How Spatial and Transport Planning affects

Car Ownership and Commute Mode Choice

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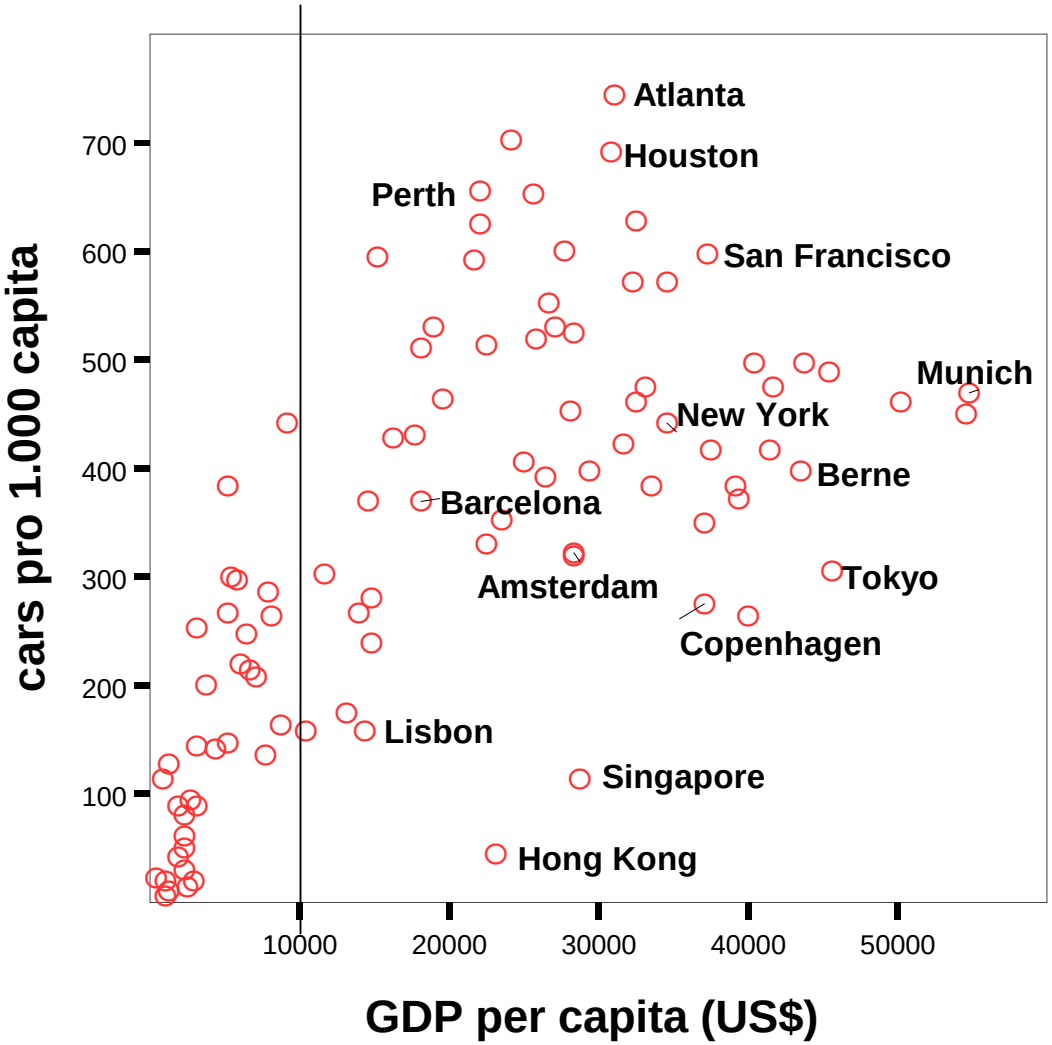
Wealth and car ownership in metropolitan areas



R^2=0,01
for regions with a per capita-GDP > 10.000 US $

Bohnet (2001);Data from the Millennium Cities Database (Kenworthy and Laube 2000)

Houston vs. Amsterdam

http://www.texasfreeway.com/houston/photos/downtown/downtown_houston_pt2.shtml

Source: http://imagene.youropi.com/Tram_Dam_Amsterdam(p:assets,Amsterdam,City_info).jpg

Quelle: http://www.sfgate.com/cgi-bin/blogs/green/category?blogid=49&cat=2048

Hypothesis and Research Questions

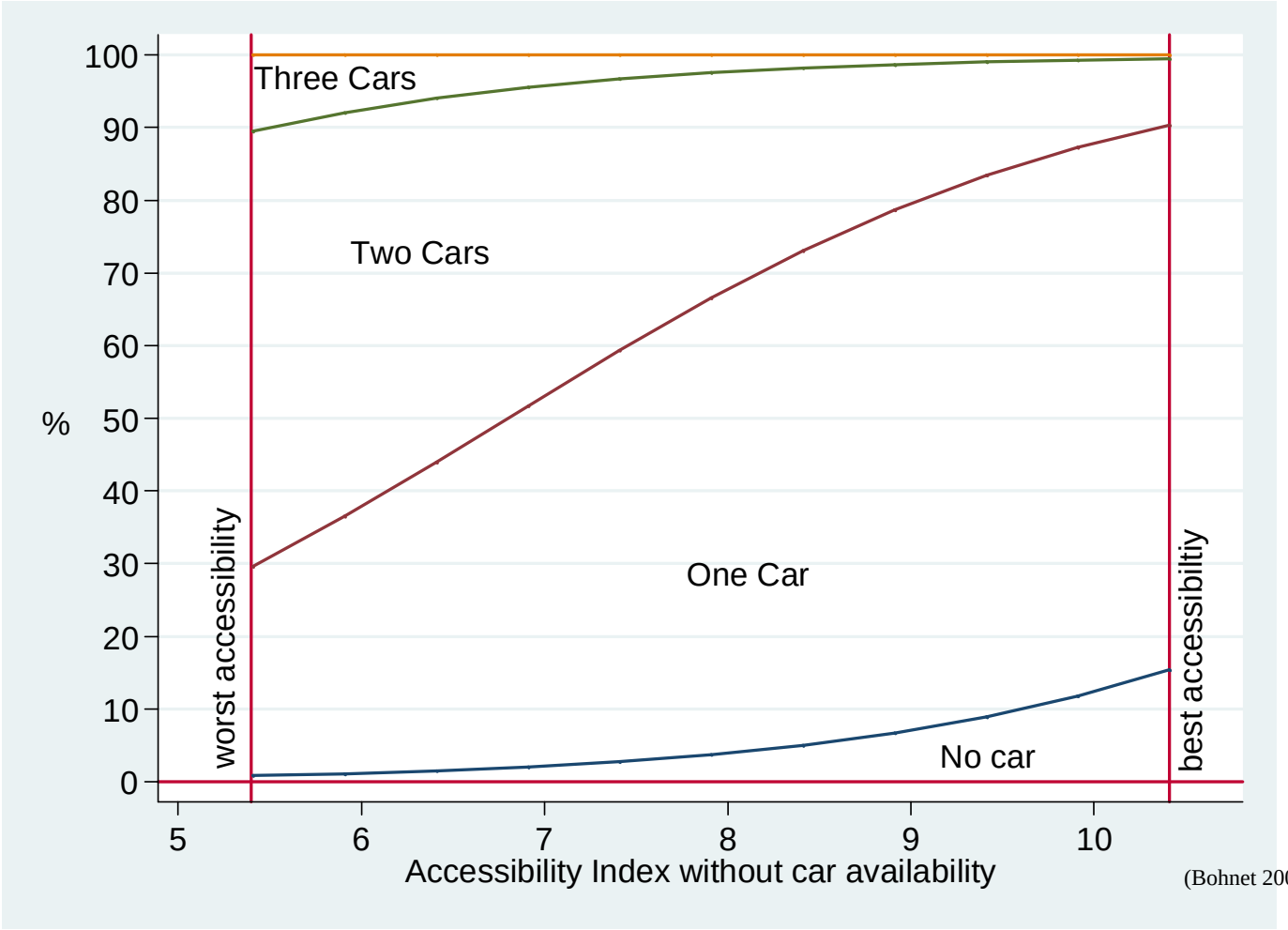
- In **car-dependent** areas with a **poor** local & regional **accessibility** by foot, bicycle, and public transport households tend to own **more cars** than in areas, where cars provide only few accessibility advantages.

- How to integrate car ownership into travel demand models in a way that is sensitive to land use and transport policy?

- How to model household car ownerhsip and car use of household members for commute trips?

- Does it make a difference for mode choice effects if one integrates car ownership effects?

Cars per household for a typical 2-adult household

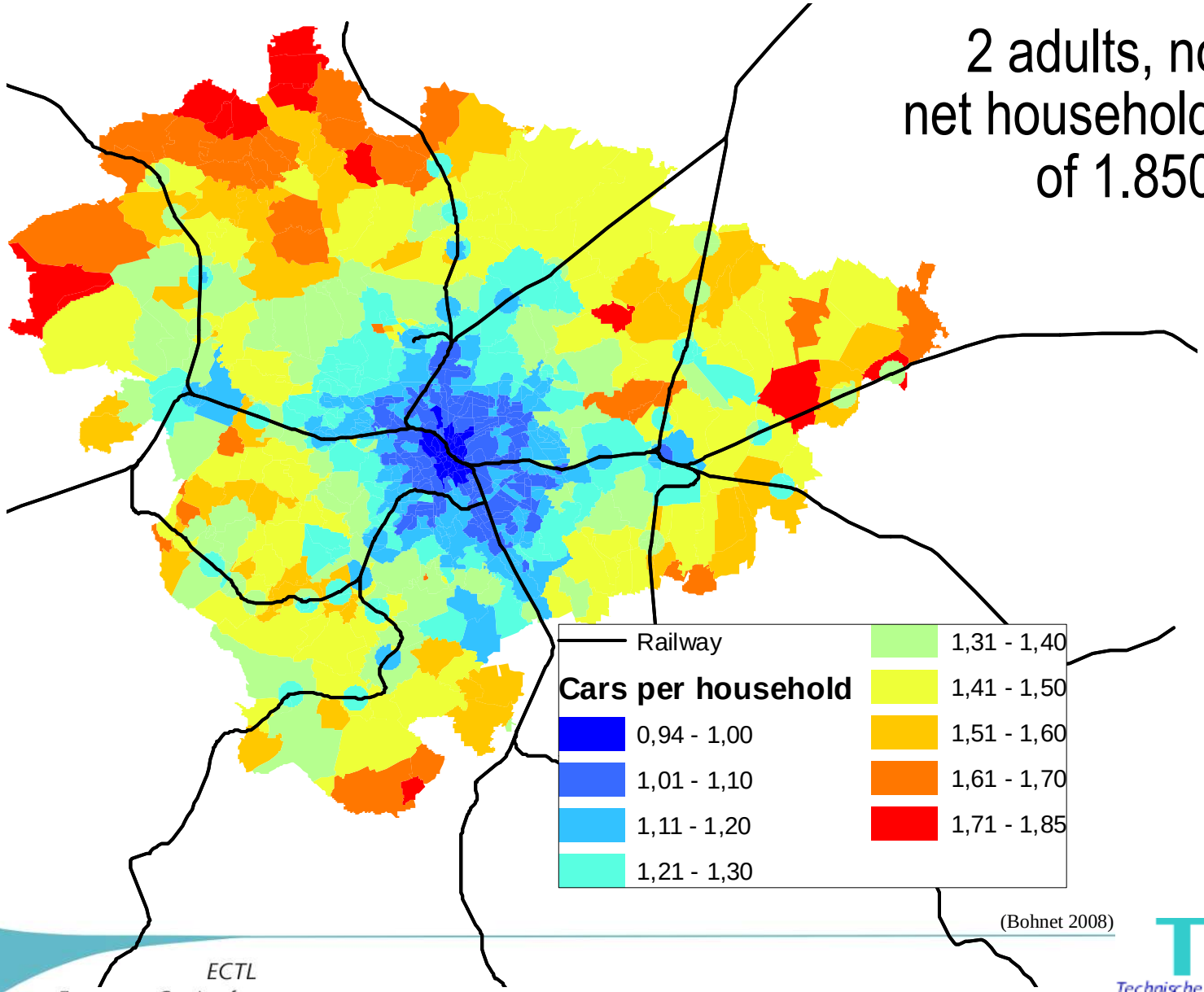


(Bohnet 2008)

Ordinal Logit Model based on 4.500 household interviews from the Hanover Region

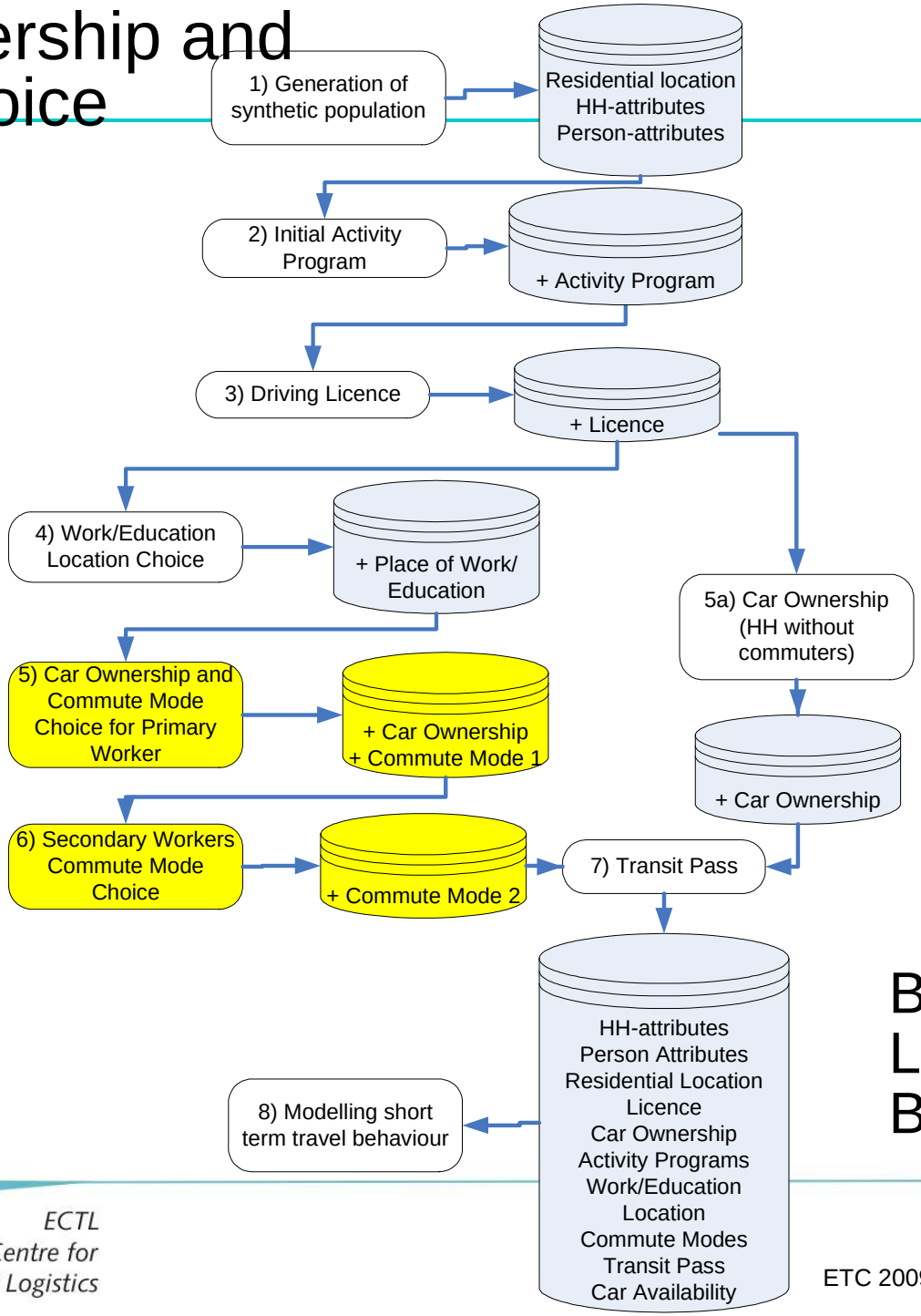
2 adults, no kids net household income of 1.850 €

Cars per household for a typical 2-adult household



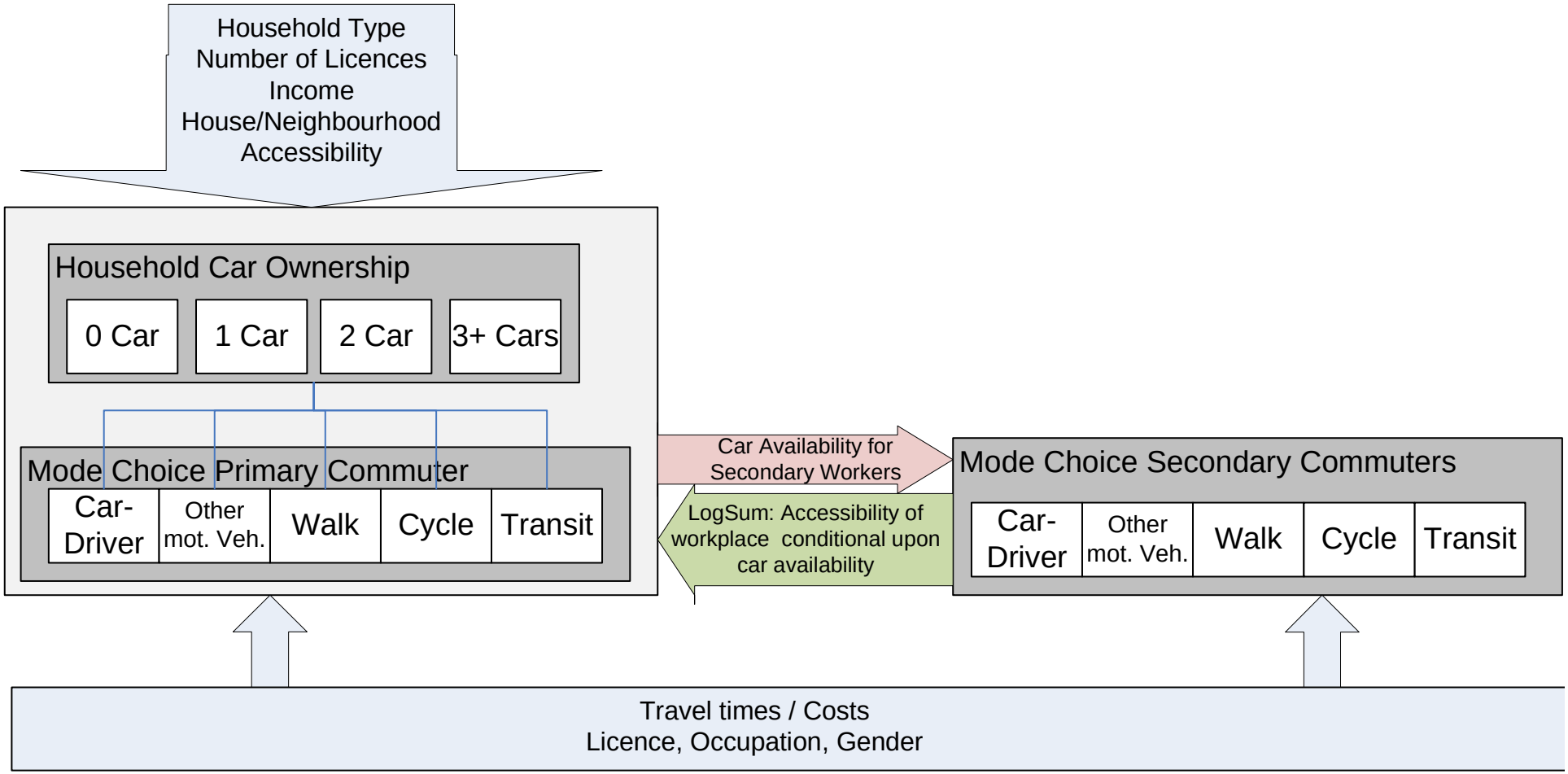
(Bohnet 2008)

Car ownership and commute mode choice

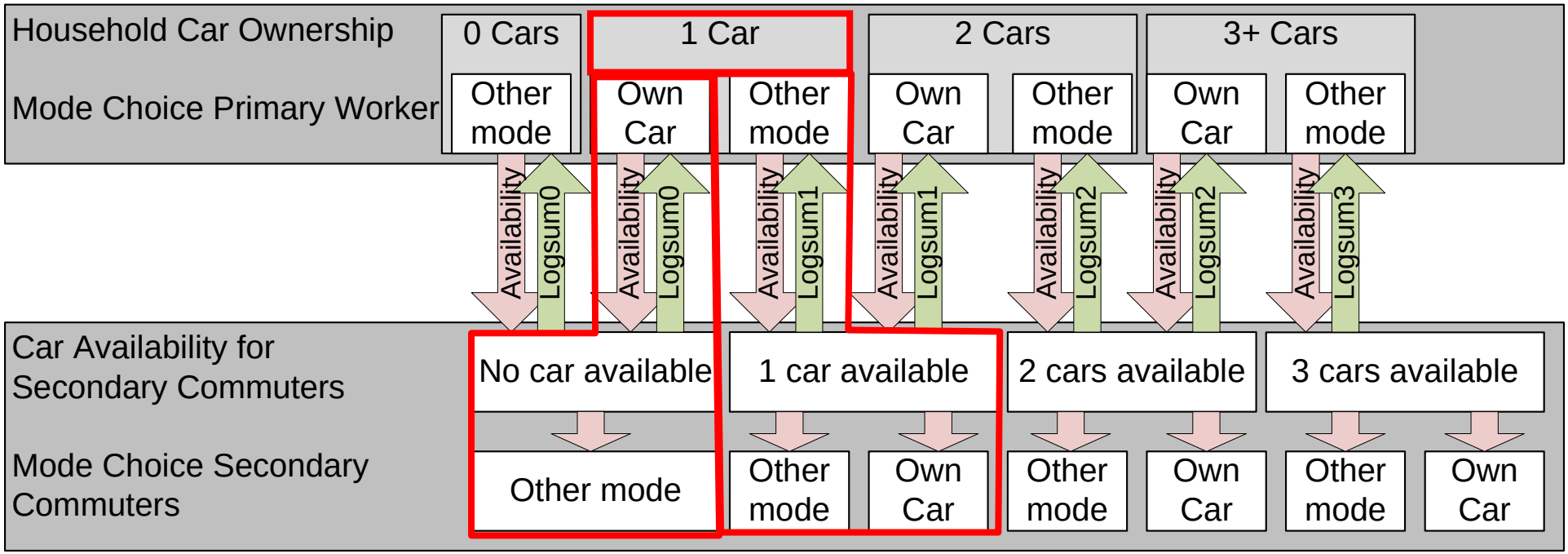


Based upon Lerman and Ben-Akiva (1976)

Car-Ownership/Mode Choice Model



Linking Models through LogSum-Indicators conditional upon Car Availability



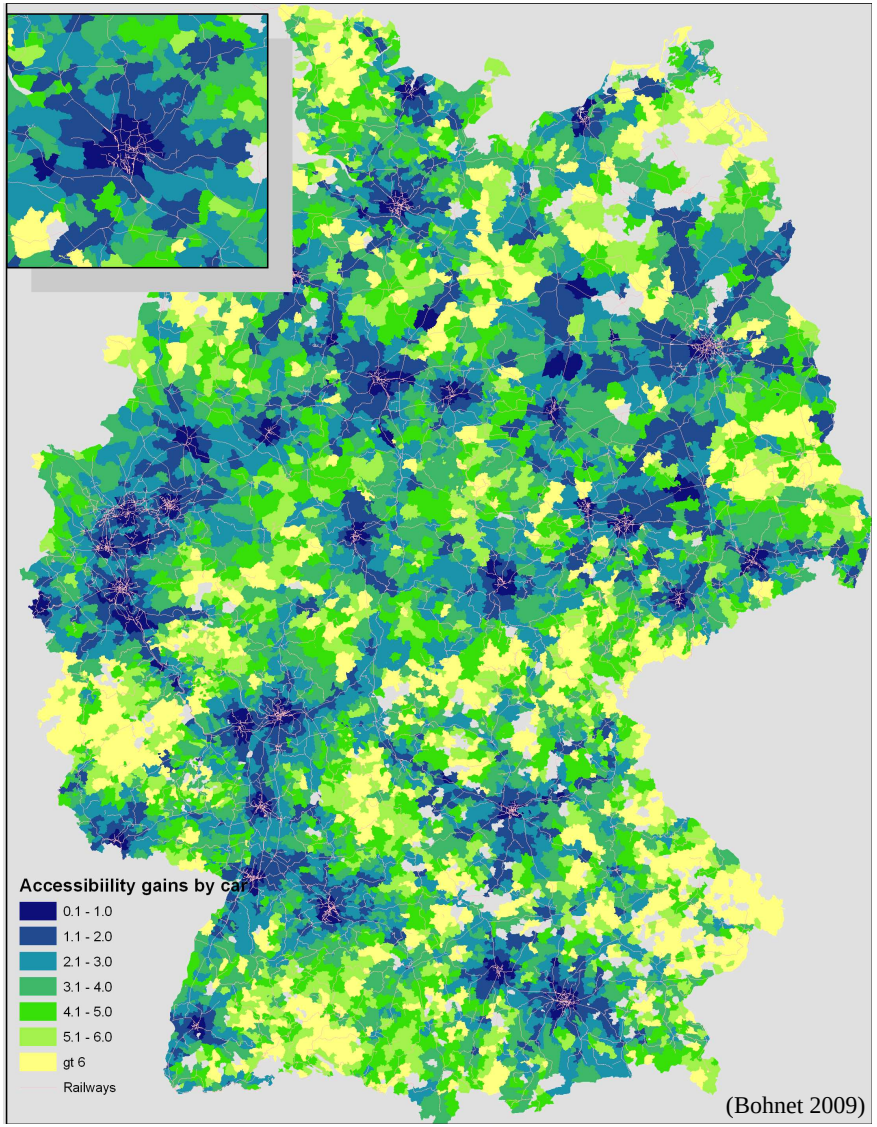
Data Used: The German Socio-Economic Panel

- Multi-purpose household panel survey
- Running since 1984
- 14.000 household interviews from 1998 and 2003 : focus on travel behaviour and environment
- 2003: car ownership and mode choice 5 years ago

- Data includes indicators on residential location type and local accessibility (for shopping...)
- additional regional accessibility indicators on Zip-Code-Level have been added

Accessibility gains by car to next high-level-centre

Accessibility Indicator: logsum from commute mode choice model



Parameter estimated for mode choice model

	constant	occupation					female	ln(remaining income)	waiting time [min]	travel time [min]	remaining cars available				other licenced drivers in household	*State dependence: Same mode 5 years ago*
		full time	part time	apprentice	univ. student	other (pupils)					no car	1 car	2 cars	3 cars		
	Mode Choice of Primary Commuter															
public transport	0,20	-1,23	-1,15	-0,38	0,60	0,00	0,36	*14*	-0,06	-0,04						
bicycle	-1,97	0,99	0,78	0,38	2,26	0,00	-0,24	*14*		-0,11						
walk	2,70	-1,62	-1,69	-1,58	-1,28	0,00	0,49	*14*		-0,12						
other car	-3,02	-0,04	-0,99	0,45	0,54	0,00	-0,17	*14*		-0,06						
drives own car	0,00	0,00	0,00	0,00	0,00	0,00	0,00	*14*		-0,06						
	Mode Choice of Secondary Commuters															
public transport	-0,39	-2,08	-1,97	-0,79	0,15	0,00	0,59	*14*	-0,05	-0,03						*1,38*
bicycle	1,05	-1,88	-1,56	-1,26	-0,25	0,00	-0,05	*14*		-0,11						*1,87*
walk	0,53	-1,36	-1,49	-0,63	-0,60	0,00	0,52	*14*		-0,11						*1,17*
other car	-2,23	-0,33	-0,52	0,19	0,02	0,00	0,07	*14*		-0,07						*0,90*
drives own car	0,00	0,00	0,00	0,00	0,00	0,00	0,00	*14*		-0,07		0,00	0,33	0,79	-0,68	*1,24*

Parameters for car Ownership Model

	no car	1 car	2 cars	3+ cars
Licences in Household				
No Licence	3,70	0,00		
1 Licence	-1,70	0,00	-2,26	
2 Licences	-2,96	0,00	-0,39	-2,65
3 Licences	-3,04	0,00	0,89	0,79
4 Licences		0,00	1,31	2,30
Children in household	-0,42	0,00	0,14	0,14
Drives own car, 1 licence		0,00	1,21	
Drives own car, 2 licences		-0,55	0,80	0,74
Drives own car, 3 licences		-0,59	0,17	0,53
Drives own car, 4 licences		-1,04	-0,15	0,41
Accessibility gains of cars for secondary commuters	0,36			
Shopping facilities in walking distance	0,06	0,00	-0,25	-0,79
Mixed neighbourhood	0,11	0,00	-0,08	-0,30
Housing type				
Rural house	-0,47	0,00	0,92	1,19
Detached single family home	-1,30	0,00	0,54	0,97
Terreced houses	-0,65	0,00	0,55	0,68
Multi-family house with 3-8 appartm	-0,30	0,00	0,09	0,15
Multi-family house with 9+ appartm	0,00	0,00	0,00	0,00
Accessibility benefit of a car on trips to				
Next middle level centre	-0,21	0,00	0,09	0,13
Next high level centre	-0,14	0,00	0,02	0,04
Public transport waiting time	-0,02	0,00	0,01	0,03
Car ownership 5 years ago				
no car	0,48	0,00	-0,13	-0,17
1 car	-0,78	0,00	-0,41	-1,15
2+ car	-0,73	0,00	0,43	0,26
ln(Remaining income)	14,71			

more licenced drivers
children in household
→ more household cars

more licenced drivers
1st worker takes other mode
accessibility gap without car for secondary commuters

shopping facilities and mixed Neighbourhood
→ lower car ownership

higher housing density
→ less cars

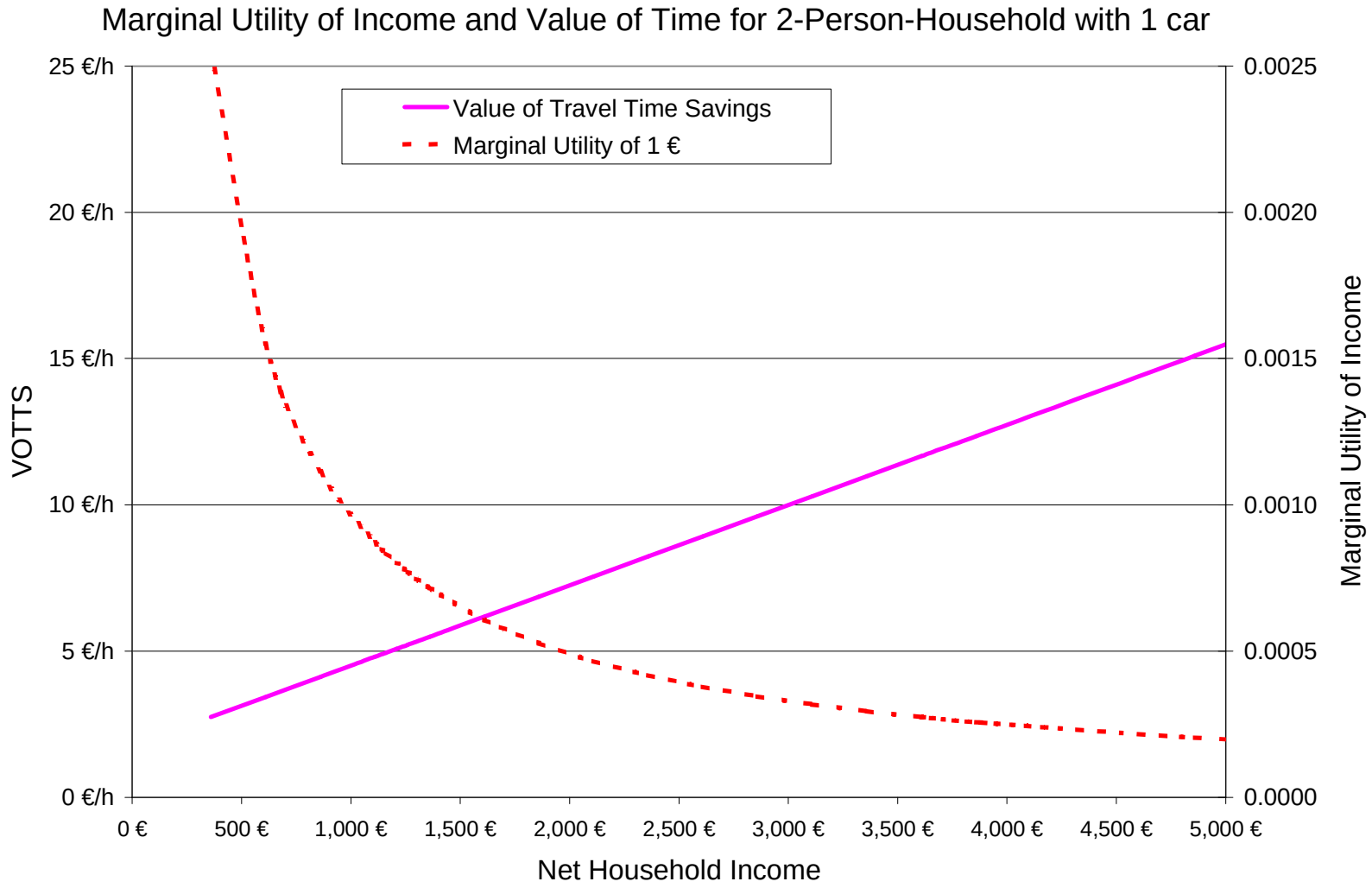
poor public transport accessibility of next middle/high level centre
→ more cars

Car ownership 5 years ago
→ habituation to live with/without cars

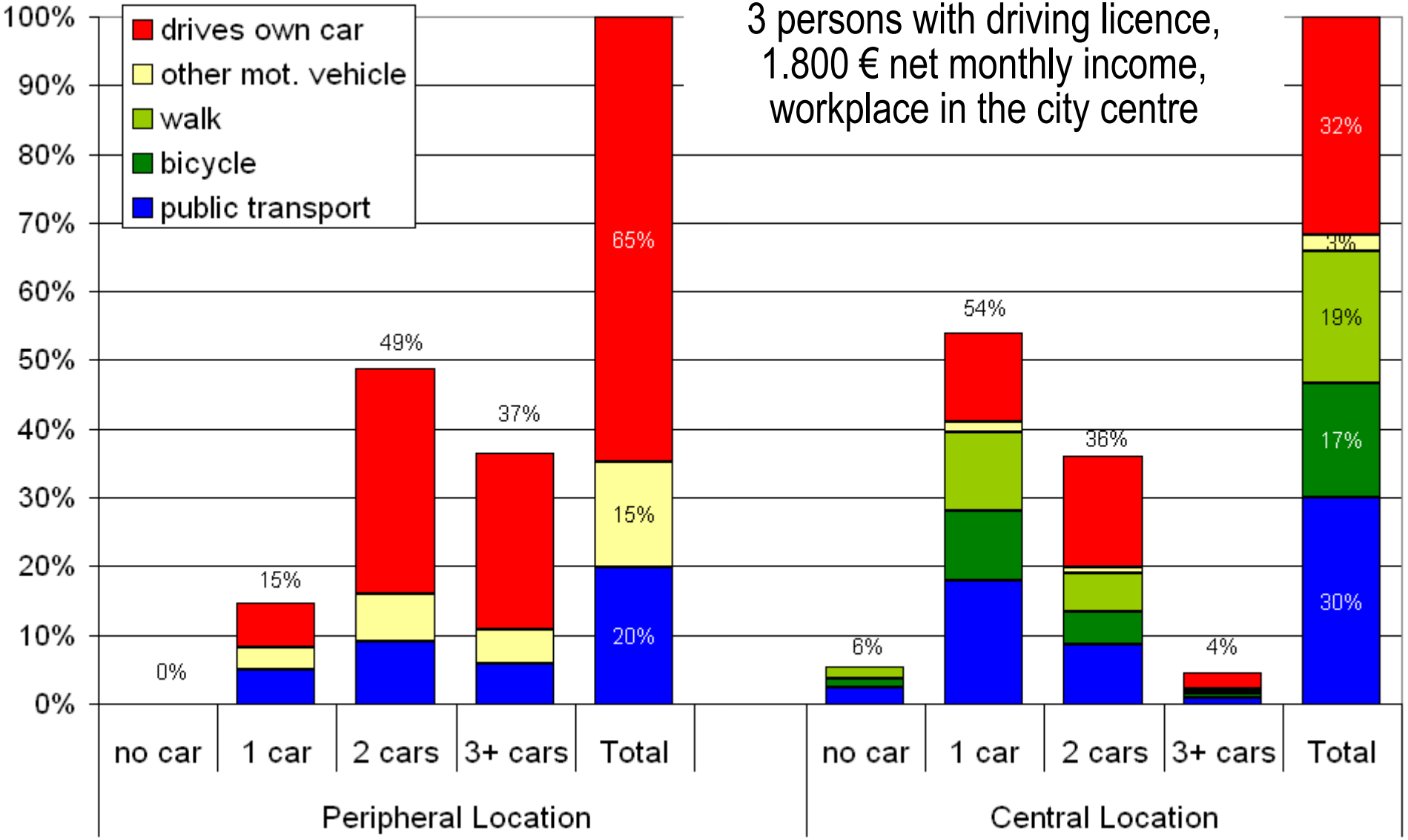
Marginal utility of remaining income and value of travel time savings

Alternative specific variable: ln(remaining income)

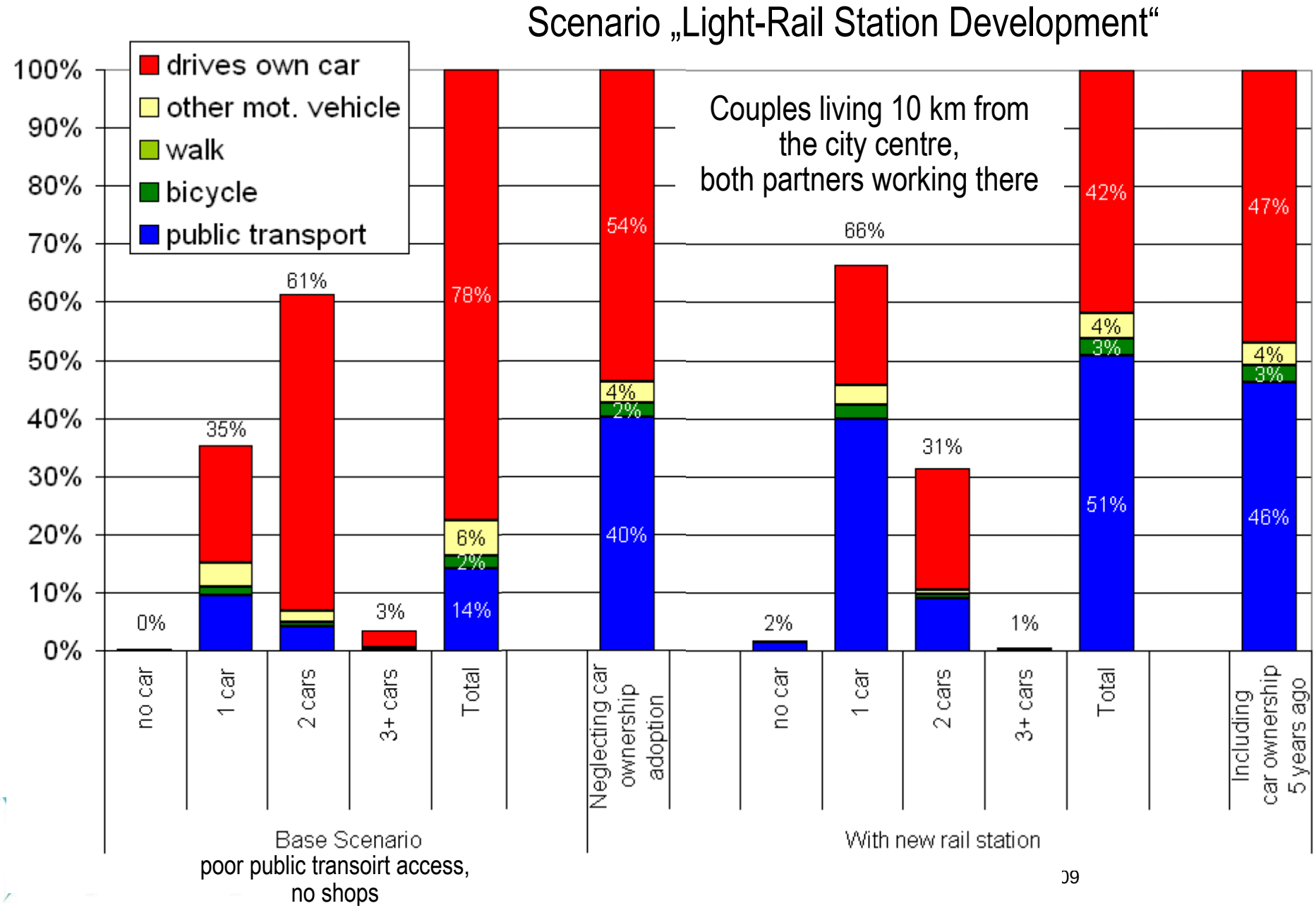
= ln [Remaining Income– (# of cars * 200 €) – variable commute costs – hh size-factor]



Car ownership and primary workers commute mode choice at different locations
Comparisons for typical household



Impact of "new rail station" scenario on car ownership and primary workers commute mode choice of typical household



Conclusions and further research needs

- Urban form and transport services shapes not only mode choice but also household car ownership levels
- Land use and transport policies that improve/sevaguard accessibility by foot, bicycle and public transport might reduce the need for car ownerhsip
- This saves space and money for parking provision
- Neglecting car ownership effects:
  underestimation of the effectiveness of land use and transport policy
- however – people get used to car dependent / car free lifestyle – change needs time
- new urban development:
  provide shops and public transport from the beginning

Thank you for your attention