

Modelling the weekly work patterns in sBelgium

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The problem

Two postulates:

Work patterns remain a major determinant of daily mobility

The natural activity planning horizon for households is a week

Main question:

How do households organize their work activities over the week?

(daily repartition, full/half/no-time)

+ **application** to a realistic (synthetic) population

The research context

- long-term nation-wide **activity-based demand modelling** project
- strong **privacy protection** laws in Belgium
⇒ use of disaggregate real population stats impossible

Nation-wide synthetic population

- \approx 10 millions synthetic individuals
- \approx 4.5 millions households
- in 589 municipalities

Synthetic population characteristics

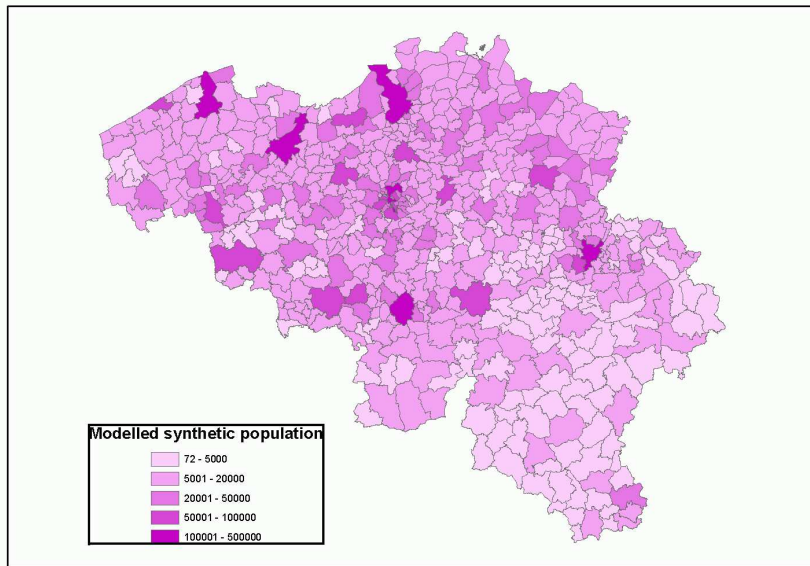
Individuals:

- age (5 classes)
- activity status (inactive, student, worker)
- education level (4 classes)
- household id
- driving licence ownership

Households:

- household type
(head type, number of children, number of other adults)
- NUTS-4 localisation (municipalities)
- land-use class (4 classes)

Population for sBelgium



Data sources and method

Data

- National Register (online population database)
- National Census 1991, 2001 (household types)
- federal administration of transports (driving licences)
- GEDAP (demographic aspects)
- MOBEL national travel survey (household details)

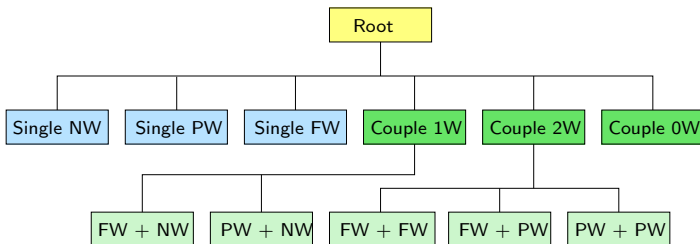
Method

individuals' generation → households' generation

data sources inconsistencies...

The nested-logit model structure

Modelled: households heads and mates



Average day:

- 44 degrees of freedom
- 7173 observations in 3 Belgian datasets (MOBEL, OVG, RW)

Estimation for the average day

Coefficients of the (linear) utilities (**Amlet** package):

Single NW	0.787	(4.4)
primary school	-0.184	(-1.1)
secondary school	-0.253	(-3.8)
active	-0.468	(-2.7)
Single PW	-1.59	(-5.5)
primary school	-0.576	(-1.8)
secondary school	-0.310	(-3.0)
active	1.31	(4.6)
Couple FW+FW	0.342	(1.6)
no children	0.168	(3.5)
mate's age in [18-39]	1.01	(4.8)
mate's age in [40-59]	0.892	(4.4)
both active	-0.945	(-7.9)
mate is male	-0.142	(-2.5)
Couple FW+PW	0.282	(1.2)
mate's age in [18-39]	0.511	(2.3)
mate's age in [40-59]	0.448	(2.0)
mate is active	-0.738	(-5.8)
mate is male	-0.120	(-1.7)

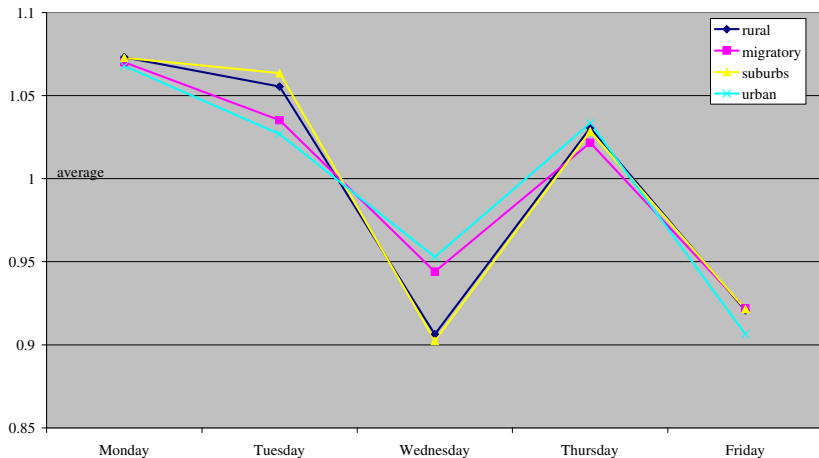
Couple PW+PW	-1.51	(-3.8)
both drive	0.794	(2.0)
Couple FW+NW	4.12	(13.1)
head age in [18-39]	-0.777	(-5.5)
head age in [40-59]	-0.722	(-5.2)
head is male	-0.451	(-3.8)
head drives	-0.171	(-2.6)
head active	-0.907	(-10.3)
mate is male	0.350	(2.8)
mate's education is superior	-0.201	(-4.4)
mate drives	-0.261	(-3.7)
mate is active	-1.69	(-11.5)
Couple PW+NW	2.29	(7.4)
head age in [18-39]	-0.908	(-4.9)
head age in [40-59]	-0.920	(-5.1)
household = couple	-0.210	(-2.1)
household = family	0.620	(4.2)
mate's age in [18-39]	-0.388	(-2.5)
mate's age in [40-59]	-0.231	(-1.5)
mate is male	0.611	(4.1)
mate is active	-1.79	(-10.0)

Estimation of all daily models

	Average	Monday	Tuesday	Wednesday	Thursday	Friday
Final logl	-9014.8	-1883.9	-1753.5	-1740.6	-1722.4	-1810.6
D. of F.	44	41	41	41	41	41
Obs.	7173	1507	1444	1424	1388	1410
$\rho^2(0)$	0.2	0.232	0.261	0.253	0.238	0.212
$\rho^2(c)$	0.0	0.067	0.076	0.070	0.069	0.068
θ_{OVG}	4.91 (11.7)	4.91 (*)	4.91 (*)	4.91 (*)	4.91 (*)	4.91 (*)
θ_{RW}	1.22 (12.5)	1.22 (*)	1.22 (*)	1.22 (*)	1.22 (*)	1.22 (*)
$\theta_{F/P}$	0.468 (9.8)	0.468 (*)	0.468 (*)	0.468 (*)	0.468 (*)	0.468 (*)

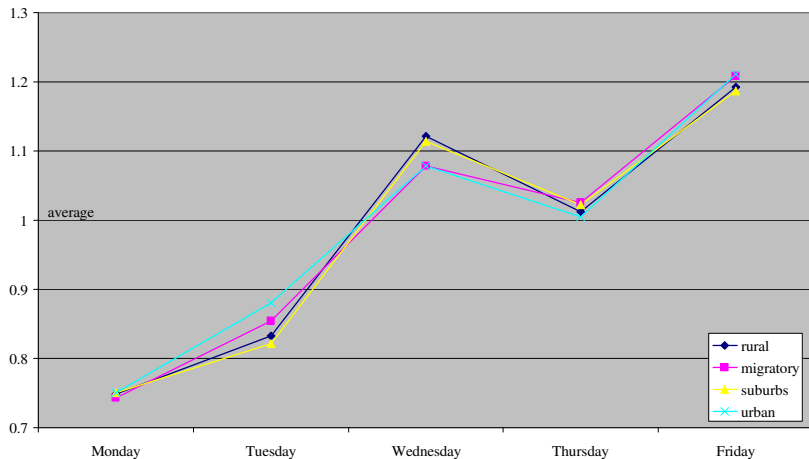
(*) = fixed at value for an average day

The weekly profile for full-time workers



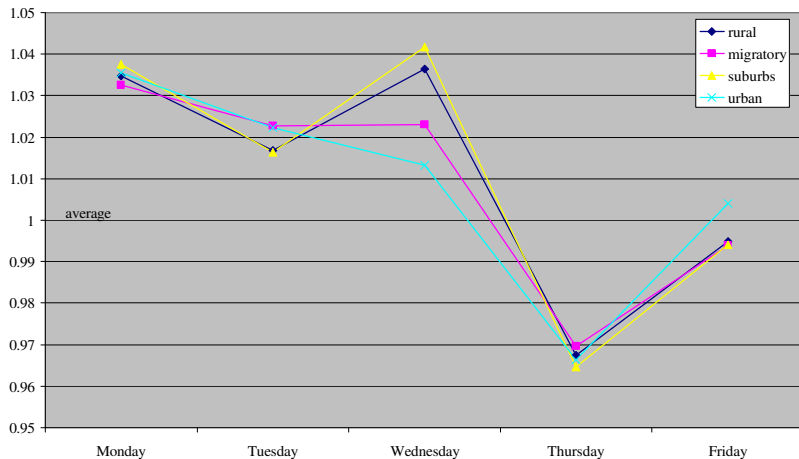
Deviation from weekly average of the number of full-time workers
(averaged on all municipalities)

The weekly profile for part-time workers



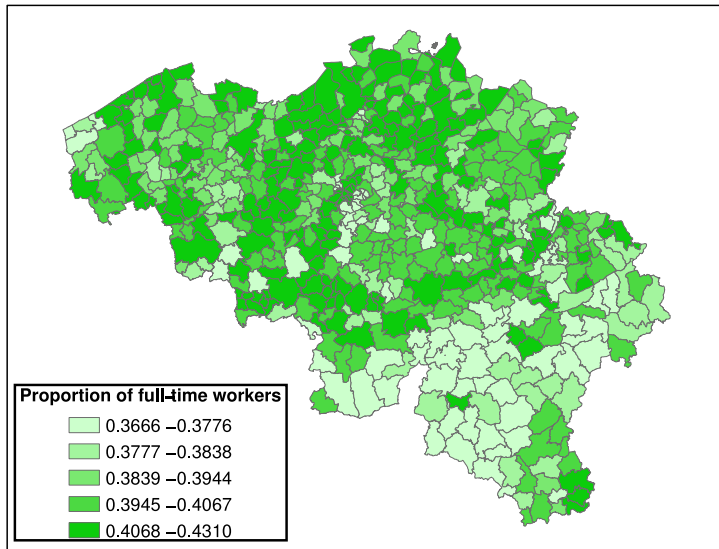
Deviation from weekly average of the number of part-time workers
(averaged on all municipalities)

The weekly profile for non-workers

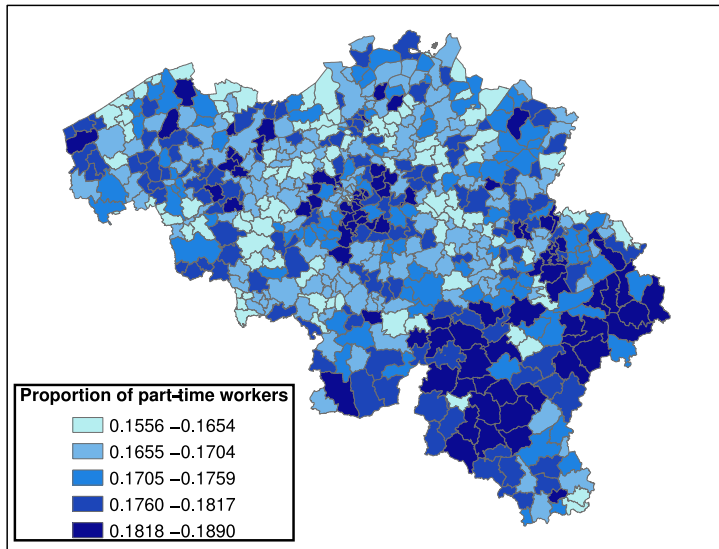


Deviation from weekly average of the number of non-workers
(averaged on all municipalities)

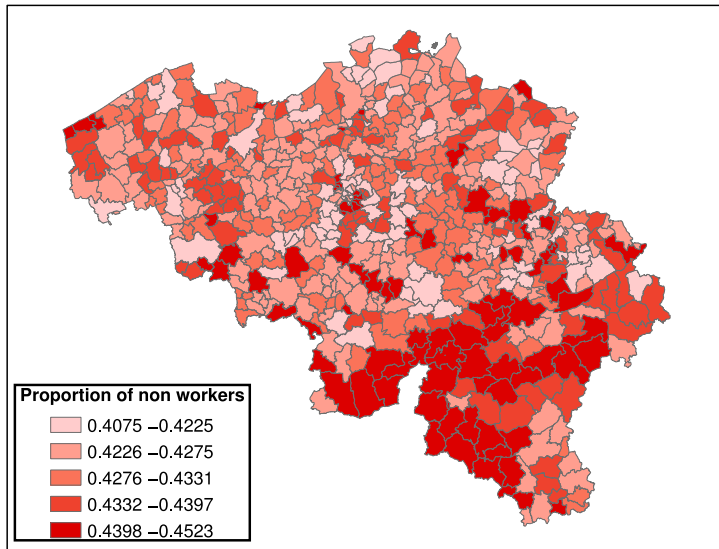
Full-time workers in sBelgium



Part-time workers in sBelgium



Non-workers in sBelgium



Conclusions

- results **coherent** with known distributions
(but hard to validate explicitly)
- **weekly working patterns** are possible to estimate
- interesting **daily variations** (fraction of part-time workers)
- nice integration of synthetic populations and discrete-choice models
- refinements are planned
(extend to other adults in households, **collect more data** [BMW])

Thank you for your attention!