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Happiness in Transport Decision Making Process – The Swiss Sample

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Abstract

Introduction of different dimensions in the individual decision process has been of increasing interest to behavioural economists. This work is a progress to previous research in which the happiness dimension was introduced along with the common deeply investigated economic trade-offs. In the present work, happiness is disaggregated in two different concepts: Experienced and Expected Happiness. Experienced Happiness results from the influence of previous similar experience evaluation and memory phenomena's. Expected Happiness aggregates the influence of the predicting capability of an individual, the expectations, the motivations and the hidden beliefs in the decision process. These two concepts are integrated in a Mixed Multinomial Logit with panel data consideration that reveals interesting results, suggesting innovative approaches in order to better understand the transport users' choice behaviour. The choice based sample used for model estimations is a convenience sample in which the Swiss participation is highly significant, accounting for 44 % of the total answers. In the present work particular attention is given to the Swiss respondents by calibrating the models using only data from the Swiss choice experiments. The results are similar to the overall sample, with some interesting differentiations on the preferences and values of time of the Swiss respondents. The main findings comprise the significance of Experienced and Expected Happiness in the transport mode decision process; and that these concepts are much more related to the choice of private car as opposed to the choice of public transport (metro). The conclusions arisen might contribute to a better understanding of the transport market demand, supporting the improvement of strategic decisions of policy makers.

Keywords

Experience, Expectations, Memory, Happiness, Discrete Choice Models, Mixed Logit Models, Transport Surveys.

1. Introduction

‘‘Happiness…belongs to that category of words the meaning of which everybody knows but the definition of which nobody can give’’ as Howard Mumford Jones stated (cited in (Freedman, 1978)).

According to (Veenhoven, 2004), empirical research on happiness has started in the 1960's in many branches of the social sciences. Developing from social indicators research, in sociology, subjective indicators were introduced in addition to traditional objective indicators, and happiness gained a major importance as the main subjective indicator of social system performance.

It has been recently acknowledged the contribution of behavioural science in economic field, and the new challenges on measuring and quantifying the motivations and perceptions that drive the consumers’ motivation. In 1789, Jeremy Bentham introduced the concept of final ‘utility’ as human ‘happiness’ (Veenhoven, 2004), and this philosophy, known as ‘Utilitarism’ expresses happiness as both the presence of pleasure and absence of pain, a concept brought from the roots of hedonism. According to various research fields it is clear that, on one hand, the word 'happiness' has different meanings, and, on the other hand, these are very often mixed up with the notion of ‘well-being’, which gives the concept a reputation for being elusive (Veenhoven, 2004).

Nowadays, the term of happiness is frequently used for a person’s short-lived state, while the philosophers encompass the concept within a life time. It is suitable to use the idea of ‘”well-being” rather than “happiness”, when discussing the notion of what makes life good for the individual.

The transportation field is undoubtedly embed on daily choice making processes, and therefore plays an important role on the individual’s life, contributing for its overall perception of life satisfaction. The evolution on both complexity and alternatives of choice proposed to individuals by transportation on one hand, and the economic, social, human and environmental dimensions and scales of transportation projects on the other hand, is a very strong argument to focus on target the reasoning behind transport mode choices.

In this sense, importing the main findings of recent research on behavioural and economic sciences to the grounds of transportation research, the present work evaluates the impacts of happiness on bi-mode transportation decision-making process – private car and metro (public transport), centred on quantifying the impacts of stated and expected happiness, as two differentiated parts of the happiness. What is the impact of both stated and expected happiness

on the transport mode decision process was the question addressed, and for this study two types of trip purpose were explored - work and leisure.

This paper is structured in six sections. The present section introduces the work explored. Section two discusses the concepts of happiness and well-being and brings some insights within happiness ground and transportation field. Section three describes the behavioural framework and the methodological approach. In section four data collection methodology is presented, followed by the model estimations and main results on section five. The final section presents the most important conclusions and recommendations for further research.

2. State of the Art

Research on happiness field has been introduced by economists in the 18th century focusing on the aim of defining and quantifying the utility of a personal choice. Focused on individuals within their lives, psychology field has, since their early stages, concerned about observing and developing measures of individuals' well-being.

During the 20th century psychologists and other fields' scientists developed interest in the study of happiness, pursuing the aim to use empirical methods to answer questions like - "What is happiness? Can it be measured? What causes happiness?" (Diener, 2003).

The most recent research developments, pursued in last decades, have strengthen the importance on the individuals' behaviour to understand, not only their choices, but also how can this be incorporated in the modelling tools that are used to picture present demands and future calls on society levels such as economy, transport and social policies, among other. Following this, it is presented a high level summary of the research findings in several areas of knowledge, such as Psychology, Economy and Transportation fields concerning the happiness context.

2.1 Happiness in Psychology Field

To date, the study of subjective well-being (SWB), human strengths and positive psychology has substantially increased. One consequence of this 'positive psychology' focus has been the proliferation of new measures based on clear definitions, strong theoretical frameworks and rigorous methodology (Kashdan, 2004). Presently, some of the positively constructs under study (e.g. purpose of meaningfulness, kindness, curiosity, etc.) have shown positive relationships with SWB. Future prospective studies may find bi-directional relationships among these constructs and SWB.

As stated by Kashdan (Kashdan, 2004), there are several empirically informed models, with a large degree of overlap, on the structure of SWB. Based on the definition that assumes SWB as the combination of three specific factors: (a) frequent and intensive positive affective states; (b) the relative absence of anxiety and depression; and (c) global life satisfaction, it becomes apparent that most studies of SWB measure either the affective or cognitive component, but not both.

According to Sandvik et al. (Sandvik *et al.*, 1993), one of the most common scales used to measure happiness is composed by the following classification: (a) very happy; (b) fairly (or pretty) happy; (c) not too happy; (d) unhappy. The main advantage of using this scale is its

simplicity, while one of the disadvantages is related with its comparable difficulties. Moreover, the amount of happiness is subjectively determined by the respondents. The subjectivity limitation can be surpassed by adopting a level of zero happiness, and a simple way to identify this zero-reference level is by introducing an intermediate level on the scale – neither happy nor unhappy.

One of the most recent methods applied in the attempt of measuring happiness is the Experience Sampling Method (ESM), also known by the names of time sampling, beeper studies and Ecological Momentary Assessment (EMA), during which the participants fill out a questionnaire several times a day. The questionnaire asks about the participant's current activities, conditions and feelings (Diener, 2000).

Another approach of measuring SWB is the Day Reconstruction Method (DRM), which seems to be a more practical method (Kahneman *et al.*, 2004). The respondents should keep a diary of events of the day before. Then, they rate a set of positive and negative feelings about the events (Kahneman *et al.*, 2004). Generally, DRM has been designed to collect data that describes the experiences a person has on a given day, through a systematic reconstruction conducted on the following day.

Finally one other way of measuring SWB is by the frequency that people smile when they recall positive memories in comparison with negative emotions (Sandvik *et al.*, 1993). Additionally, with the help of technology, researchers have been able to possess stronger and more reliable forms of assessing a positive or negative individual reaction in different activities.

2.2 Happiness in Economy Field

Economists have had a long-standing inclination for studying people revealed preferences, which means taking into account individuals' actual choices rather then their stated intentions or subjective reports about their preferences. However, people do often make choices that are highly embed with their own sense of happiness or well-being (Kahneman *et al.*, 2006).

In the past, the term of happiness was part of philosophy and psychology territory; nowadays, it can also be regarded as a province of economics. However, economists are not interested in the meaning of this term but in its quantification. By this way it is expected to assess the success of economic policies in terms of their impact on people's happiness.

According to Frey and Stutzer (Frey *et al.*, 2002) subjective well-being can be considered a useful approximation to utility in the economic science, while happiness is a concept very close to utility but not identical. These authors consider four economic elements that affect

happiness: income; unemployment; inflation and effects of democracy (in terms of economic growth).

On a macroeconomic point of view, the majority of the economists conclude that money (higher income) can bring high value of happiness, because individuals (or countries) can buy and consume more products or services. However, there are economists who do not agree with this argument. Easterlin (Easterlin, 1974) was the first economist who supported the idea that "money does not buy happiness", others have been adding arguments on this idea (Diener *et al.*, 2004). Layard (Layard, 2005) found that countries like USA, UK and Japan have become richer, and their residents on average are no happier as depression, suicide, and alcoholism have increased. With regard to the poorer countries happiness is observed to increase with higher income. This author concludes that "all the evidence suggests that extra income certainly matters, but only when we do not have a lot of it", and that income is not the only variable for happiness.

Still in a macro level on the economic focus, the effects of unemployment are felt on the reduction of the individual and society's well-being. Differences between well-being and unemployment in terms of gender and age are identified in some studies, for example: unemployment on average weights more heavily on men than on women; or people in the middle working life suffer more than younger and older when unemployment hits them. In a study of Knut and Stephan (Knut *et al.*, 1996) it was found that the happiness of German women over 50 years was not affected by unemployment.

Additionally, Clark and Oswald (Clark *et al.*, 1994) conclude that people with low education have a lower decrease in their SWB due to unemployment than people with higher education. Clark (Clark, 2006), in his working paper, argues that unemployment and happiness are correlated positively because unemployed people learn how to live while unemployed or find friends who are unemployed too. This author also identifies another reason, for this positive correlation, which refers to adoption and habituation, and concludes that the effect of unemployment in life satisfaction falls with unemployment duration in the British Household Panel Survey, but rises with unemployment duration in the German Socio-Economic Panel.

In what relates to inflation, the study of Frey and Stutzer (Frey *et al.*, 2002) states that "Happiness research finds out that inflation systematically and sizably lowers reported individual well-being. In European countries, the effect on happiness of a 1.0 percentage point increase in unemployment is compensated by a 1.7 percentage point decrease in inflation".

On the effects of democracy, it has been observed that commitment to public decisions and decentralization does contribute to happiness.

Moreover, on a microeconomic approach, there are other issues that economists are interested in as far as individual SWB is concerned: happy and unhappy people act differently in activities, such as saving and spending (Kahn, 1993), and the dimension of work behaviour, as the majority of satisfied employees are productive (Iaffaldano *et al.*, 1985). Notwithstanding, it is to point out a currently under investigation field that aims to understand if happy people-investors are willing to take higher or lower risk investments and also, if happy investors would prefer different markets and types of financial investments.

The present work aims to contribute on the microeconomic dimension of the happiness impact, endeavouring the comprehension on the effects of happiness variables on the individual behaviour.

2.3 Happiness in Transportation Field

Transportation has been a significant field of experimentation to understand human behaviour, as worded by McFadden (McFadden, 2007): "Transportation is affected by human behavior through its consumers (drivers, riders, vehicle buyers, and shippers); through its managers and workers; and through the policy-makers and voters who determine transportation infrastructure and policy."

The introduction of the happiness thematic in transportation has been highly related to the behavioural approach introduced in the transport mode choice models and also the impact of travel happiness in the overall well-being perceived by individuals.

Ory and Mokhtarian (Ory *et al.*, 2005) undertook a project that aimed to measure how much individuals like to travel. For this purpose they have proposed, to use on 32 statements, a five-point Likert-type scale: (a) Strongly Dislike, Dislike, Neutral, Like and Strongly like. They have investigated the travelling satisfaction according to: transport mode; trip purpose; and travelling distance (short and long distance travel). Some of the main conclusions were that travellers' attitudes and personality are more important determinants of Travel Liking than objective travel amounts (costs).

Abou-Zeid M. is currently working in her PhD thesis with her supervisor Prof. Ben-Akiva M. on exploring the interrelationship between transportation and happiness (Abou-Zeid, 2008), (Ben-Akiva *et al.*, 2007), (Ben-Akiva, 2007). She has developed a cross-sectional travel and activity well-being survey which was conducted with a sample of commuters in the summer of 2007. Two main findings emerged from the analysis of this survey: first, commute satisfaction was found to be related to commute stress, social comparison, personality, and

overall well-being; second, happiness experienced from performing an activity was found to be related to the propensity of activity participation.

The above state of the art indicates that there is an innovative field of research involving transportation and happiness. This research field will borrow and encompass several methodologies and findings from the fields of psychology and economics, adapting and extending them in the transport domain. In this research, we are particularly interested in developing advanced demand models that are behaviourally realistic and include the notion and impacts of happiness in the travellers' choice behaviour. The following sections comprise the behavioural framework, data collection and modelling methodology adopted to accomplish the above mentioned objectives.

3. Research Methodology

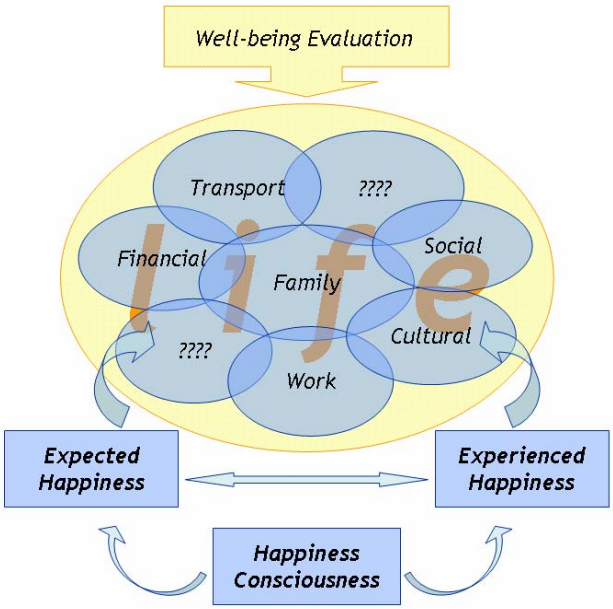
3.1 Behavioural Framework

The methodology development requires the definition of the terms of "well-being" and "happiness". However, as described in Section 2, happiness and well-being are two concepts that imply a personal evaluation (both individually and emotionally related). Therefore, it is unrealistic to state a global and unique definition for both concepts.

One can think of happiness as a personal positive reaction to a certain environment or system in a certain time frame. In this sense, the perceived happiness depends on both the environment considered and the different personal points of view among individuals.

On the other hand, well-being can be understood as the perceived evaluation of the overall life environment or system. If the domain of this evaluation is reduced to a sub-system of each one's life, happiness and well-being, can be seen as depicted by Figure 1.

Figure 1 Well-being Evaluation and Happiness Access

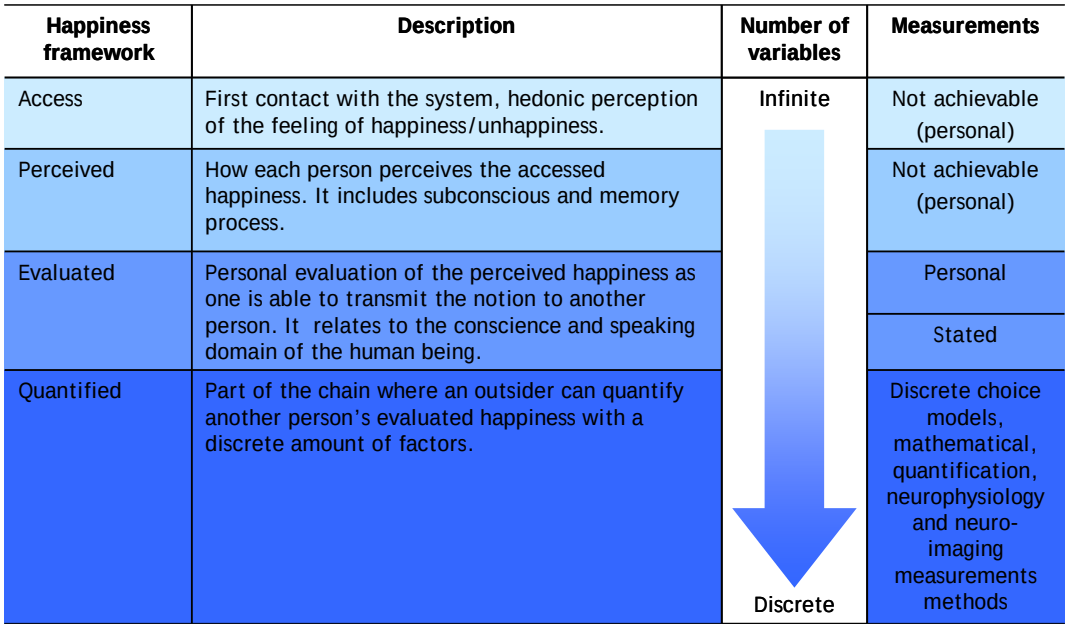


The perceived evaluation of well-being and happiness are a highly emotional related evaluation that combines an infinite number of variables and factors, as all complex reactions of human beings.

This infinite number of variables is reduced when one reduces the size and complexity of the system. However, at the individual level one is always dealing with an infinite number of variables involved in the perceived happiness. As an outsider, one can never state and quantify all the variables and factors involved in the perceived happiness of another. As a result, self-responding questionnaires with stated ranking of happiness are commonly used. Following this perspective, one can foreseen happiness framework as presented in Figure 2.

The main conception illustrated is that the process that takes one from the accessed to the evaluated happiness already comprises a lost in the knowledge of variables that explain the accessed happiness. This loss can be explained by: (a) the amount of self knowledge an individual can have; and (b) the memory effects and all subconscious processes that each individual is not aware of.

Figure 2 Happiness Framework Description



Once more, one looses information when asked to report this perceived happiness to someone else. An emotional context is normally very difficult to translate into a dialogue. Imagine one have to explain how it feels to eat the best sweet one can have. Someone might be able to write thousands of words about that, but there is always something missing, something that really transfers this feeling to an interlocutor. In the end of the day, probably one will say: "You have to try it, I can't explain it".

Bearing this human related characteristics (and limitations, in a quantifying and unique conceptual approach), one suggests that perceived happiness can be very distant from

evaluated happiness, considering evaluated happiness the way an individual can express own happiness to another person. The method commonly used to assess evaluated happiness is to ask a person to rank the perceived happiness as a way to evaluate their level of happiness. This can drive to very dubious results, as people do not share the same reference point, so the scale proposed does not fit the personal scale of the respondents. However, this is one of the best ways to evaluate happiness.

Nevertheless, in order to quantify happiness as a function of some variables a huge amount of information will be lost. One will need to adopt a discrete number of variables, disregarding all the other (infinite) variables involved in the individuals' happiness context. Normally, this procedure requires relating the stated happiness with the descriptive variables, and essaying the calibration of a mathematical expression for happiness in a determined system.

The following description attempts to adapt the above framework on a transportation context.

Since the main scope of this project is to evaluate the impact of happiness in the decision process of a transport mode, it is aimed to identify the relationship involving stated happiness and social demographics factors with the choice between using the private car or metro (public transport).

Following, the overall well-being and the stated happiness is related with several topics incorporated in the decision process:

- Do people feeling happy with their life, as opposed to unhappier people, choose the same transport mode?
- How do different stated happiness indicators explain distinct behaviours on transport mode choice?
- Does stated happiness with the used transport mode influence people's overall stated happiness?

Moreover, the distinction between well-being and individual happiness unveils two latent concepts, differentiated within the proposed happiness framework: Experienced and Expected Happiness.

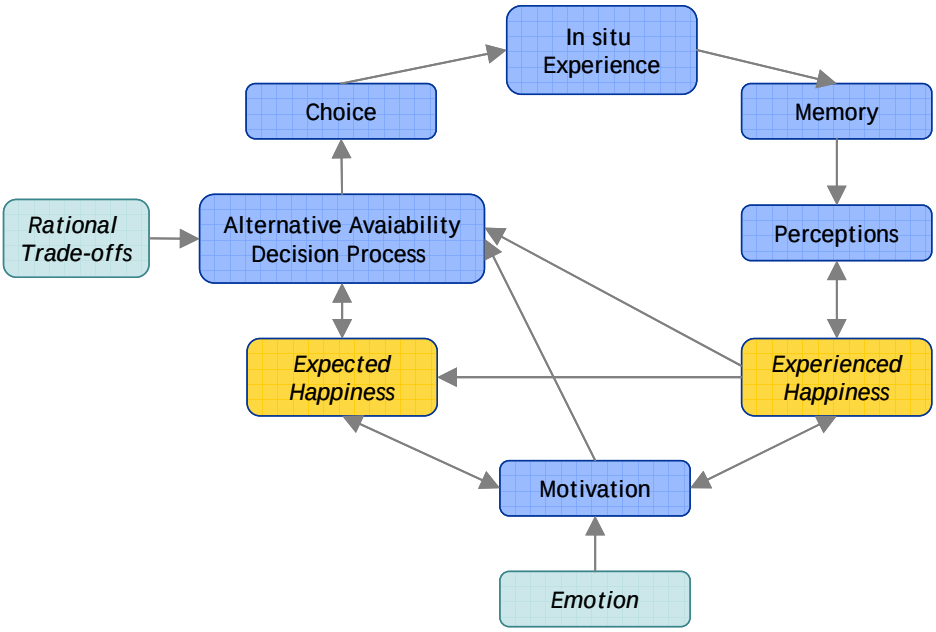
The memory of a previous experience, choice or environment is an important factor influencing the decision process towards a similar future experience or choice process. This latent happiness assessment is, from now on, referred as Experienced Happiness, and corresponds to a cumulative evaluation process over past experiences with similar characteristics.

However, human beings have also the ability to create predictions based on possible future scenarios. In this sense, Expected Happiness is considered as a result of the assessment of individual expectations, attitudes and evaluation during a decision process. This happiness

component might enable an individual to better face a innovative future experience, in comparison with a previous one, as he can benefit from technology improvements, update of a service, etc.

These two latent concepts interact and are expected to have different type of dynamic correlations within the decision choice process. One's Expected Happiness is certainly correlated with the one's previous Experienced Happiness within a similar situation. In addition there is a dynamic effect in similar consecutive decision processes. While experiencing your decision, an updated Experienced Happiness is constructed, which also depends on your previous expectations. This new Experienced Happiness will influence the next similar decision process. So the cycle is closed and starts again. Therefore, a dynamic compromise between these two latent concepts is expected to help understanding the decision process of an individual. This structure illustrated by Figure 3 was inspired in the behavioural choice model framework suggested by McFadden (McFadden, 2005) and Ben-Akiva *et al* (Ben-Akiva et al., 1999).

Figure 3 Behavioural Choice Model



The hypothesis tested in this work is related to the presentation to respondents of a cartoon aiming to transmit the expected environment when conducting the suggested trip, and then, include the type of environment represented by the cartoon as an attribute in the built discrete choice model. The methodology suggests that, if there is a highly related emotional context on the given response/evaluation, one should transmit an emotional expectation to each alternative. It is world spread that an image may worth more than a 1'000 words.

4. Data Collection Methodology

An on-line survey developed on previous work (Duarte *et al.*, 2008) was used to collect the data for further analysis and model calibration. The survey was built in Php language and MySql was used for the database development.

4.1 Survey Design

The web survey was composed of three parts: the first one intended to capture the behaviour of different social groups through the respondents' social and demographic characteristics; the second comprised a set of questions intended to capture the respondents' happiness in different life domains; the final part, focused on the individuals' travel choice, where they stated their preference for a presented travel option. The experienced happiness questions included on this survey are one of the innovative breakthroughs of this work. Data collection on individual's experienced happiness comprised two questions regarding the transportation field for the two trip purposes addressed in this case study (*How happy do you feel by using your current mode of transport to make a work related trip?; How happy do you feel by using your current mode of transport to make a leisure trip?*).

One other innovative instrument of the survey held is the use of cartoons to help the individuals make their choices. Different transport alternatives were presented to respondents and they were asked to make eight different transport mode choices between metro and private car for a specific trip purpose. In each conducted choice experiment a cartoon was presented as a form of transmitting/suggesting the travel conditions and expected travel environment. Three different cartoons were drawn for each transport mode, representing: high satisfaction; average satisfaction; and low satisfaction, as shown in Figure 4.

Figure 4 Cartoons' Design[1]

Satisfaction Level	Low	Average	High
Private Car			
Metro			

4.2 Descriptive Statistics

The on-line questionnaire remained available for six days during November 2007, at www.civil.ist.utl.pt/~aduarte, and received the total of 1'342 entries, 556 from Switzerland (see Table 1). Approximately 80% of responses, 44% in the case of the Swiss sample, were used to analyse the social-demographic characteristics and the stated happiness of the individuals as several of them did not answer all questions. The model estimations considered 65% of total responses, 44% of Swiss responses, corresponding to complete answered questionnaires.

Table 1 Survey Main Results

	Total # of Entries	**Total %**	**Total # Swiss Entries**	**Swiss %**
Total of Entries in the On-line Questionnaire	1'342	100%	556	41%
Social-demographic and Stated Happiness	1'084	81%	474	44%
Discrete Choice Models	870	65%	387	44%

[1] Originals depicted by Arq. Tiago Veras.

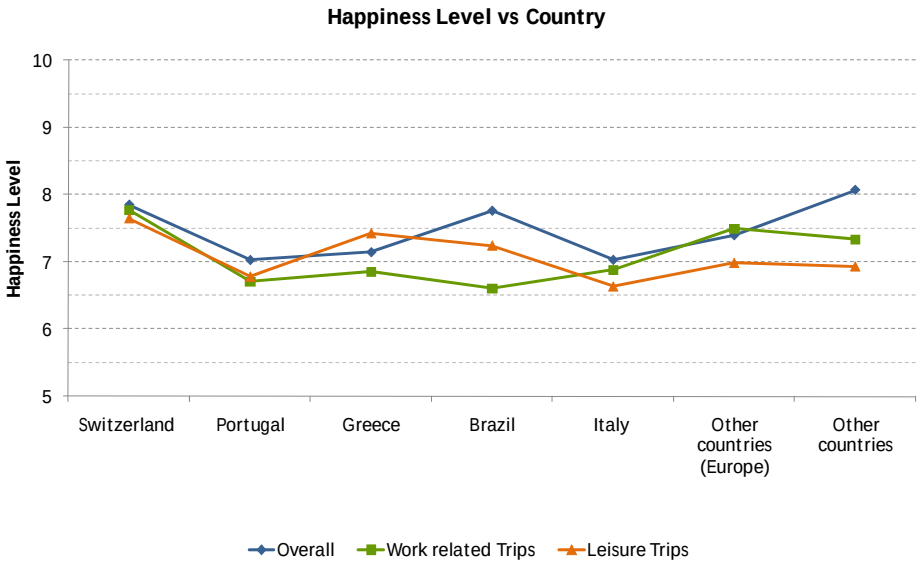
4.3 Descriptive Analysis

The results from the descriptive analysis are extracted from a convenient sample, as one of the targets of the survey held was to capture the socio-economic influences on the transport mode decision choice and not having a country representative sample analysis.

According to the social-demographic answers most of the respondents are from Switzerland, Portugal, Greece and Italy, but responses were also received from other countries, especially from Brazil.

The most important results raised from stated happiness questions show that the overall happiness level has a significant variation by country. An overall perspective demonstrates that the most satisfied respondents are non Europeans, especially the Brazilians. In Europe, the most satisfied are the Swiss respondents and the least happy are the Portuguese and Italians, as can be seen in Figure 5.

Figure 5 Happiness Level versus Country



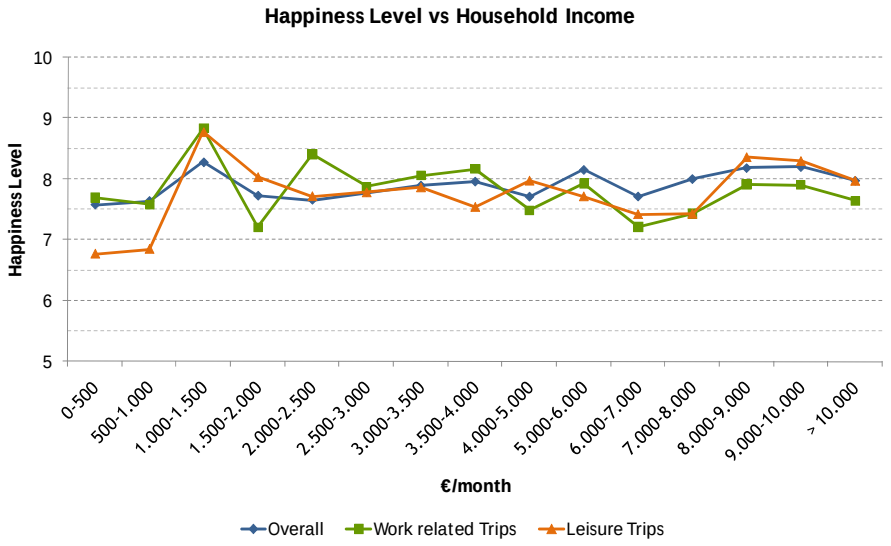
Regarding the stated happiness with the current transport mode used in work related trips, the happiest are the Swiss and the least happy are the Portuguese and Brazilians. Concerning the happiness related with the current transport mode used in leisure trips, the more satisfied are the Swiss, Greeks and Brazilians, and the less satisfied are the Portuguese and Italians.

Considering only the results of the Swiss sample, the age range of the majority of the respondents is between 20 and 29 years old and their average monthly household income is 4.500€, with an household average size of 2,5 members. Most of the respondents live in urban

areas and work in suburban areas, among which 1/2 is employed people and 1/2 are students. The most used transport modes for work trips are private car and metro. Considering car ownership, 1/2 of the respondents own a car and 1/2 do not have a car.

The influence of the household income in the Swiss overall level of happiness is not very significant. However, the Swiss respondents with income between 1'000 – 1'500€ stated higher levels of satisfaction both in work related trips and leisure trips, as can be seen in Figure 6.

Figure 6 Happiness Level versus Household Income



The respondents' car ownership can also be a determining factor on the statement of the level of happiness; however, the correlation between this variable and the level of overall happiness cannot be supported, as show in Figure 7. On the one hand, half of the respondents are car owners (see Figure 8) and express they are happier with their leisure trips rather than with their work related ones'. On the other hand, the respondents who do not have a car expressed happier with their work related trips than with their leisure trips.

Figure 7 Happiness Level versus Car Ownership

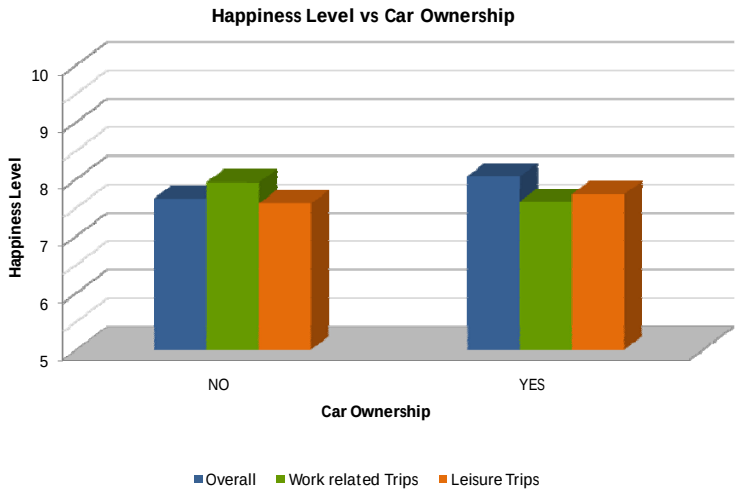
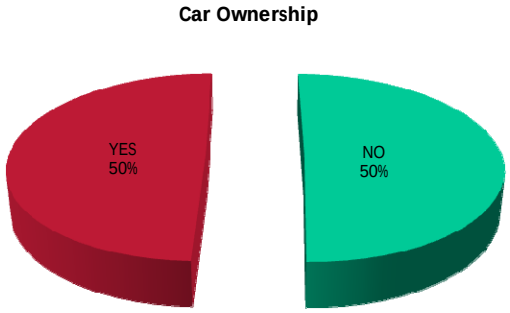


Figure 8 Car Ownership



One other factor that may influence people's happiness in their work related trips is the transport mode used to perform it. The respondents that use non-motorized modes, such as walking and cycling, to travel to work are more satisfied than those who use motorized modes such as car and train, as shown in Figure 9. An interesting result concerns to the second more satisfied group that are the user of "other transport modes". In this segment one must consider the motorcycle users that can in Switzerland be a very representative group. One other finding is related to public transport users, particularly metro and bus users are more satisfied with their work related trips than car users. However train users, the second most used public transport mode according to Figure 10, are the less satisfied among the Swiss respondents. Nonetheless the difference on the level of happiness between train and metro transport modes can be partly attached to travel distance. Thus the results presented on Figure 10 should be read carefully, taking into account the correlation between the used transport mode and the distance travelled. In addition, one may consider travel distance also correlated to stated

happiness, as it is expected that higher travel distances induce lower levels of happiness. In this case, the referred result may be significant on the relation between land use and transport, and used for the support of strategies to reduce commuting distances, that can include more sustainable and rational metropolitan planning.

Figure 9 Happiness Level versus Transport Mode used, in Work related Trips

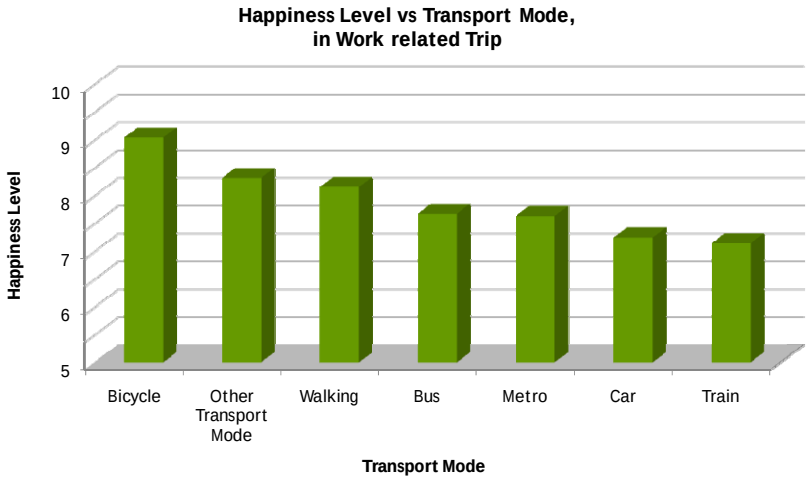
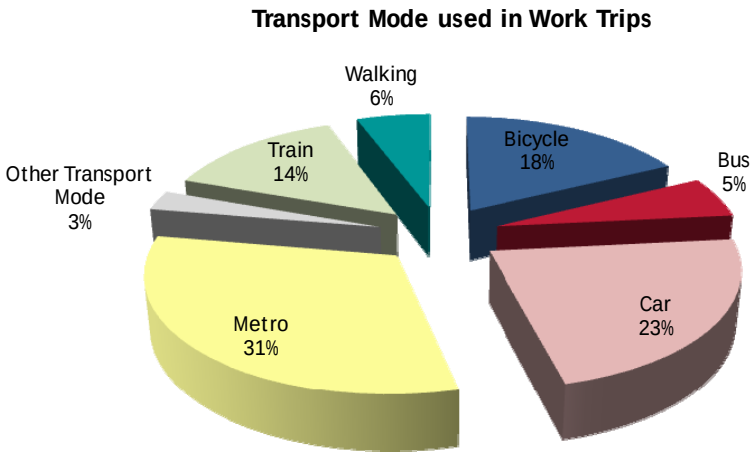


Figure 10 Transport Mode used for Work Related Trips



Considering the distance between home and work location, shown in Figure 11, the more satisfied Swiss respondents are the ones that live and work in the rural areas, although the rural area, along with the central area, represent, within the sample, the locations were less work and home sites are placed, as shown by Figure 12.

In a second level of stated happiness are the Swiss respondents that live in urban and suburban areas and work in suburban areas, locations that concentrated the majority of the work sites, according to Figure 12. The lower levels of happiness were stated by the Swiss respondents that live in rural areas and work in urban areas, even though the latter is the location of highest concentration of home locations.

Figure 11 Happiness Level in Work related Trips versus Home to Work Distance

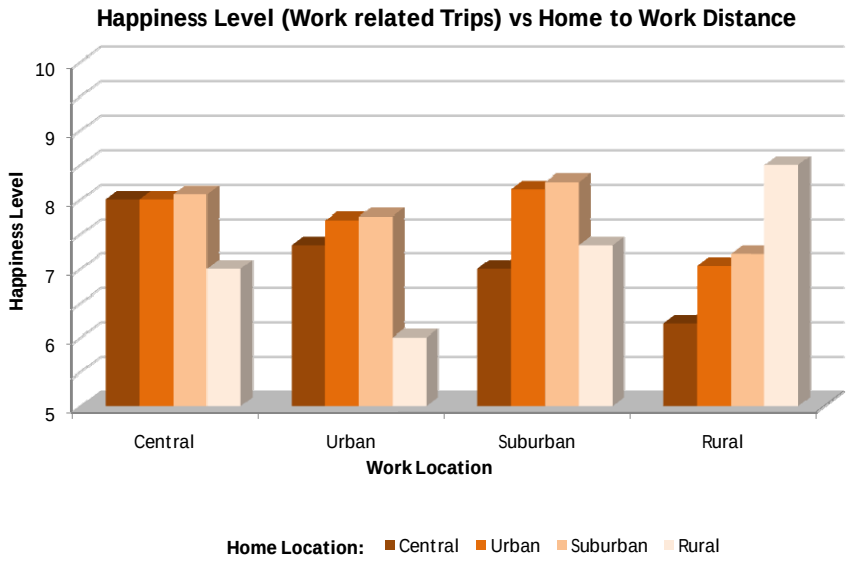
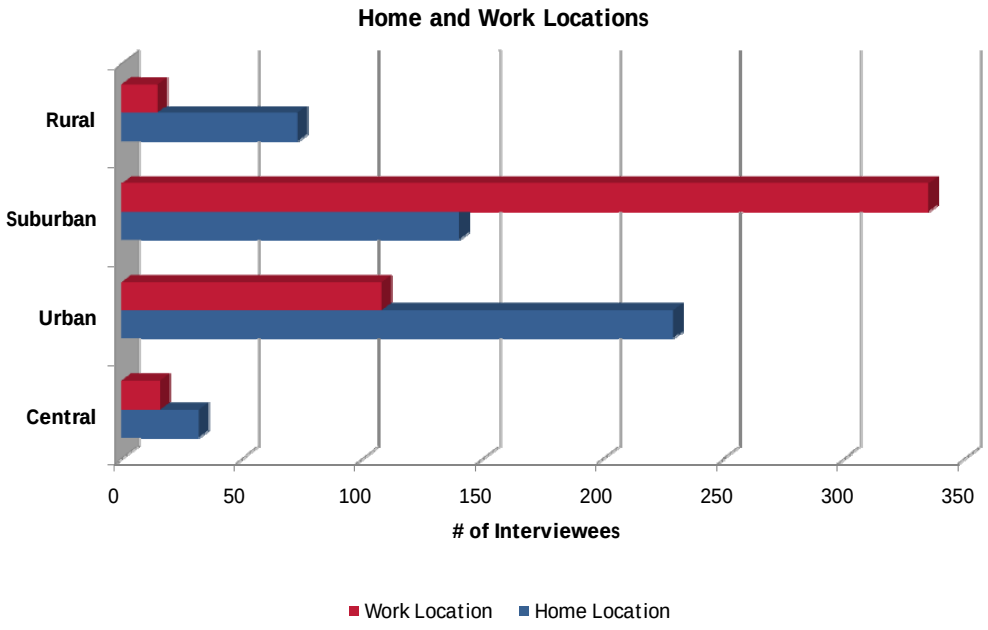


Figure 12 Interviewees' Home and Work Locations



5. Model Development and Estimation Results

Following the assessment of transportation happiness significance on the decision making process of an individual (Duarte *et al.*, 2008) it is now aimed to answer the following questions:

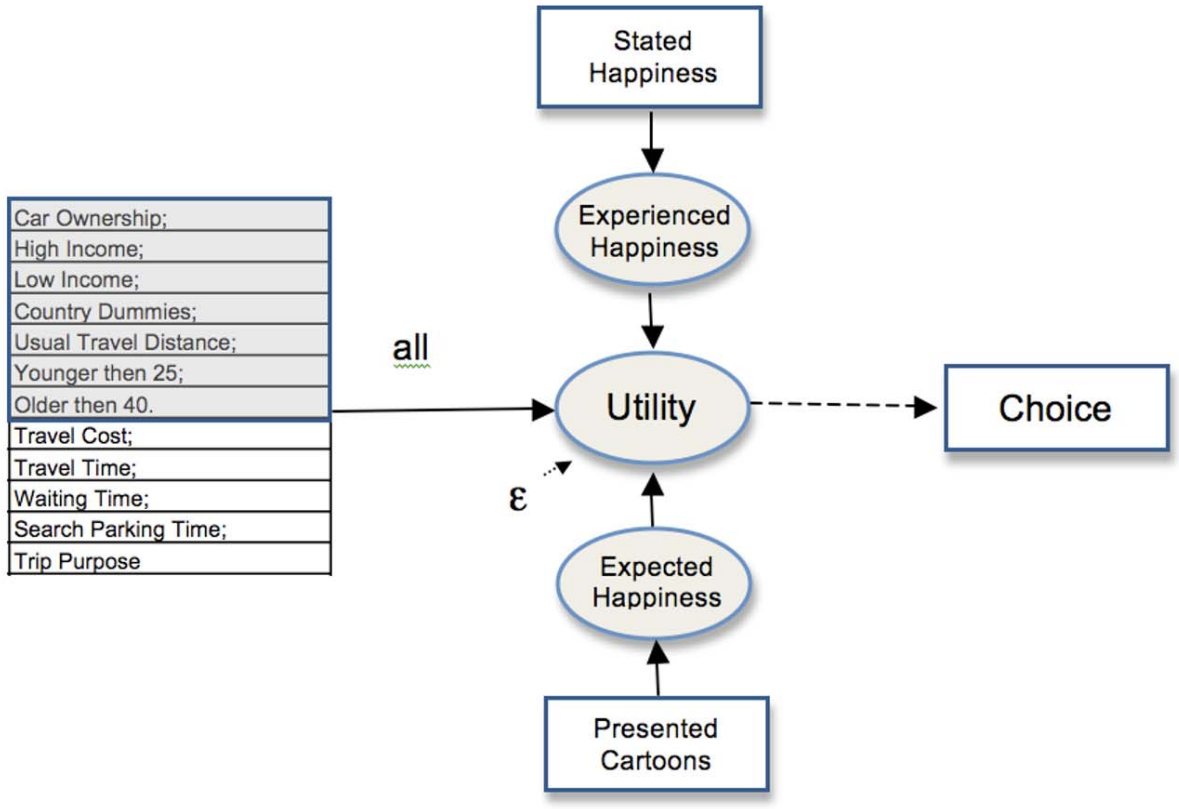
- Does previous experienced happiness influences the decision process for future similar experiences?
- Is the weight of the experienced happiness in the decision process independent of the type of experience?
- Is the suggested expected happiness, translated by the cartoons, significant in the transport mode decision process?

In this particular work we state the overall results based on the convenient sample with different nationalities followed with a focus only on the Swiss sample.

5.1 Behavioural Mode Choice Model

Subsequently a discrete choice modelling estimation is presented, including the latent concepts of: Experienced Happiness, captured by the stated happiness questions; and Expected Happiness, translated by the use of the cartoons. Figure 13 summarizes the overall mode choice model structure, developed in this study, which is able to address all of the questions above mentioned.

Figure 13 Mode Choice Model Structure



The modelling estimations used Random Utility Modeling techniques, such as the inclusion of Panel Data variables and Mixed Logit with Taste variation. All the model calibrations were completed using the *Biogeme* software (Bierlaire, 2003) developed at the Transport and Mobility Laboratory at EPFL, Lausanne[2] and the results are presented below in Table 2.

[2] http://transp-or.epfl.ch/page63023.html (EPFL/ENAC/INTER/TRANSP-OR, Lausanne).

Table 2 Estimation Results

		Model 1	Model 2
Results		All Nationalities	Swiss Sample
Rho-square		0,301	0.374
Initial Log Likelihood		-2412152	-1072.992
Final Log Likelihood		-1685397	-671.932
Number of parameters		25	20
Observations		3480	1548
Number Individuals		870	387
Value Of Time Metro		22.8	30.6
Value Of Time Car		27.1	40.9
Coefficients	*Comments*	**Value (T-Test)**	**Value (T-Test)**
Constant			
CONST		-2,13 (-7,76)	-2.41 (-5.75)
Specific Coef			
COSTC	*Cost of Car Trips*	-0,109 (-7,34)	-0.0985 (-4.31)
COSTM	*Cost of Metro Trips*	-0,176 (-6,74)	-0.158 (-4.06)
TIME1C	*Real Travel Time for Car Trip*	-0,0493 (-10,95)	-0.0671 (-9.15)
TIME1M	*Real Travel Time for Metro Trip*	-0,0670 (-14,05)	-0.0807 (-10.96)
TIME2C	*Parking Time*	-0,0839 (-5,84)	-0.0681 (-3.07)
TIME2M	*Waiting Time*	-0,0663 (-6,08)	-0.0996 (-5.64)
Trip Purpose			
LEISU	*Dummy for Leisure Trips*	0,814 (7,67)	0.846 (5.2)
Cartoons			
CHIGHCAR	*High Expected Happiness in Car*	1,38 (9,76)	1.51 (7.01)
CHIGHMETRO	*High Expected Happiness in Metro*	0,610 (4,43)	0.933 (4.33)
CLOWCAR	*Low Expected Happiness in Car*	-1,50 (-9,79)	-1.48 (-6.08)
CLOWMETRO	*Low Expected Happiness in Metro*	-0,118 (-0,91)	0.261 (1.25)
Social DemoGraphic			
AGE25	*Younger then 25 years old*	-0,0282 (-0,20)	-0.0289 (-0.13)
AGE40	*Older then 40 years old*	0,311 (2,07)	0.261 (1.03)
DISTLIVE	*Different Home and Work Location*	-0,104 (-0,74)	-0,104 (-0,74)
GR	*Dummy for Greeks*	0,795 (3,38)	*
OTHERC	*Dummy for Other Countries*	0,647 (2,93)	*
PT	*Dummy for Portuguese*	0,668 (3,69)	*
HIGHINC	*Income Higher then 8'500 €*	0,0444 (0,23)	-0.129 (-0.46)
LOWINC	*Income Lower then 2'000 €*	-0,0598 (-0,38)	0.211 (0.72)
Experienced Happiness			
EHCar	*Experienced Happiness - Car*	-0,147 (-7,13)	-0.237 (-5.95)
EHMetro	*Experienced Happiness - Metro*	0,0130 (0,53)	0.00302 (0.09)
Standart Deviation			
Sigma Panel	*Panel Data Sigma Distribution (mean zero)*	1,37 (12,69)	1.57 (9.37)
Sigma EH Car	*Sigma for a normal distribution on EH Car coefficient*	-0,105 (-2,45)	*
Sigma Eh Metro	*Sigma for a normal distribution on EH Metro coefficient*	-0,0790 (-1,48)	*

* Not used in this model estimation

One important result of the model estimations is the improvement in overall goodness of fit, compared to the results obtained in prior model estimations (Duarte et al., 2008). This is mainly due to the inclusion of a panel data variable, which incorporates the fact that the same respondent performs eight different experiments. In addition, incorporating the experienced happiness variable significantly improves the model. Another interesting result emerges from the different significance of Experienced Happiness related to car and to metro alternatives. This variable is very significant in the car context, but not at all significant in the metro case. Furthermore, the impact of the cartoons remains similar to the previous estimation results (Duarte et al., 2008), in which the car related cartoons are, in this case as well, highly significant compared to the metro related ones.

Therefore, the model estimations suggest that the individuals have a much higher emotional relation to the car than to the metro. Looking at the taste variation of the Experienced Happiness coefficient, it is possible to strengthen the latter idea, as the normal distribution assumes the same relation: it is significant for car related decisions and not significant for metro related decisions. This also suggests that the intensity of the emotional relation with the car is normally distributed along the population, and differs from individual to individual.

When comparing different model estimations, using the overall sample and the Swiss sample, some interesting results are found. Firstly, the overall fitness of the model has improved when considering one nationality, i.e. the Swiss. This is a result representing the complexity of modelling behaviours based on different cultures, different societies and different lifestyles. Secondly, the estimated value of time for the Swiss sample, is almost 10€ per hour higher relative to the overall sample. Thirdly, the income related variables are still not statistically significant, but with different coefficients values and signals. This result supports the lack of significance of income variables on transport mode choice decisions across nationalities, as these are important variables for the same country context, but turn not significant in a multi country analysis. All other coefficients remain similar in the estimation procedures, a finding reinforcing the robustness of the models.

Finally, it should be noted that the size of the Swiss sample did not allow the identification of a Mixed MNL model, which was possible when using the overall sample (possibly due the amount of observations available).

6. Conclusions

Recent studies on "happiness" have demonstrated interesting achievements in many fields, such as economics, psychology, finance, and are also encouraging a wider methodological approach to be used by transportation researchers. Happiness attributes in transportation models have been stimulating new approaches towards the understanding of the decision process of transport users.

Transport plays an important role in the establishment and development of modern economies and has a significant impact in individuals' happiness. Preliminary results of this project showed stated happiness concept as a consistent indicator in the decision choice process and that non quantifiable attributes (represented by the cartoons) return consistent effects on the model calibration. Following the adoption of a different framework for the decision process of a transport mode, different discrete choice model structures have been investigated. Desegregating the happiness concept in Experienced and Expected Happiness resulted in a robust structure, consistent with previous established frameworks.

One important finding of this research is related to the fact that individual happiness significance and impact in the decision process is highly related to the alternative. The different happiness concepts explored are highly attached to the car as opposed to the metro, as people tend to relate more to the hedonic characteristics of car use like freedom, status, feeling of possession, personal time and pleasure.

One handicap of contemporary policy making, many times, is the limited market knowledge. In this study we compared the findings of the research analysing an overall sample (coming from all over Europe) to the Swiss sample. We were therefore able, to specifically model the behaviour of Swiss people, identify the effect of happiness on their choices, and calculate their values of time, which are relatively much higher than the average European ones.

Further work, involves the simultaneous estimation of latent variables (happiness) models and choice models, enabling the application of the proposed model system in future scenario evaluations.

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