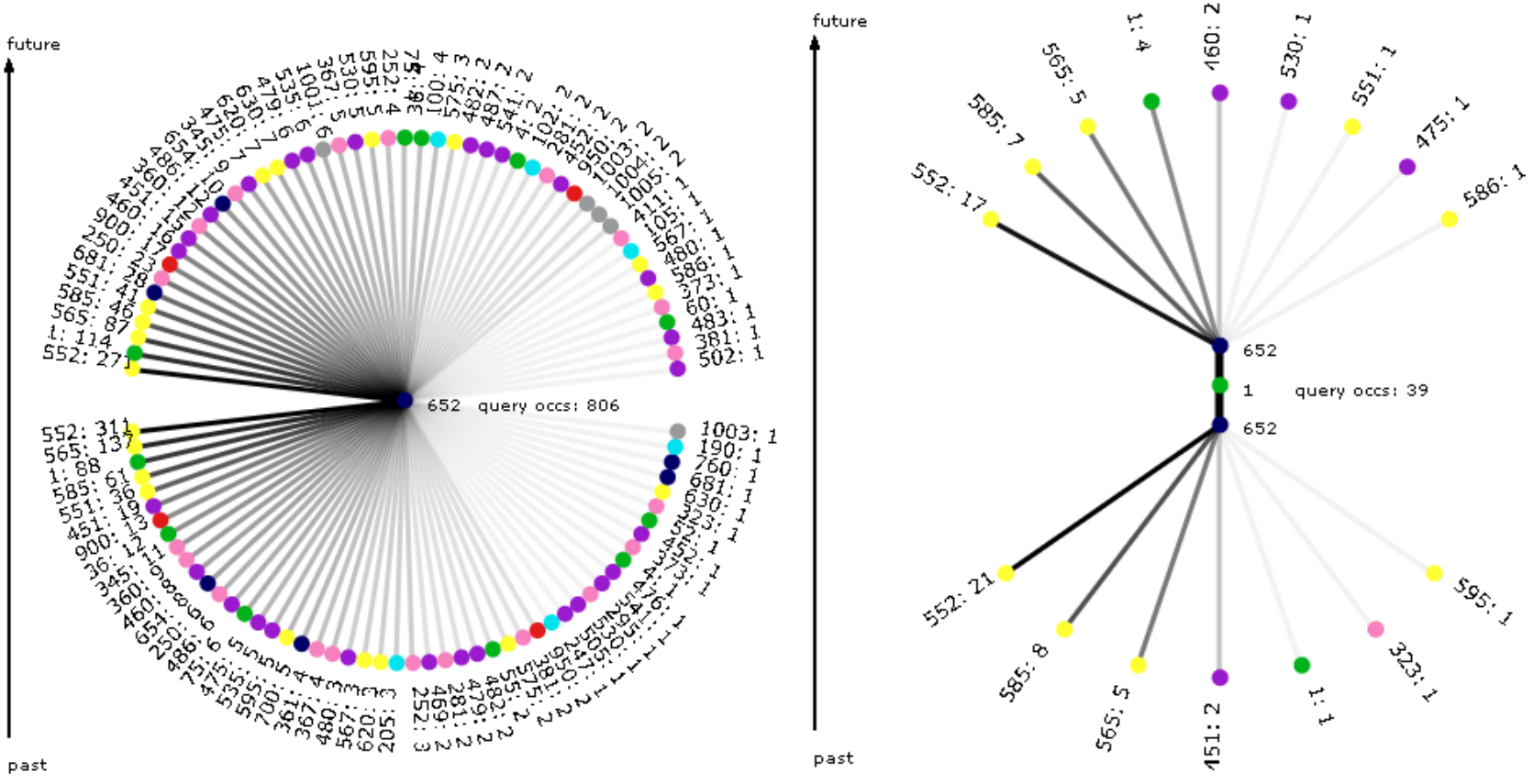
Time use data

1. more **fine-grained categorisation of activities** (*2000 British Time Use Study:* 265 activity codes vs. 23 in NTS)
   - ➢ detection of more **meaningful 'traces of practices'**

2. **completeness of information**: all (travel and non-travel) activities carried out on the diary day, (144 10-minutes slots from 04:00 to 04:00)
   - ➢ investigation of **how activities are 'flanked' by mobility** and car travel

3. **internationally harmonised dataset** (MTUS, 25 countries 1960s-2012) - vs. historical lack of harmonisation of NTS data
   - ➢ allows us to investigate **longer term trends in international comparison**

Visual-TimePAcTS - ActiviTree



Preliminary data manipulation

- **Adapt activity classification**: travel activities defined by mode (rather than purpose)
- Transform episode dataset in **'long' form** (1 case = 1 activity episode)
- **Collapsed subsequent episodes** together so that no episode is followed by another occurrence of the same main activity
- Resulting data sets:
  - British TUS 2000: 478,731 episodes within 19,898 diary days of 10,381 persons
  - MTUS (selected waves for UK, NL & US): 6,399,397 episodes, 299,990 diary days and 177,225 persons

Mobility intensity

- *MI=(Tb+Ta)/2A* *= (5+4)/(2*10)=0.45* (in the example)
- the **likelihood that the activity of interest is flanked by transport activities**
- MI ranges between 0 (the activity of interest is never flanked by travel activities) and 1 (it is always flanked on both sides).

Car modal share for sequenced data

- *CMS =(Cb + Ca)/(Tb + Ta)* *=(3+2)/(5+4)=0.51* (in the example)

- **the likelihood that, when the activity of interest is flanked by transport activities, it is flanked by car travel**

- CMS ranges between 0 (i.e. when the activity of interest is flanked by travel activities, these are exclusively alternative modes) and 1 (all travel activity episodes flanking the activity of interest consist of car travel).

Finding: selected high car modal share activities

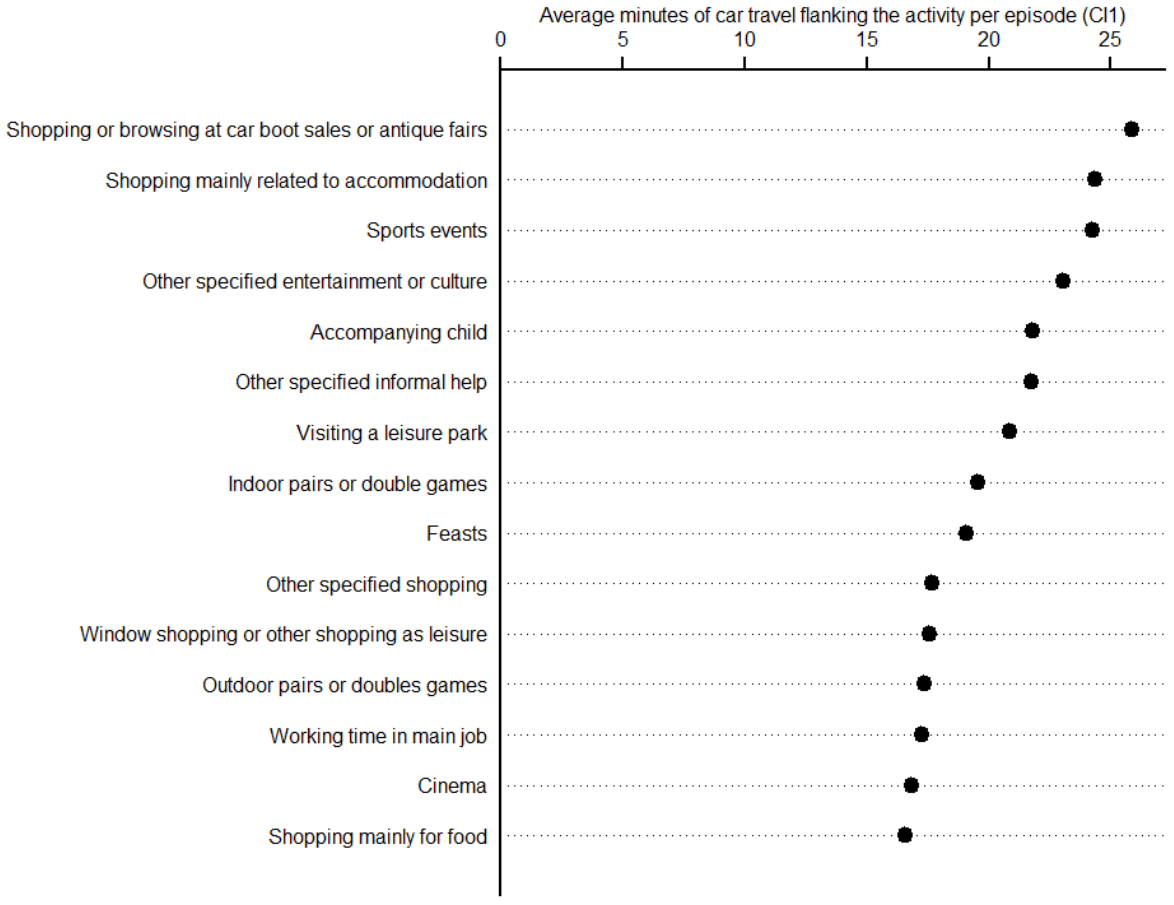
Car intensity

- policy-relevant question ‘which activities are responsible for a disproportionately large amount of car travel?’

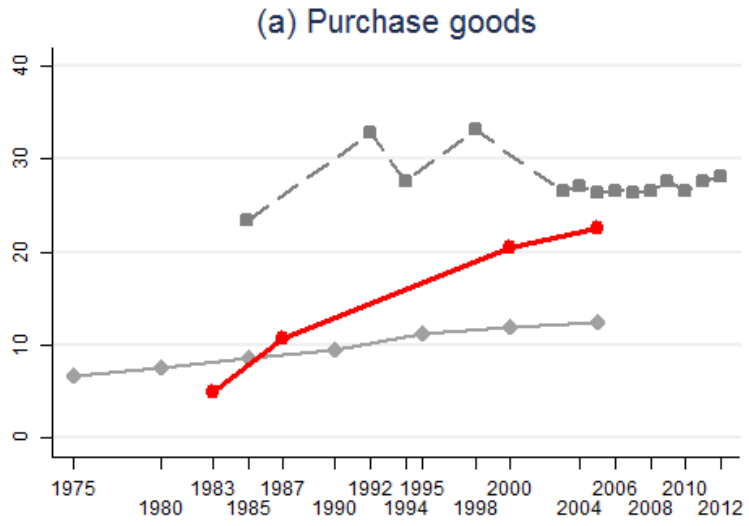
Car Intensity index 1

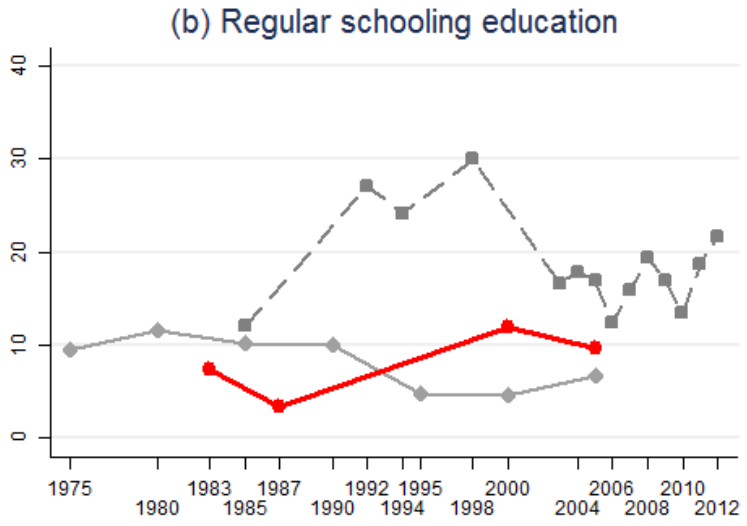
- the average minutes of car travel flanking the activity of interest (CI1= TDCi /A)
- proportional to the product of MI, CMS and the average duration of the car travel episodes flanking the activity of interest (CI1=2*MI*CMS* MDCim)
- if the assumption is made that car travel duration is a reasonable proxy for the minutes of engine running, and that the contribution of public transport to transport-related CO_2 emissions is negligible CI_1 is a proxy for the *carbon intensity* of the activities

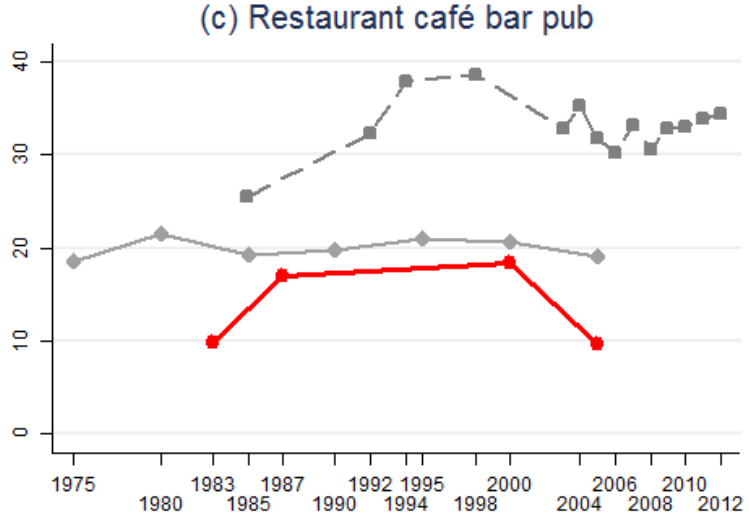
Car intensity

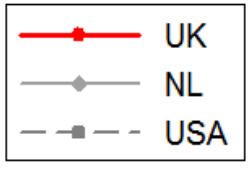


MTUS analysis









Beyond flanking: 3-tuples

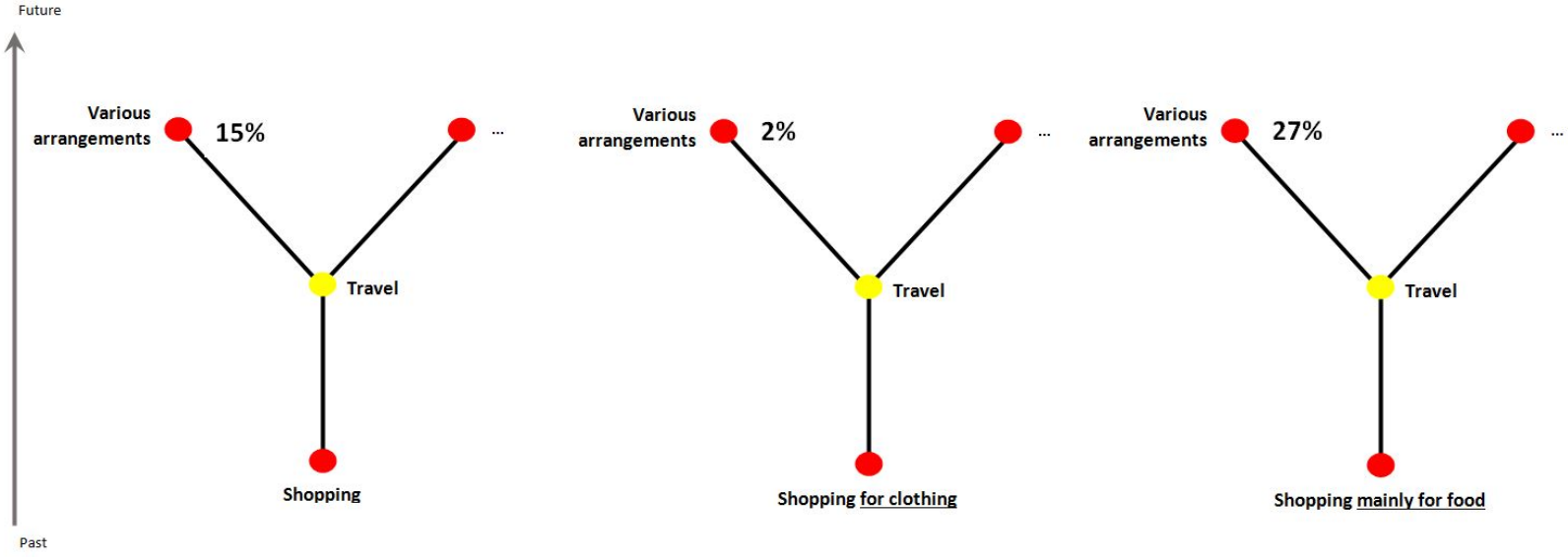
Goals:

- (substantive): investigate **practices crossing over the transport /domestic energy domains**, link in- and out-of-home activities
- (methodological): investigate **sequences longer than two episodes**

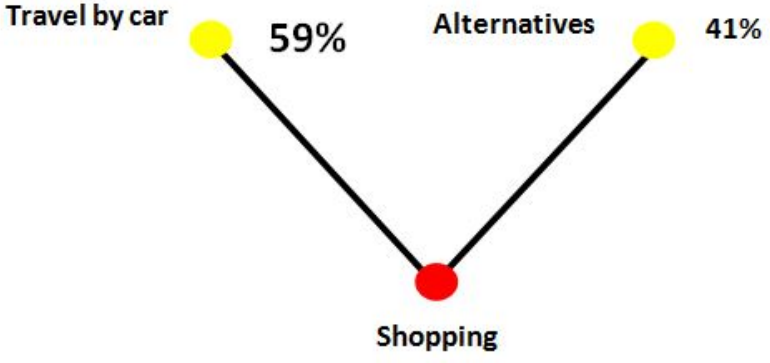
Two explorative studies:

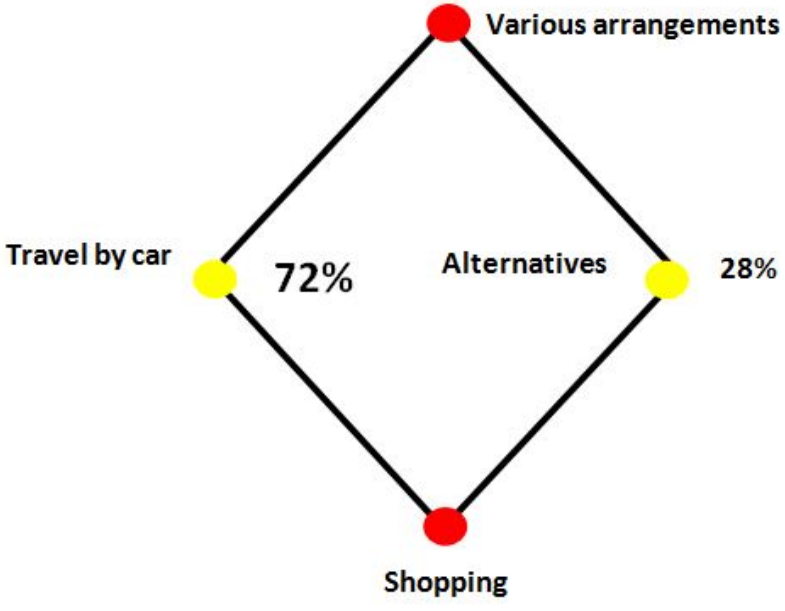
1. **Cargo function of car travel**: sequences of shopping – travel (by car) – arranging purchases (as proxy for the presence of a large amount of items)
2. **Cycling and showering**: sequences of working – cycling – wash and dress

Cargo function of car travel

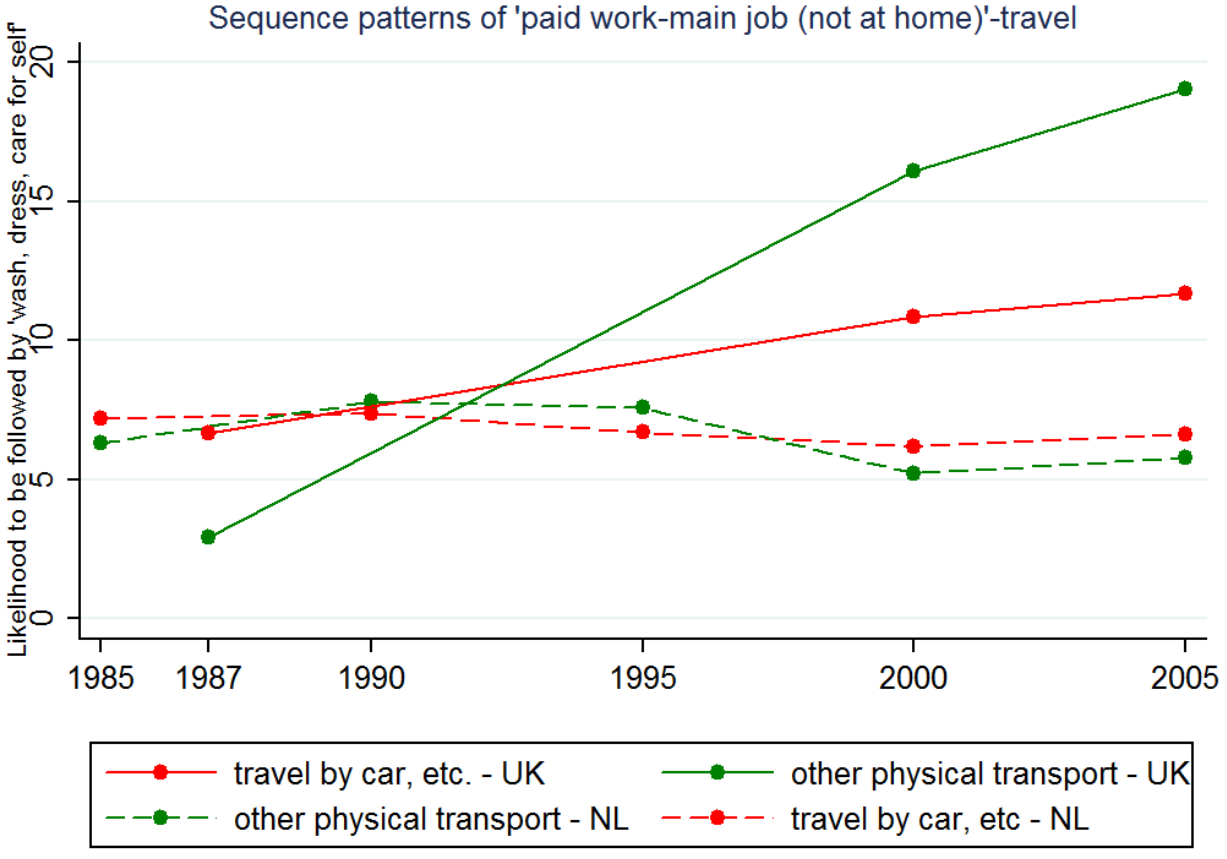


Cargo function of car travel





Cycling and showering
UK & Netherlands, 1985-2005



Conclusions

- A **useful approach** to the study of the transport energy intensity of activities?
- **'flanking' analytical approach**: can give rise to distortions if other activities are slotted in between travel and the activity that is travelled to, or if travellers chain different transport modes.
- **Considering tuples >2** is attractive but challenging (sample size issues, etc.)
- Hopefully limitations can be addressed by **further research**

Thank you for your attention!

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