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Swiss Value of Travel Time Savings

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Zürich

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Eidgenössische Technische Hochschule Zürich
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Context: New Swiss CBA - guidelines

SN 671 800	Framework and Approach
SN 671 801	Discount rate
SN 671 802	Value of passenger travel time savings
SN 671 803	Value of freight travel time savings
SN 671 804	Value of safety improvements
SN 671 805	Prediction and valuation of system reliability
SN 671 806	Road operating costs
SN 671 807	Prediction and valuation of external effects

Project team

Steering group organised by SVI (chair: U. Weidmann, SBB)

Core team:

- G Abay
- KW Axhausen
- A König

External advisers:

- JJ Bates
- M Bierlaire

Survey approach

Add-on to ongoing RP – survey (KEP of SBB)

Pretests:

- Route choice
- Mode choice
- Destination choice

Main study

- Route choice
- Mode choice

Destination choice (Pretest I and II)

Einkaufszentrum A

Fahrzeit: 30 Minuten

Reisekosten: 7 Fr.

Preis Warenkorb: 120 Fr.

Einkaufszentrum B

Fahrzeit: 20 Minuten

Reisekosten: 5 Fr.

Preis Warenkorb: 140 Fr.



← Ihre Wahl →



Route choice car (Pretest I)

Route A
Fahrzeit: 40 Minuten
Reisekosten: 18 Fr.
Stauanteil Fahrt: 25%

Route B
Fahrzeit: 20 Minuten
Reisekosten: 23 Fr.
Stauanteil Fahrt: 15%

← Ihre Wahl →

Route choice car (Pretest I)(Pretest II)

Route A

Reisekosten: 18 Fr.

Gesamtfahrzeit: 40 Minuten

Davon in stop and go: 10 Minuten

Route B

Reisekosten: 23 Fr.

Gesamtfahrzeit: 20 Minuten

Davon in stop and go: 5 Minuten



← Ihre Wahl →



Route choice car (Pretest I) (Main study)

Route A
Reisekosten: 18 Fr.
Gesamtfahrzeit: 40 Min.
davon in stop and go: 10 Min.
davon freie Fahrt : 30 Min.

Route B
Reisekosten: 23 Fr.
Gesamtfahrzeit: 20 Min.
davon in stop and go: 5 Min.
davon in freier Fahrt: 15 Min.

← Ihre Wahl →

Route choice rail (Main study)

Route A
Reisekosten: 20 Fr.
Fahrzeit: 40 Min.
Fahrplantakt : 15 Min.
Anzahl Umsteigen: 1-mal

Route B
Reisekosten: 30 Fr.
Fahrzeit: 20 Min.
Fahrplantakt : 30 Min.
Anzahl Umsteigen: 0-mal

← Ihre Wahl →

Mode choice (Main study)

PW
Reisekosten: 13 Fr.
Gesamtfahrzeit: 30 Min.
davon in stop and go: 5 Min.
davon freie Fahrt : 25 Min.

Bahn
Reisekosten: 23 Fr.
Gesamtfahrzeit: 20 Min.
Takt: 30 Min.
Anzahl Umsteigen: 0-mal

← Ihre Wahl →

Experiments and number of choice situations

Chosen mode	Car availability	MC car – rail	MC car – bus	RC car	RC bus	RC rail
Car	Yes	6		6		
Car	Yes	6				9
Bus	Yes		6		9	
Rail	Yes	6				9
Bus	No				9	
Rail	No					9

Response behaviour (Main study)

Interviewed for KEP: 5560 (during weeks 22 to 40 of 2002)

Willing to participate: 3216 (58% of interviewees)

Experiments sent out: 2317 (72% of willing interviewees)

Returns: 1222 (53% of experiments sent out)

Response rate for the different experiments

Chosen mode	Car availability	RC chosen mode	Number of choice situations	Response rate
Car	Yes	Yes	15	52.2
Car	Yes	No	15	48.6
Bus	Yes	Yes	15	54.4
Rail	Yes	Yes	15	65.7
Bus	No	Yes	9	37.7
Rail	No	Yes	9	50.2

Response rate and response speed



Sample drift: Shares by age, gender and education [%]

Variable	MZ 2000	KEP	Willing to participate	Returns
Females	51	54	50	41
Below 35	40	26	28	26
36-55	32	40	41	49
Above 55	28	34	31	26
Regular schooling	32	22	16	10
Professional training	41	53	54	46
Tertiary education	27	27	30	44

Sample drift: Shares by mobility tools and income [%]

Variable	MZ 2000	KEP	Willing to participate	Returns
Discount card	35	38	43	54
National season	6	6	7	11
Car available	77	63	62	73
Up to 40 kSFr	21	-	-	19
40 – 80 kSFr	42	-	-	35
80 – 125 kSFr	27	-	-	33
125 and more kSFr	11	-	-	14

Modelling strategy

Experimental variables only

- + Inertia indicators
- + Socio-demographic variables
- + Distance and income elasticities
- + RPL for cost and travel times
- + Interaction with trip purpose

For each experiment and then for pooled estimates

Specification of the elasticities

Non-linear elements of the utility function can be specified in Biogeme:

$$\beta_{Cost} * \left(\frac{Income}{Mean\ income} \right)^{\epsilon_{Income}} * \left(\frac{Trip\ length}{Mean\ trip\ length} \right)^{\epsilon_{Trip\ length}} * Cost$$

(Adopted from recent reanalysis of UK VTTS study)

Biogeme

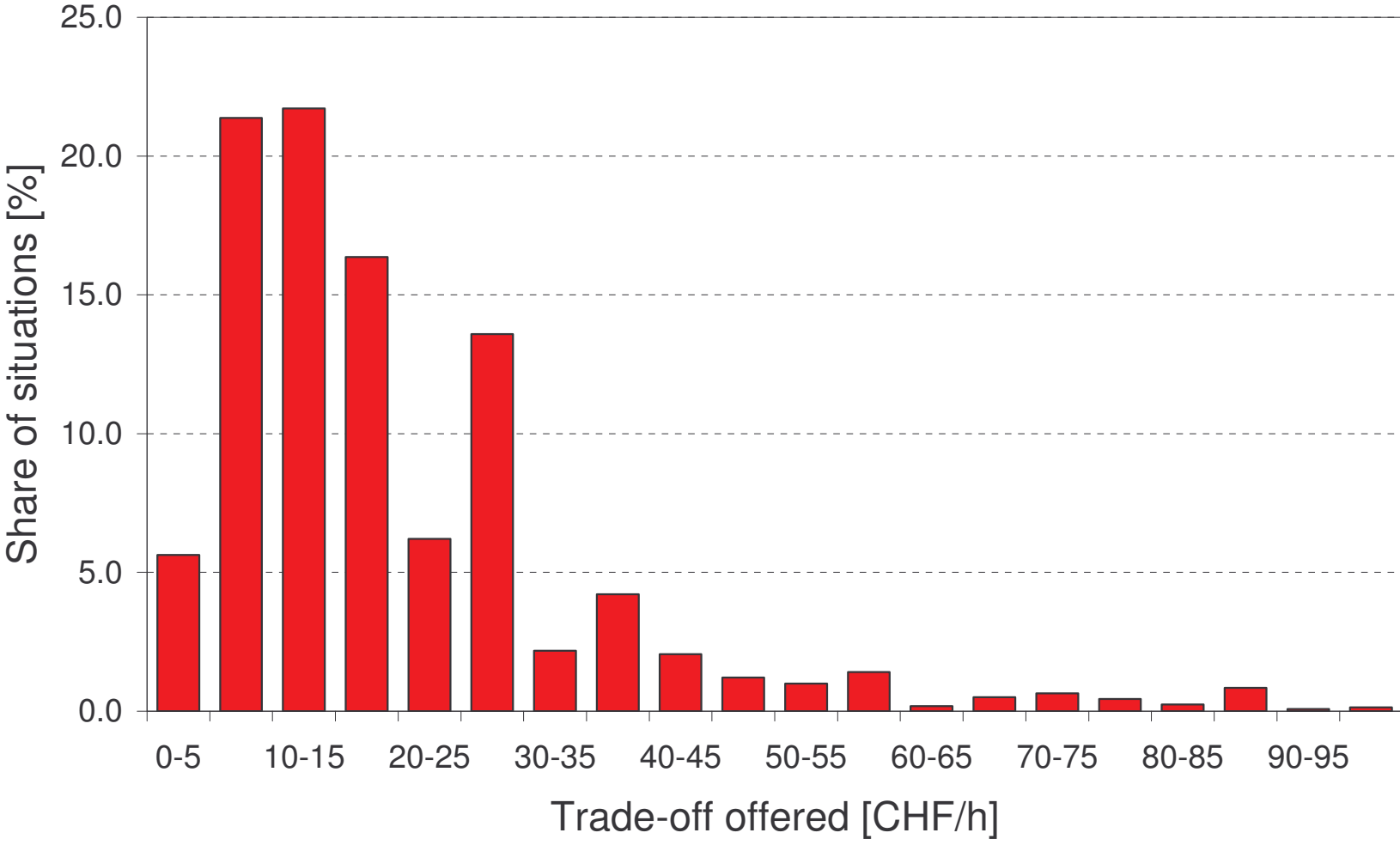
General GEV-modell estimation tool:

- MNL, NL, CNL, NetworkGEV
- Mixed logit
- Non-linear elements in the utility function, including Box-Cox transforms
- Direct estimation of error scales

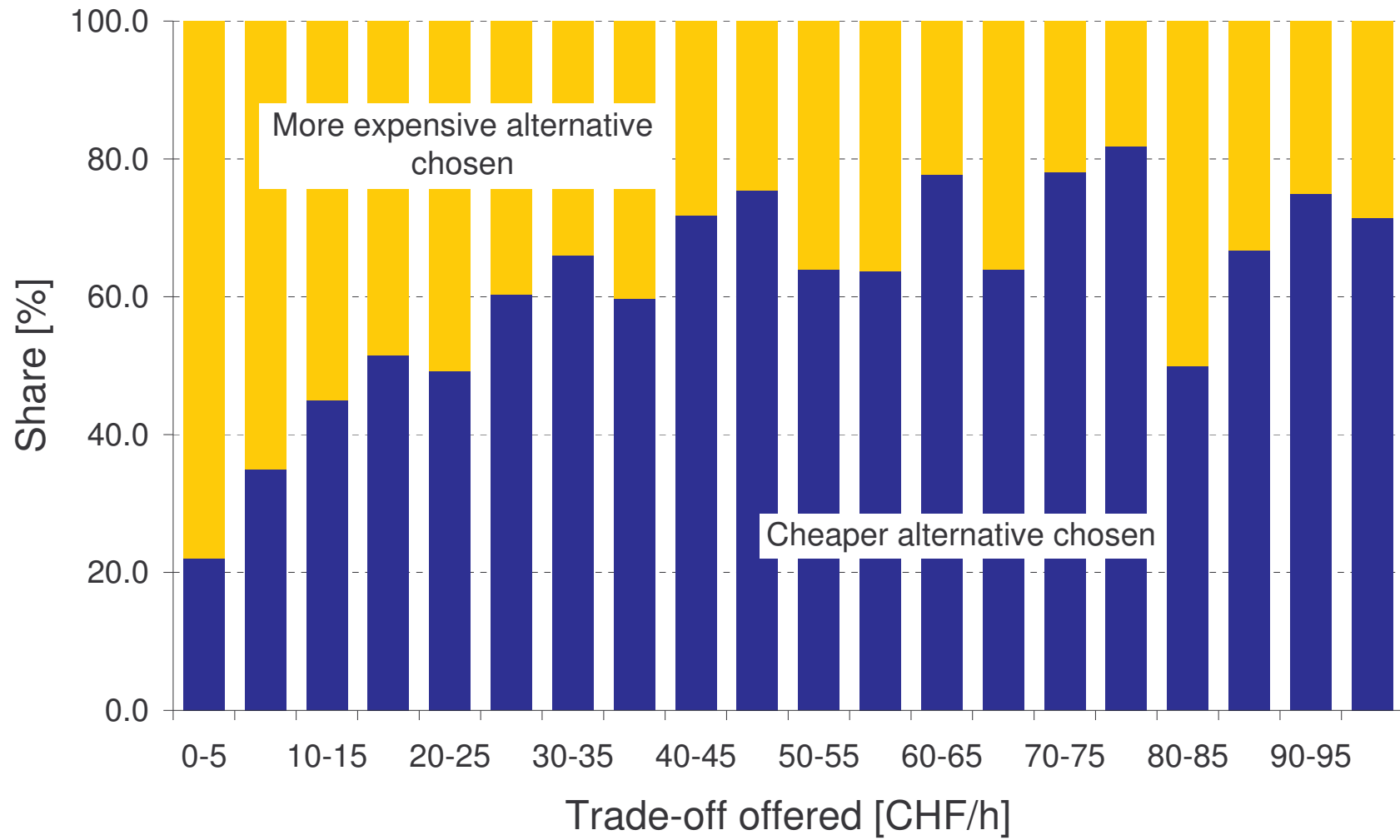
See for the freeware:

<http://roso.epfl.ch/biogeme>

Trade-offs offered (Route choice rail)



Choice behaviour (Route choice rail)



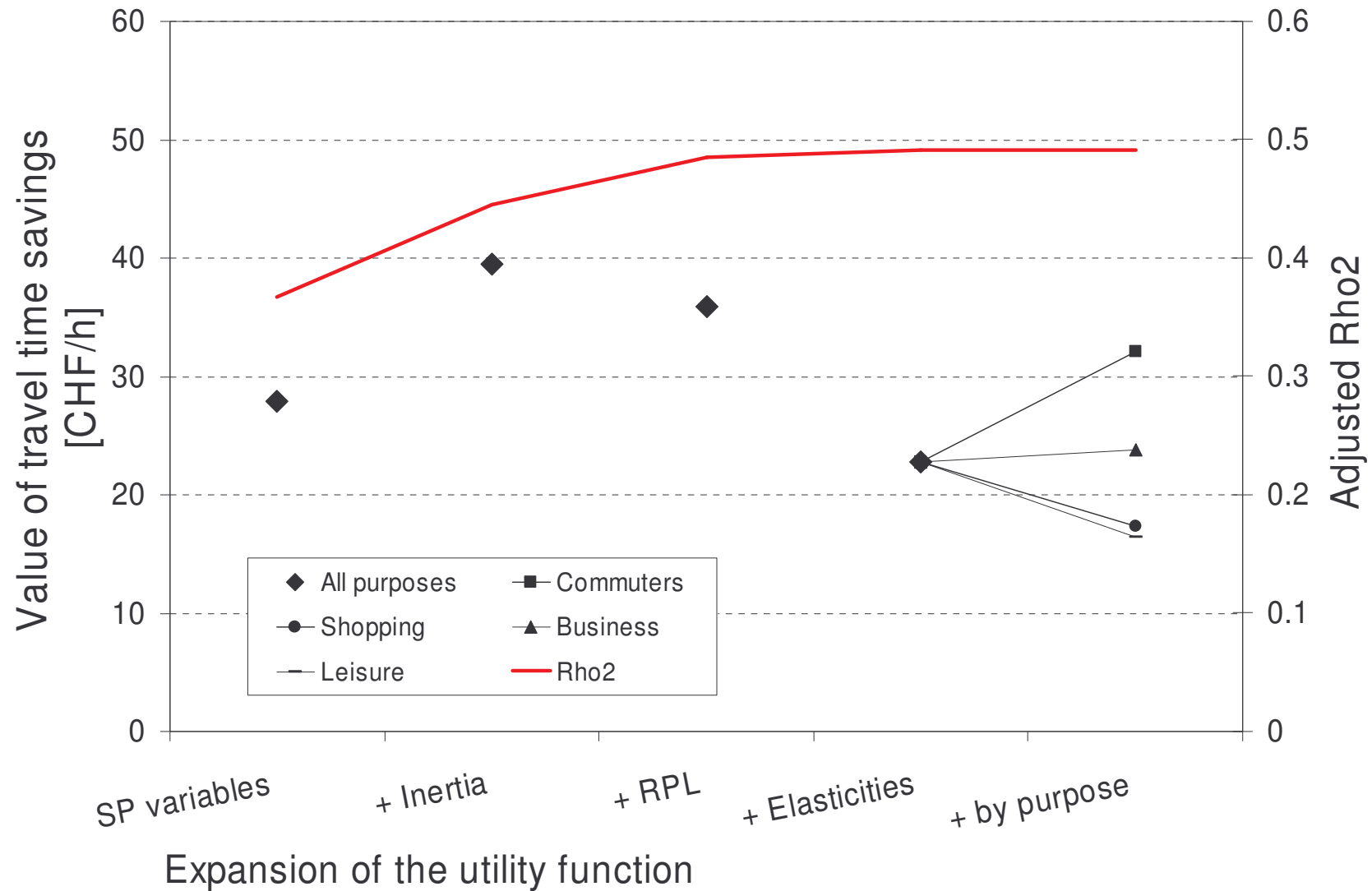
Some initial findings

No differences between congested and uncongested times

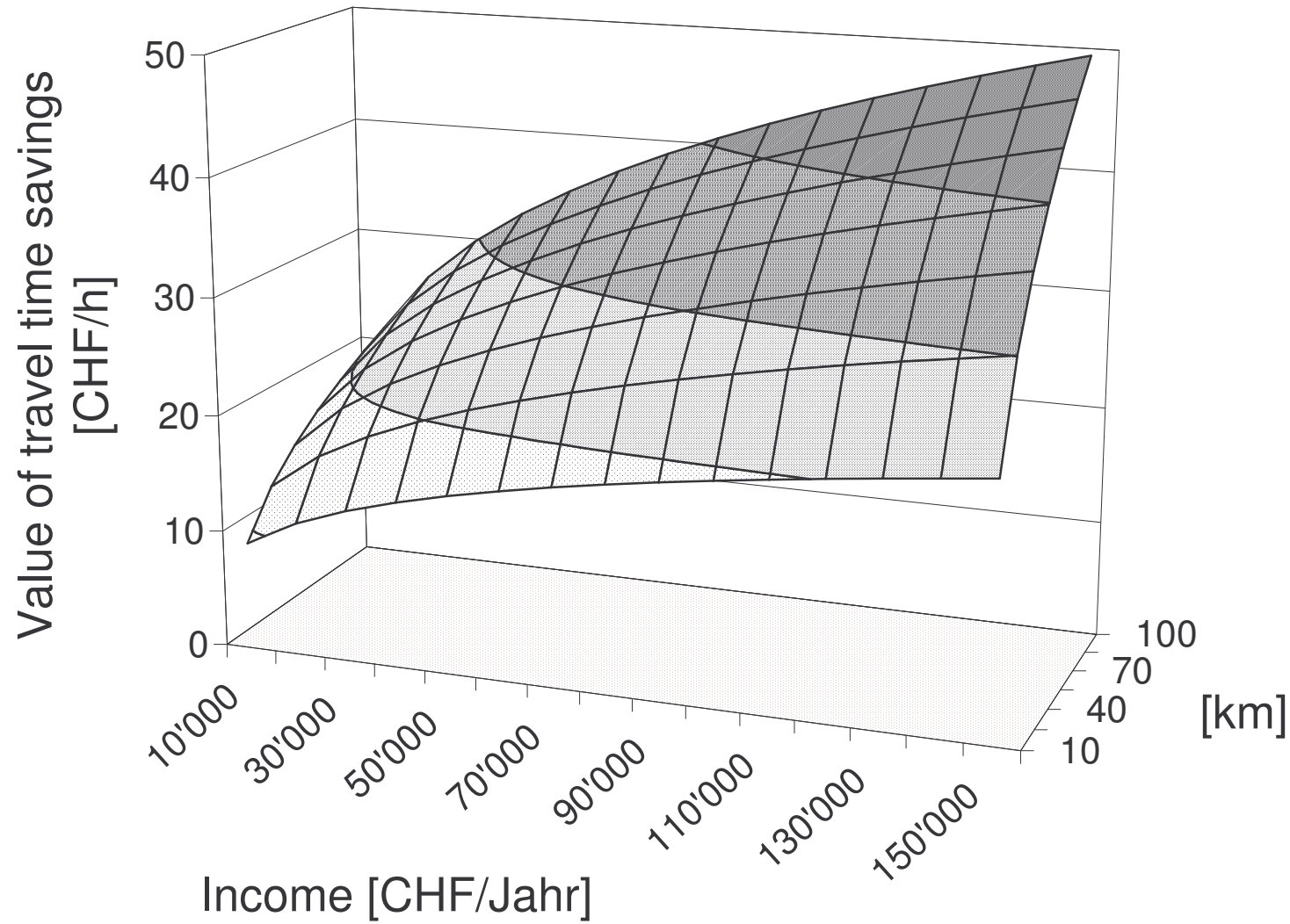
No significant impacts of other socio-demographic variables

Generally better models for the mode choice experiments

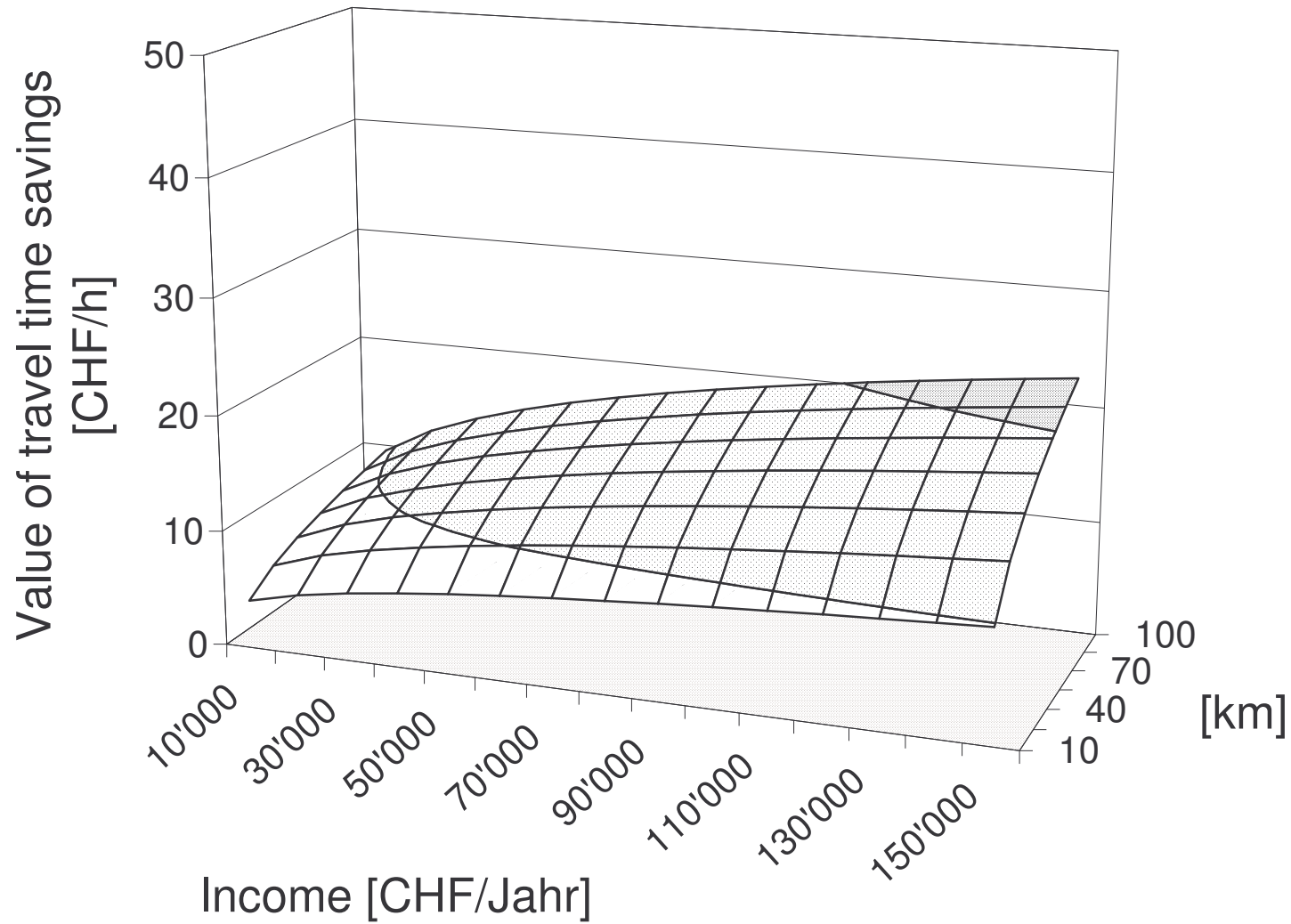
Model trajectory: Mode choice – public transport user



Value of travel time savings: Car commuters



Value of travel time savings: Rail leisure travellers



Relative scaling of the error distributions

Experiment	Route choice only		Combined	
	Para- meter	T-test	Para- meter	T-test
Mode choice	-	-	0.66	8.57
Route choice car	1.82	3.10	1.39	2.47
Route choice rail (car users)	0.97	1.19	1.05	0.83
Route choice rail (rail user)	1.00	-	1.00	-

Values of travel time savings at sample mean

	Commuter	Shopping	Business	Leisure
Car	29.9 \pm 1.6	25.4 \pm 2.2	45.2 -	17.2 \pm 0.9
Rail	23.9 \pm 2.3	19.4 \pm 3.1	40.3 -	13.5 \pm 1.2

Values and 95% confidence intervals in [sFr/h]

Values of travel time savings at population mean

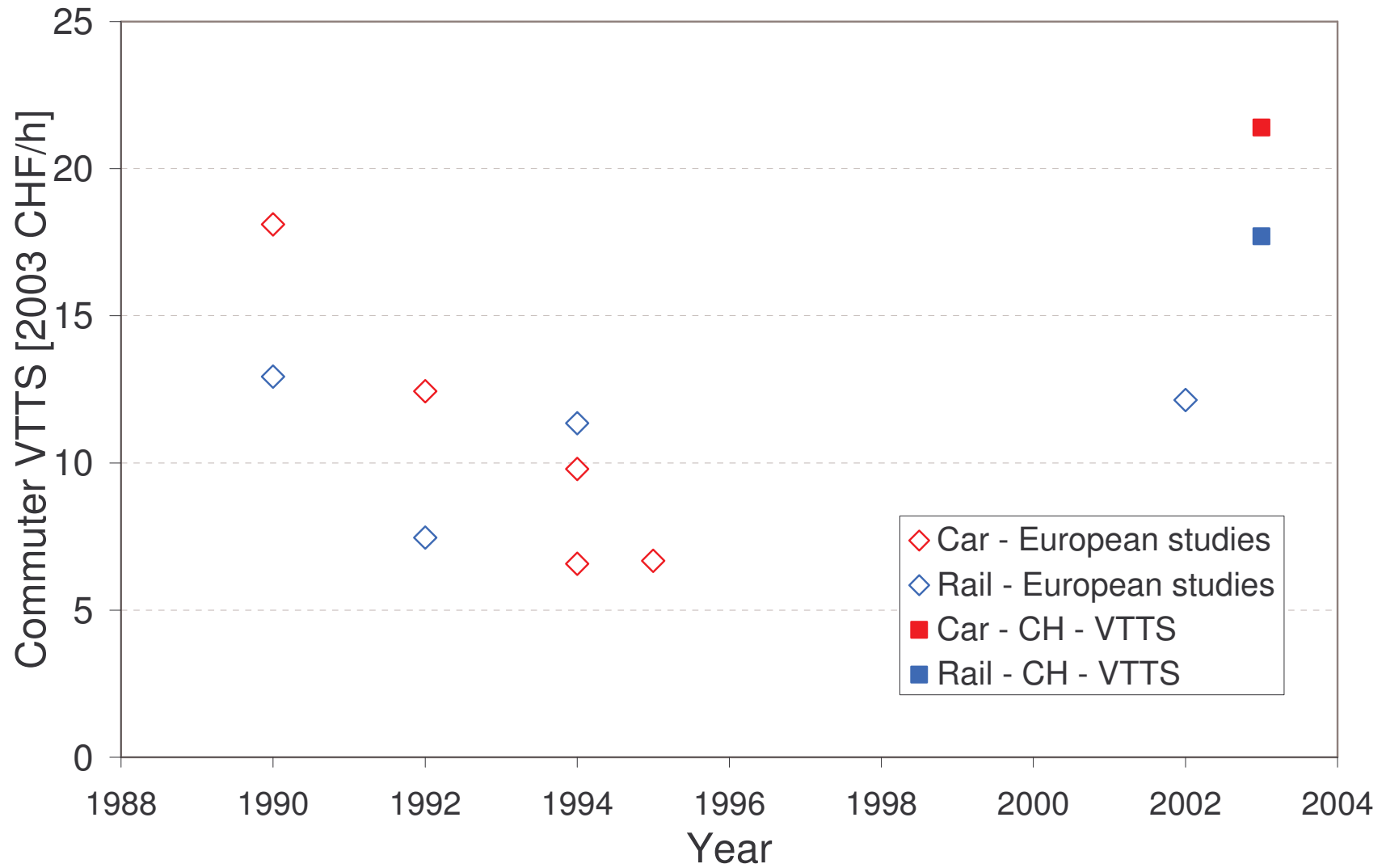
	Commuter		Shopping		Business		Leisure	
Car	21.4	2.9	18.1	3.8	32.5	-	12.3	0.8
Rail	17.7	1.7	13.8	2.1	30.3	-	9.7	0.5

Values and variances in [sFr/h];

Variances were computed by a Taylor expansion

VTTS for commuter is equivalent to 30-35% of average hourly wage

Comparison with other recent studies



Challenges and outlook

What are the interaction between MMNL and interaction terms ?

Is the enforcement of positive VTTS appropriate for SP data ?

Can the sample drift be complete accounted for by reweighting ?

Are all short term VTTS consistent ? (destination choices for shopping, route/mode choice)

Are the long and short term VTTS consistent ?