

# Young Researchers Seminar 2009


Torino, Italy, 3 to 5 June 2009

## Travel users' profile definition by means of statistical multivariate analysis of attitudinal and behavioral variables

Giorgia Servente



# OBJECTIVES

1. To investigate the complexity of the dataset identifying latent constructs underlying a set of variables
2. To reveal mechanistic interdependencies among variables
3. To increase the knowledge of the influence of psycho-attitudinal variables on modal choice 
4. To define homogeneous groups of transport users using the scores obtained from the factor analysis



# OBJECTIVES

Socio-demographic variables

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Attitudinal variables

+

Behavioral variables

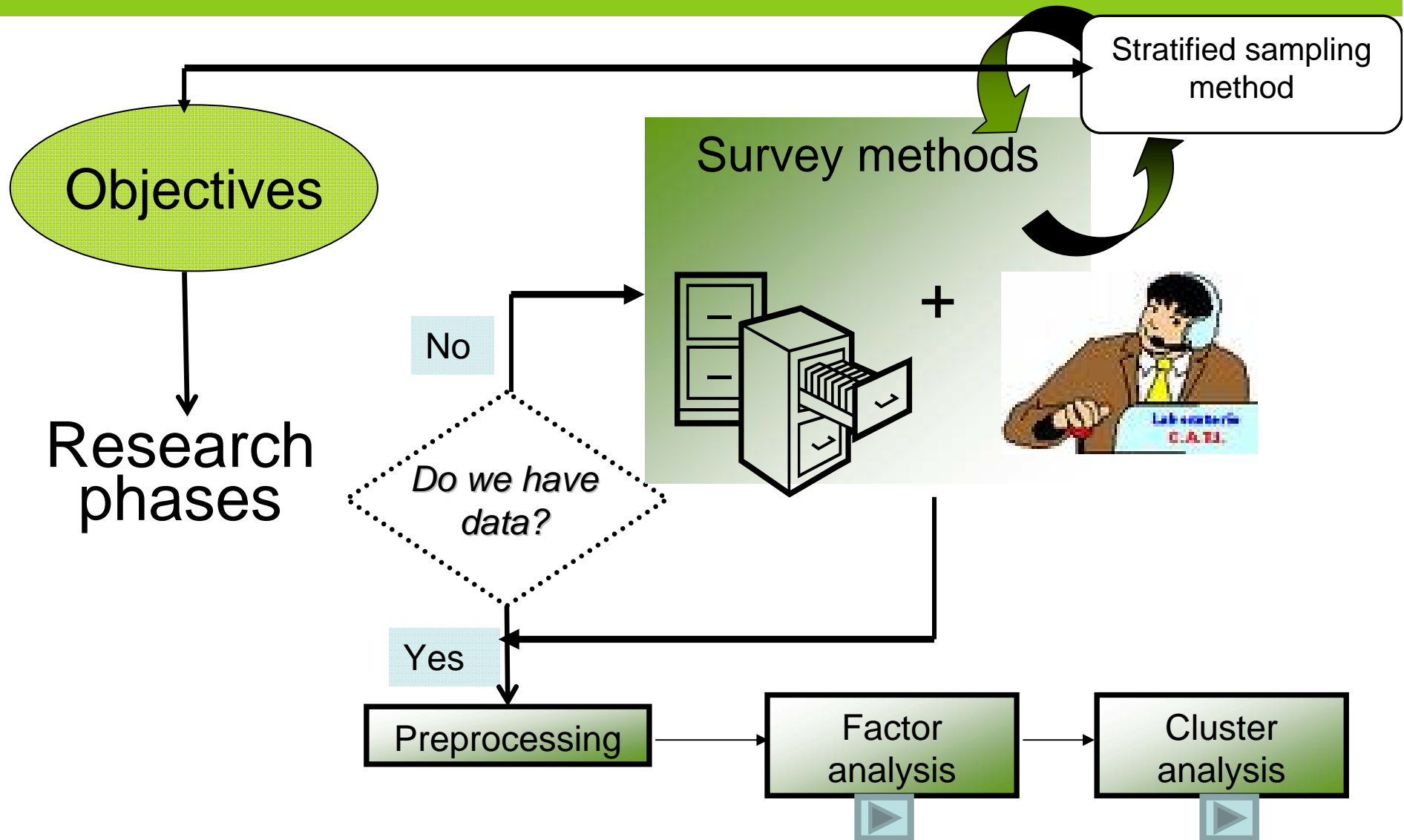
Mode choice



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# METHODOLOGY



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# THE SURVEY

## IT IS COMPOSED BY FOUR SECTIONS:

1. **REVEALED PREFERENCES** data about trips done by the respondents on both weekly and week-end trips:

- Trip destination,
- Purpose,
- Duration,
- Transport mode.

2. **ATTITUDES, PERCEPTIONS AND OPINIONS** about:

- Travel in general,
- Public transportation,
- Traffic,
- Environmental sensitivity,
- Willingness to pay (WTP) for improvements of the city air quality and noise.



# THE SURVEY

3. Applications of the **STATED CHOICES (SC) GAMES** about improving the environment and limiting car use

(road pricing);

CHOICE A	CHOICE B
Road pricing 5 €	Bus ticket 0.90 €
Parking cost 1,5 €/hour	Parking cost 0.00€/hour
Time spent by car 15 minutes	Time spent by bus 18 minutes
Time spent on foot 6 minutes	Time spent on foot 3 minutes

4. Investigation on **SOCIO-DEMOGRAPHIC ASPECTS** of the respondents and their household: gender, age, education, residence, family composition, employment situation, income and number of vehicles owned were explored.

# Exploratory factor analysis: main goals

1. Discover the influence of each psycho-attitudinal and behavioral variable on modal choice.



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2. Reveal hidden interdependencies between variables



**To create future more-effective and slimmer questionnaires**

## Factor analysis: methodological steps

- ✓ Choice of the extracting methodology

Principal Axis Factor (PAF) extraction method

- ✓ Determination of the optimal number of factors;

7 factors were extracted, by means of the scree plot explaining 62,4% of the total variance



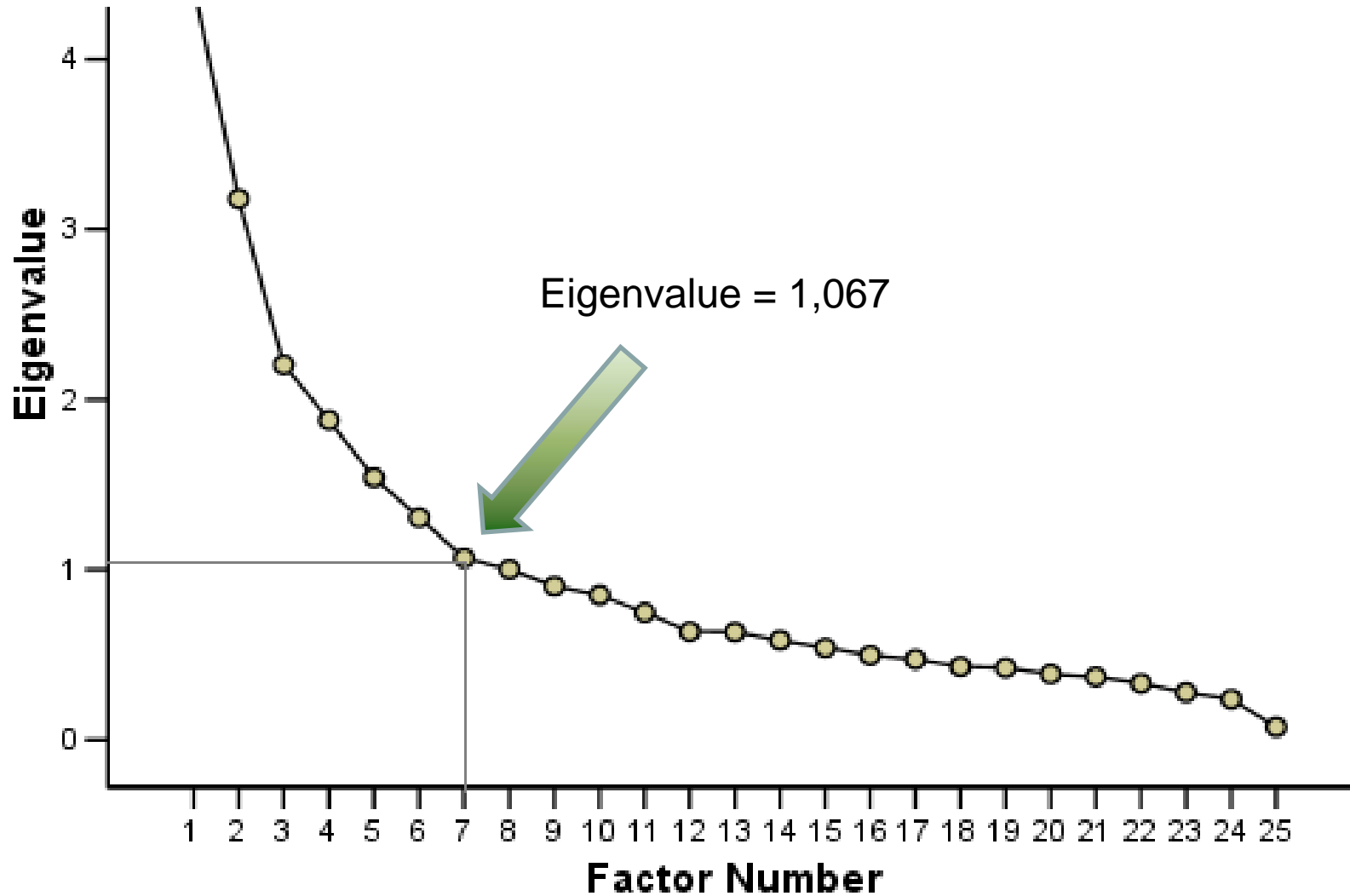
- ✓ Choice of the method of rotation;

Varimax rotation method has been performed

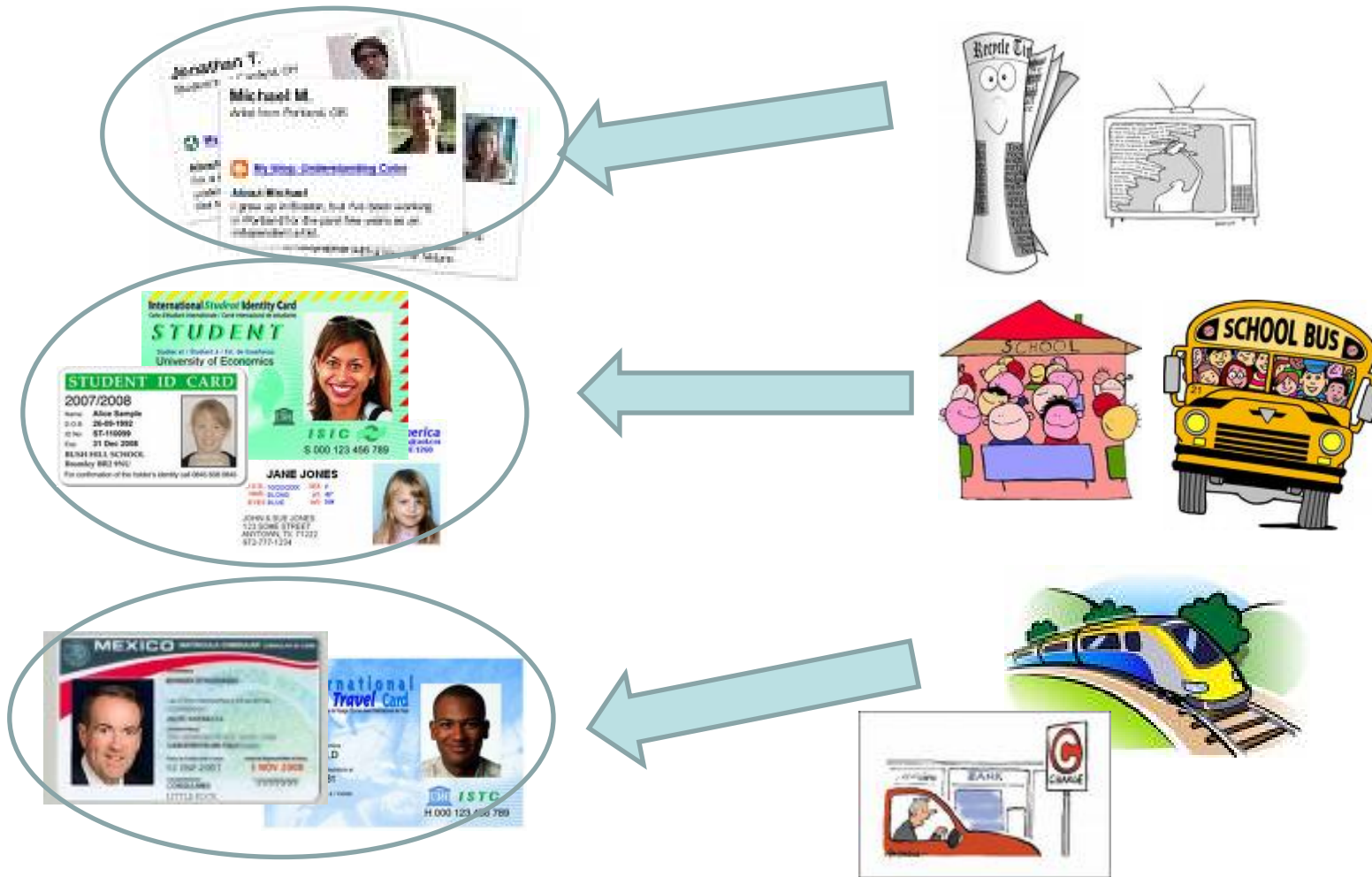
- ✓ Interpretation of the factors.



# Scree plot



# Cluster analysis: main goals

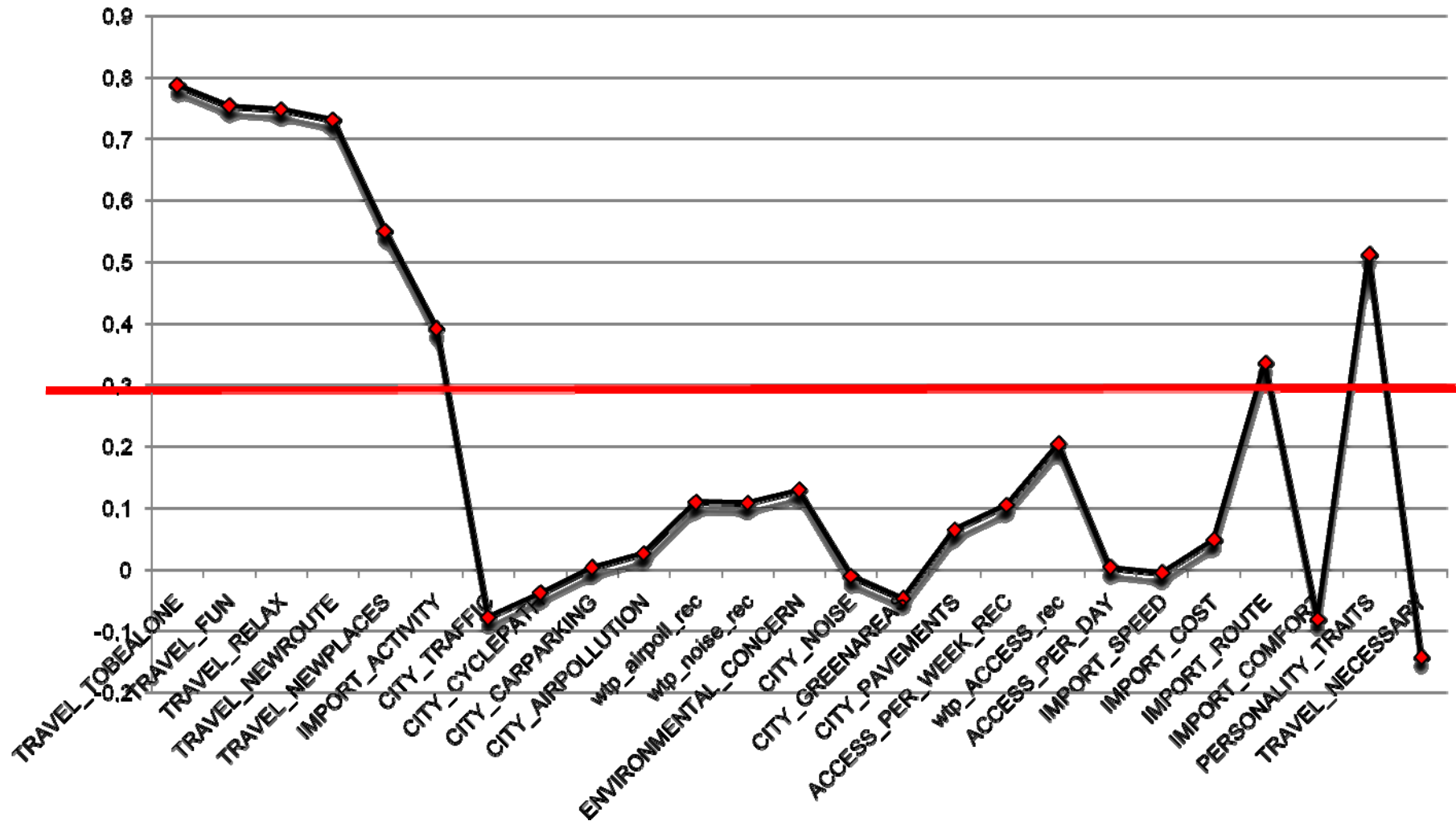


The definition of homogeneous groups of transport users

To create future transport policies tailored to these unique users' profiles

# RESULTS

## 1-Dim loading plot for Fac 1: «Travel pleasure»

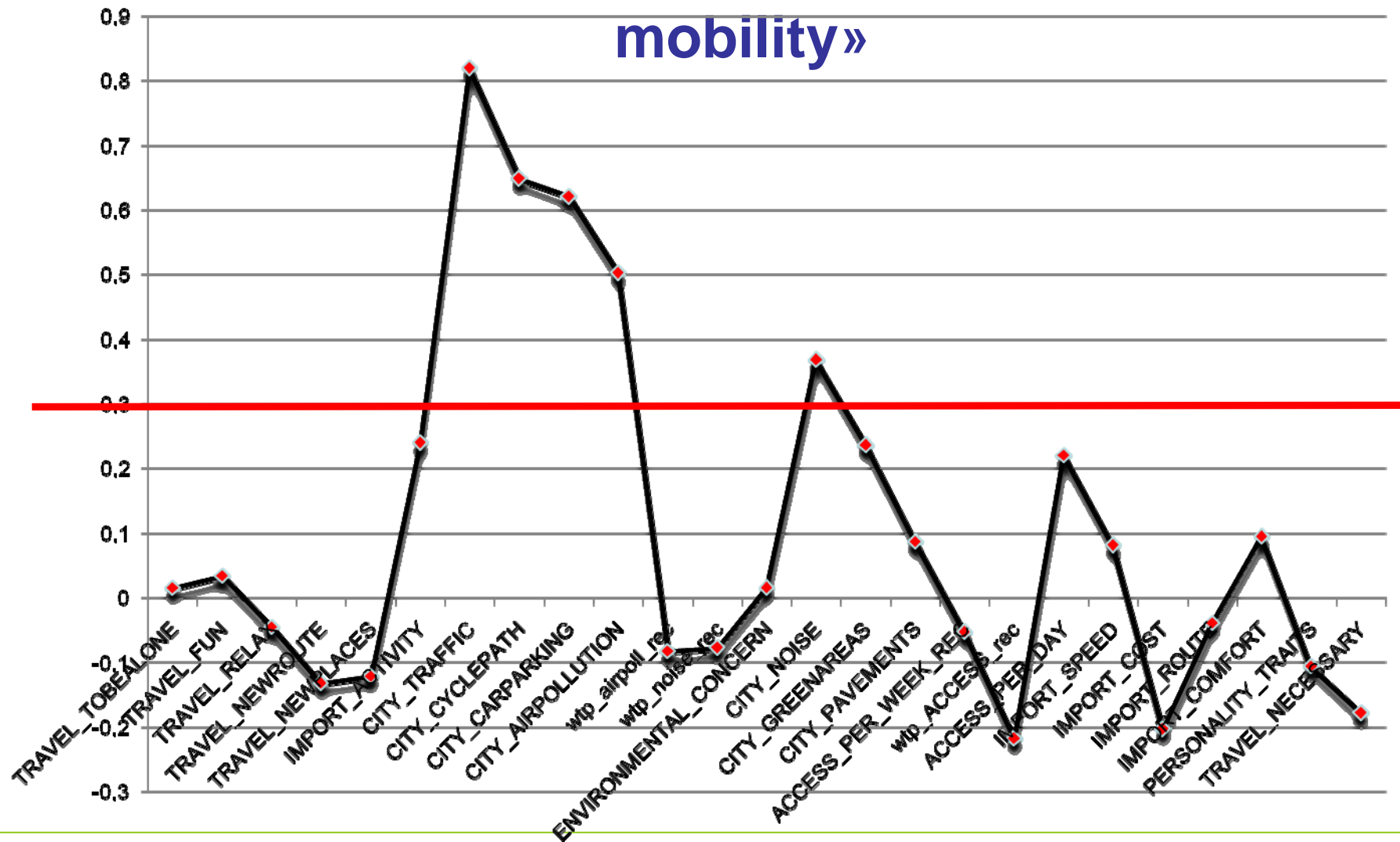


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# RESULTS

## 1-Dim loading plot for Fac2: «City quality for mobility»

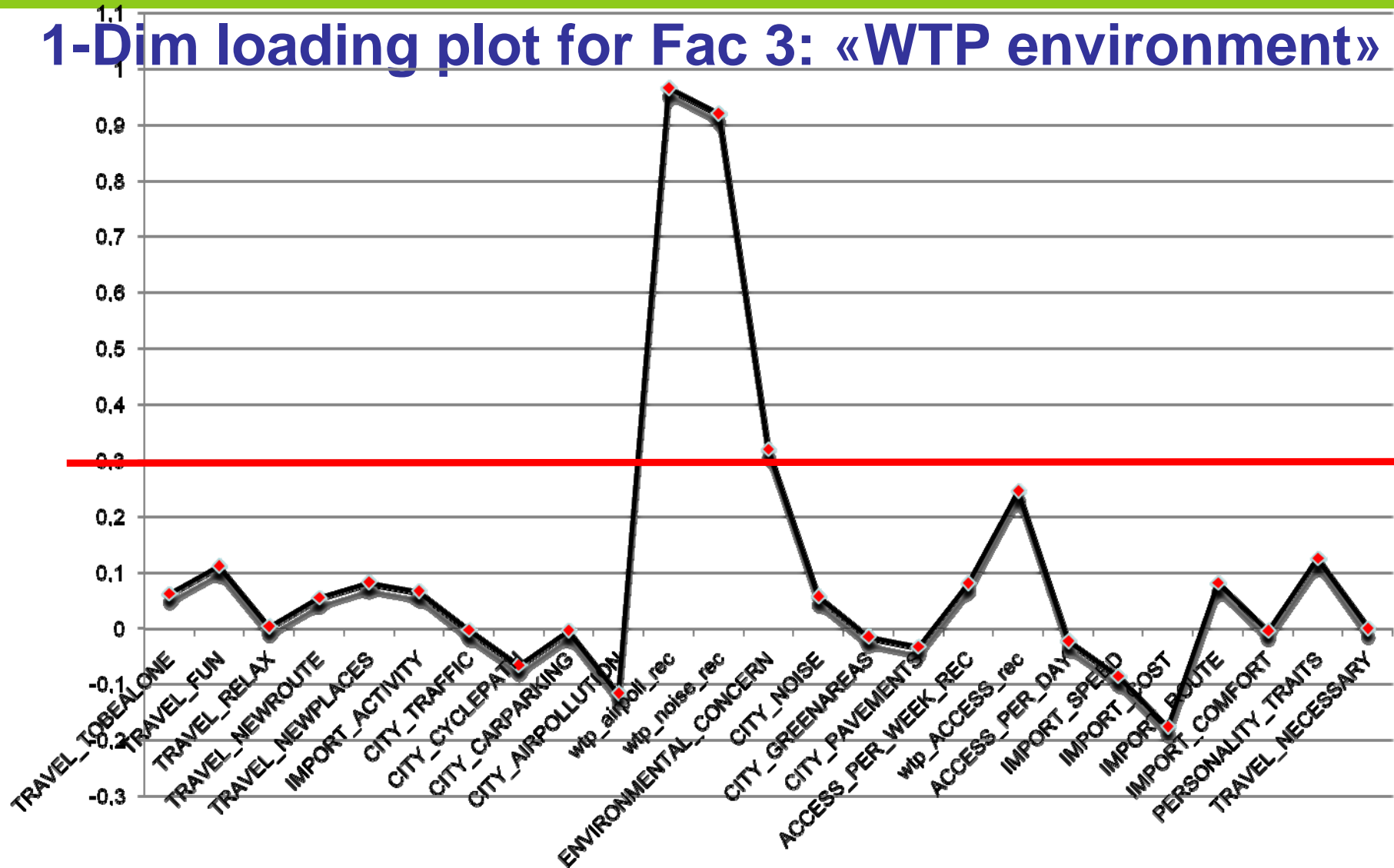


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# RESULTS

## 1-Dim loading plot for Fac 3: «WTP environment»

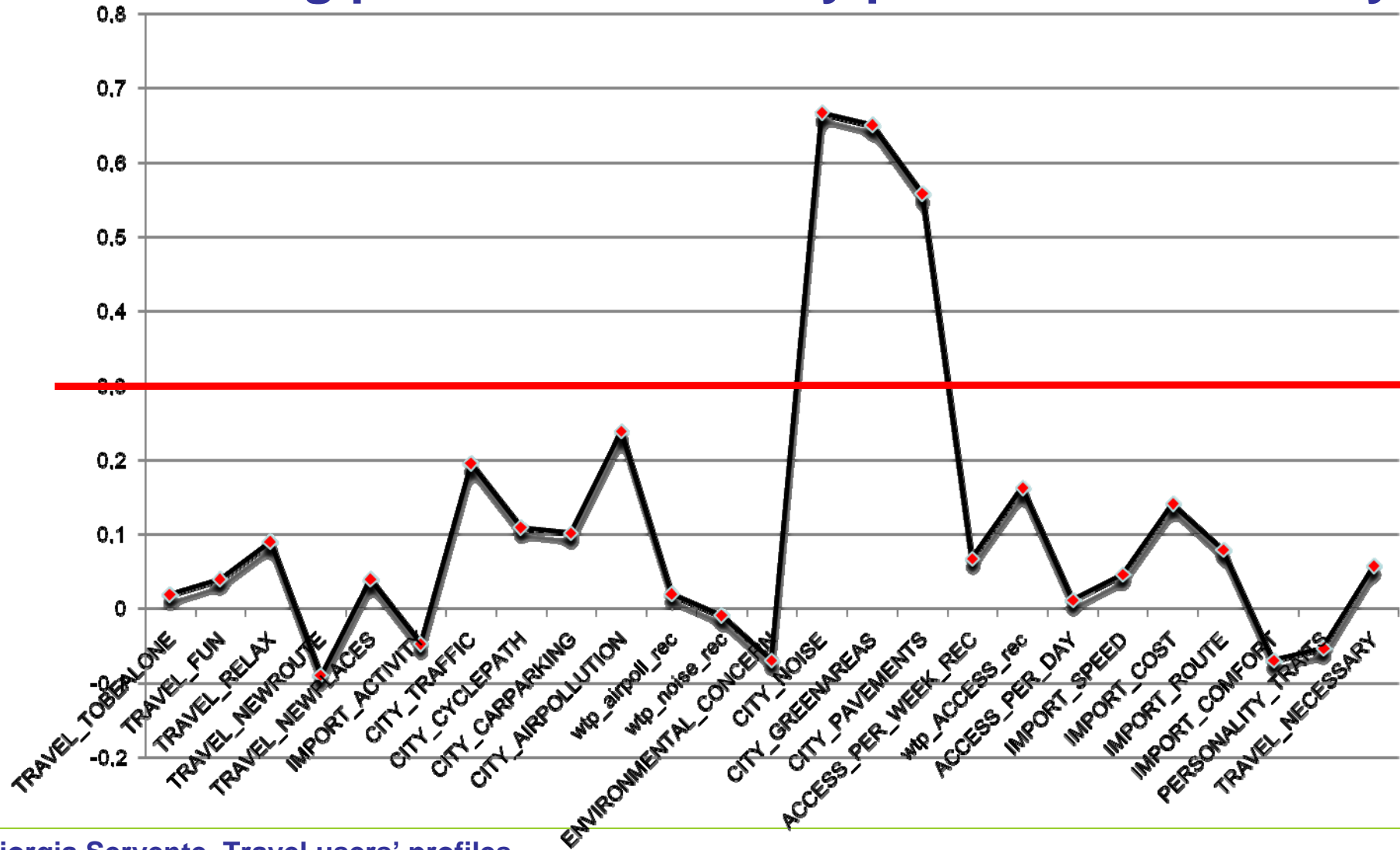


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# RESULTS

## 1-Dim loading plot for Fac 4: «City pedestrian liveability»

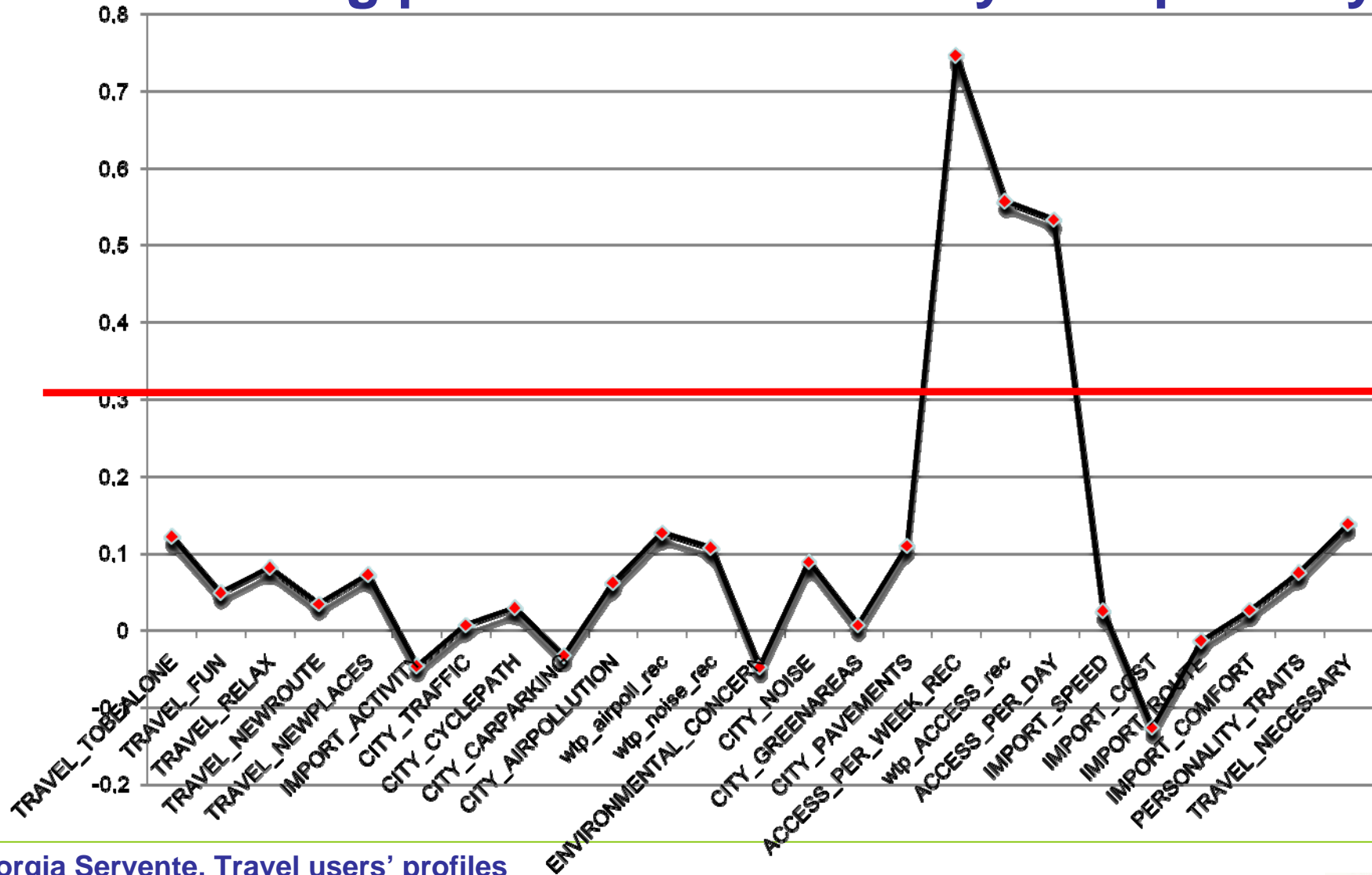


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# RESULTS

## 1-Dim loading plot for Fac 5: «Policy acceptability»

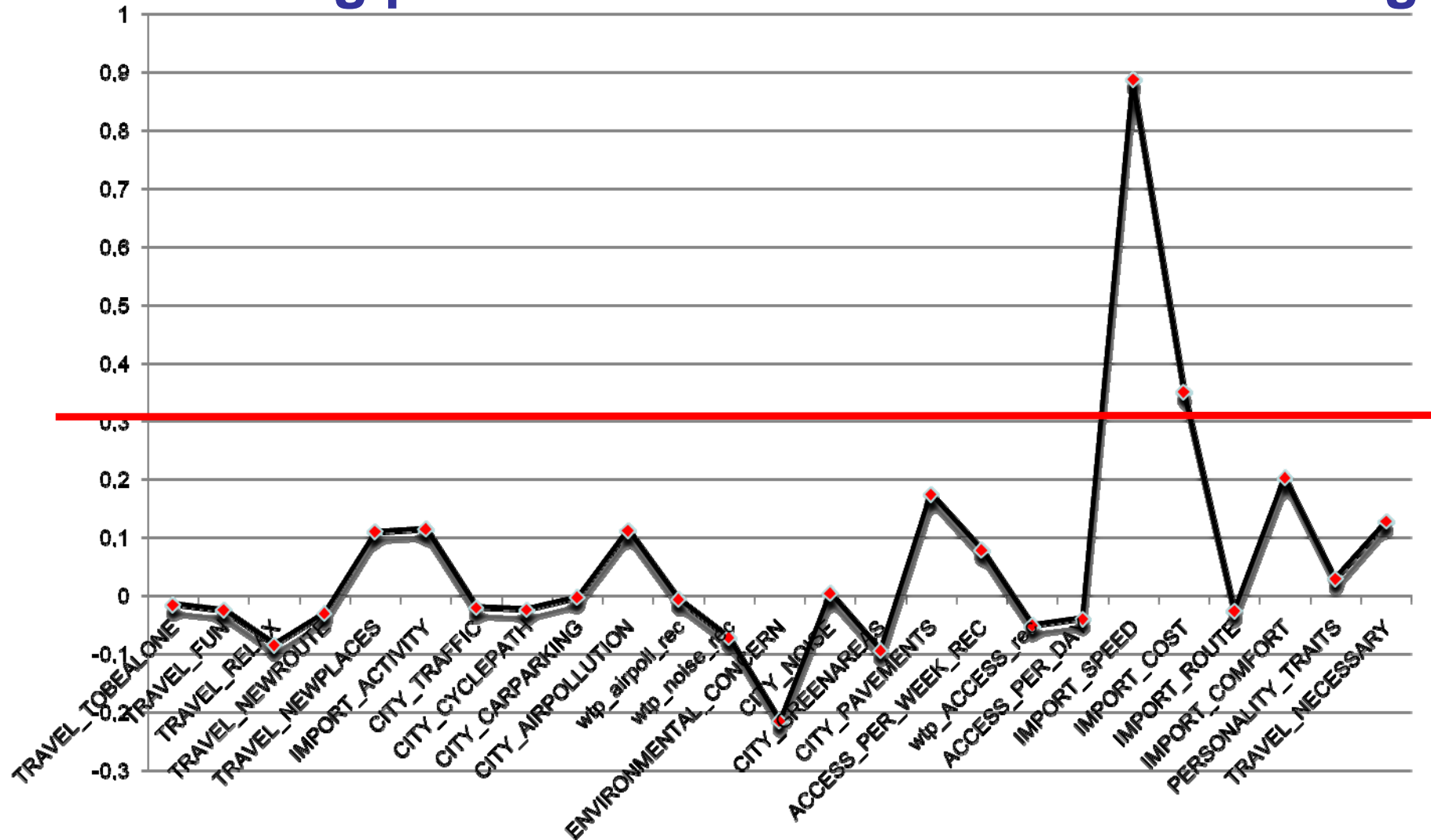


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# RESULTS

## 1-Dim loading plot for Fac 6: «Time and cost saving»

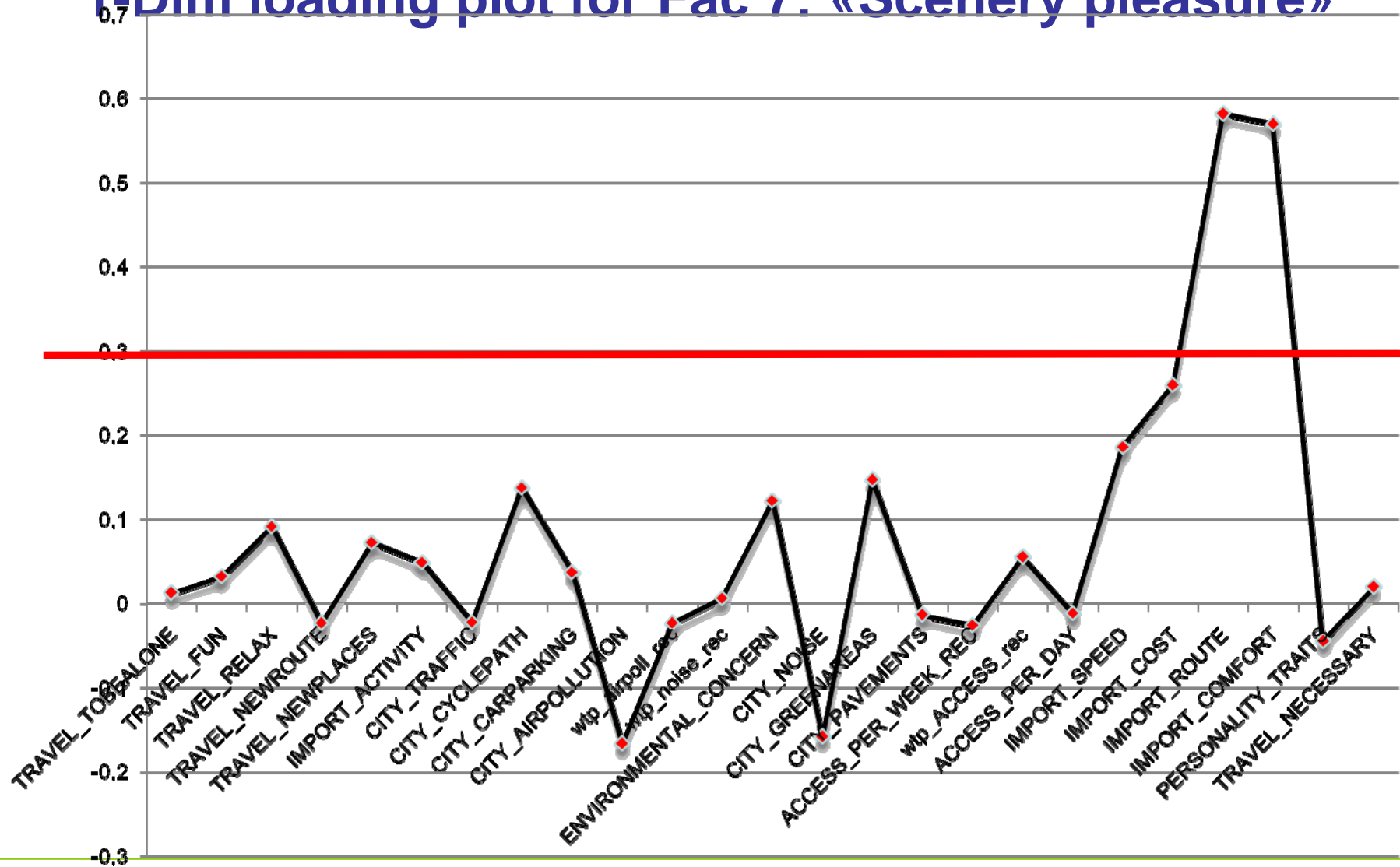


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# RESULTS

## 1-Dim loading plot for Fac 7: «Scenery pleasure»



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# RESULTS

The variable “travel necessary” (=“travel for need”) has no importance to describe the dataset, it does not provide any additional information.

## The five cluster centers into the 7-Dim Factor space

Cluster	Factor 1 Travel Pleasure	Factor 2 City quality for mobility	Factor 3 WTP environment	Factor 4 City pedestrian liveability	Factor 5 Policy acceptability	Factor 6 Time and cost saving	Factor 7 Scenery pleasure
<b>1</b>	<b>-0,57</b>	<b>0,46</b>	<b>1,04</b>	<b>0,07</b>	<b>-0,04</b>	<b>0,37</b>	<b>-0,10</b>
<b>2</b>	<b>-0,53</b>	<b>-0,18</b>	<b>-0,82</b>	<b>-0,08</b>	<b>-0,24</b>	<b>0,38</b>	<b>0,11</b>
<b>3</b>	<b>0,44</b>	<b>1,14</b>	<b>-0,52</b>	<b>0,43</b>	<b>1,04</b>	<b>0,01</b>	<b>0,18</b>
<b>4</b>	<b>0,97</b>	<b>-0,49</b>	<b>0,37</b>	<b>0,05</b>	<b>0,01</b>	<b>0,04</b>	<b>0,07</b>
<b>5</b>	<b>-0,49</b>	<b>-0,10</b>	<b>-0,04</b>	<b>-0,42</b>	<b>-0,26</b>	<b>-1,73</b>	<b>-0,47</b>

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# RESULTS

## Cluster 1: «travellers for necessity–hopefully green»

The *first cluster* includes 89 people, 19% of the global database

They give high importance to their time, and their travel has to be as quick and inexpensive as possible;

They don't enjoy travelling, they would rather stay at home;

They are willing to pay to reduce the air and the acoustic pollution

Consider themselves to be sensitive towards the environment

They are satisfied about city quality from the point of view of the mobility.



## Cluster 2: «travellers for necessity–small budget»

The *second cluster* includes includes 142 people, 30% of the total data set

They don't enjoy travelling and going far away from home to visit new places ;

They consider very important to save money and time for their habitual travel;

They are not willing to pay anything to improve the quality of the air and reduce the noise;

They don't consider themselves very sensitive towards the environment



## Cluster 3: «Die hard drivers»

The *third cluster* includes 49 people, 10,4% of the global database

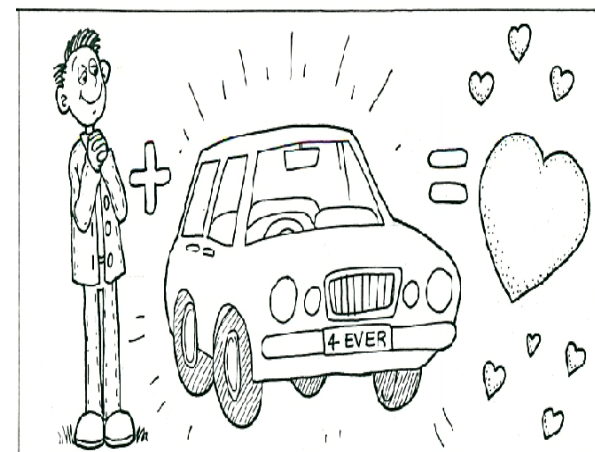
They show high degree of satisfaction for the city quality, especially for transport users and also for pedestrians;



They enjoy travelling very much;

They are not willing to pay to reduce the air and the acoustic pollution

They would not renounce to the car even if they had to pay a tax to get into town



## Cluster 4: «Adventure seekers hedonist»

The *fourth cluster* includes 135 people, 28,85% of the global database



They enjoying travelling very much, they like adventure travels and in general to visit new places;

They are willing to pay to reduce the air and the acoustic pollution

They are not satisfied of the quality of the city of Alessandria as transport users.

They perceive the travel not only as a mean to reach a certain destination, but also as a mean to do something different and they get a certain pleasure from the travelling activity;



## Cluster 5: «Non active individuals»

The *fifth cluster* includes 53 people, 11,32% of the global database

They are not interested in saving time and money and don't give high importance to their time;

They don't enjoy travelling;

They complain about city quality: few green areas, bad quality of pathways and high noise level

More than 40% of people in this cluster are over sixty years old while individuals under twenty-five years old represent only 6%.



# Conclusions

1. travelers for necessity—hopefully green

2. travellers for necessity—small budget

3. die-hard drivers

4. adventure seekers hedonists

5. non-active individuals

the improvement of public transport supply and of pedestrian/cycle facilities, together with a strong endorsement of the positive attributes of these “green” modes, represent the possible best solution for all the identified clusters.

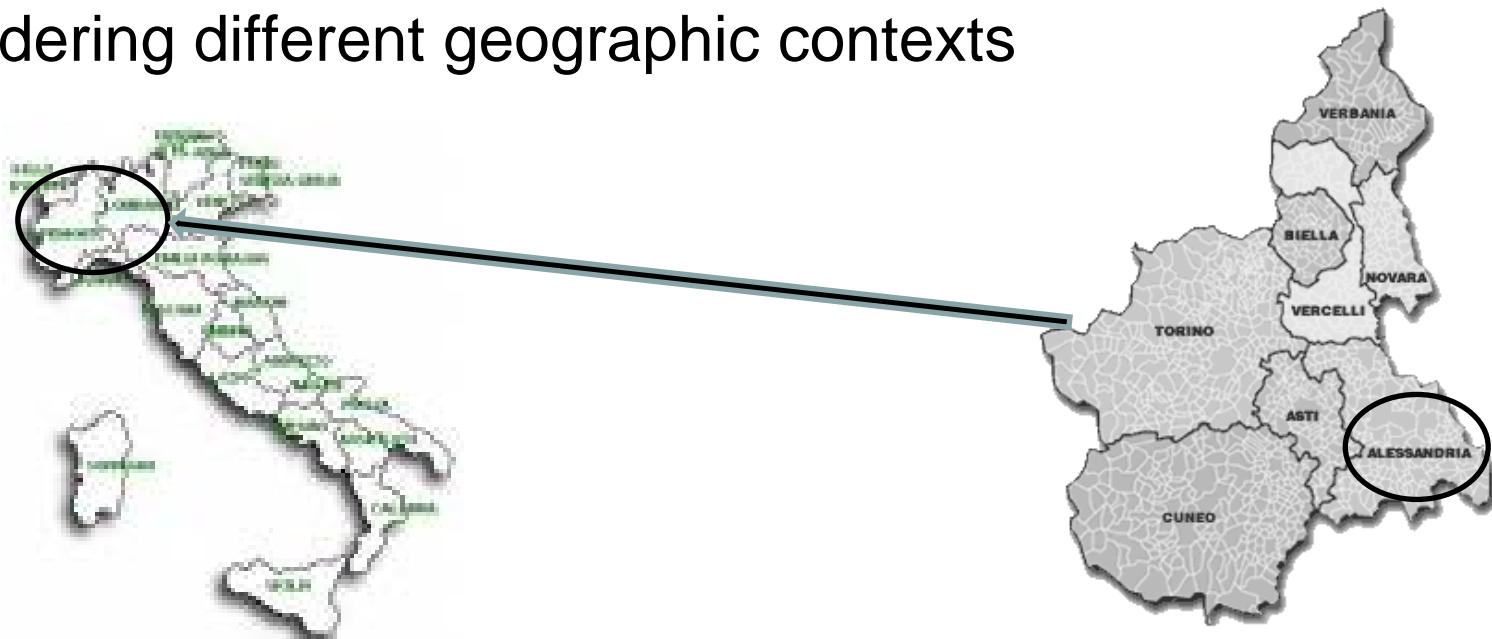


FEHRL



# Future Endeavours

1. A specific “ad hoc” questionnaire is needed to have a actual knowledge of transport behavior: it seems mandatory to focus on particular users’ attitudes and preferences.
2. Validation of the clusters attained is needed, also considering different geographic contexts



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**Thank you very much for your attention!**  
**Questions are welcome!**



## Appendix: socio-demographic cluster description

		Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5	
		N	%	N	%	N	%	N	%	N	%
<b>Cluster weight (dimension)</b>		89	19.02	142	30.34	49	10.47	135	28.85	53	11.32
<b>Internal expl. variance</b>		0.1365		0.164		0.0722		0.1287		0.115	
<b>Sex</b>	Male	42	47.19	61	42.96	22	44.9	61	45.19	14	26.42
	Female	47	52.81	81	57.04	27	55.1	74	54.81	39	73.58
<b>Age</b>	18 to 25 years	9	10.11	12	8.45	6	12.24	15	11.11	3	5.66
	26 to 40 years	25	28.09	34	23.94	11	22.45	57	42.22	8	15.09
	41 to 60 years	42	47.19	61	42.96	27	55.1	49	36.3	21	39.62
	over 60 years	13	14.61	35	24.65	5	10.2	14	10.37	21	39.62

		Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5	
		N	%	N	%	N	%	N	%	N	%
<b>Education</b>	Secondary school	17	19.1	47	33.1	13	26.53	10	7.41	13	24.53
	High school	48	53.93	63	44.37	29	59.18	91	67.41	25	47.17
	University degree	19	21.35	14	9.86	5	10.2	32	23.7	4	7.55
<b>Occupation</b>	Worker	6	6.74	17	11.97	2	4.08	6	4.44	1	1.89
	Office-worker	22	24.72	24	16.9	4	8.16	26	19.26	9	16.98
	Retired/housewife	18	20.22	50	35.21	15	30.61	23	17.04	24	45.28
	Student	10	11.24	9	6.34	5	10.2	28	20.74	3	5.66
	Others	33	37.08	42	29.58	23	46.94	52	38.52	16	30.19
<b>Income</b>	Less than 1000 €	20	22.47	30	21.13	8	16.33	23	17.04	16	30.19
	From 1000 to 3000 €	49	55.06	100	70.42	30	61.22	65	48.15	25	47.17
	More than 3000 €	20	22.47	12	8.45	11	22.45	46	34.07	11	20.75
	Missing	-	-	-	-	-	-	1	0.74	1	1.89

		<b>Cluster 1</b>		<b>Cluster 2</b>		<b>Cluster 3</b>		<b>Cluster 4</b>		<b>Cluster 5</b>	
<b>Wed_mode</b>	Auto	54	60.67	78	54.93	33	67.35	62	45.93	18	33.96
	bus/tram/metro	3	3.37	9	6.34	1	2.04	3	2.22	2	3.77
	Bici	7	7.87	6	4.23	3	6.12	13	9.63	4	7.55
	Foot	14	15.73	30	21.13	6	12.24	22	16.3	15	28.3
	Train	5	5.62	8	5.63	5	10.20	33	24.44	7	13.21
	Missing	6	6.74	11	7.75	1	2.04	2	1.48	7	13.21

### Variance explained

<b>Factor</b>	<b>Initial Eigenvalues</b>	<b>% of Variance</b>	<b>Cumulative %</b>
1	4.4297	17.7188	17.7188
2	3.1801	12.7203	30.4391
3	2.2049	8.8194	39.2585
4	1.8784	7.5136	46.7721
5	1.5418	6.1671	52.9392
6	1.3057	5.2228	58.1621
7	1.0672	4.2690	62.4310
8	1.0013	4.0053	66.4363