Happiness and Choice Models

Maya Abou Zeid

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Some Interesting Questions

- What is subjective well-being (SWB) or happiness? Why is it relevant?
- How can happiness be measured?
- What influences happiness? Does it change over time?
- Can happiness data be used to improve random utility models?

Appendices

- Appendix 1: SWB measurement issues
- Appendix 2: SWB modeling issues
- Appendix 3: SWB and valuation

What Is Subjective Well-Being and Why Is It Relevant?

Well-Being

- Well-being includes both objective and subjective components
- Objective:
  - GDP per capita, poverty, unemployment levels, infant mortality, life expectancy, education, crime, air quality, …
- Subjective:
  - How people evaluate their lives from their own perspectives → focus of this presentation

Subjective Well-Being Assessment

Example: World Values Survey

- Taking all things together, would you say you are:
  - Very happy
  - Rather happy
  - Not very happy
  - Not at all happy

Lots of Interest in Measuring SWB

- British Household Panel Survey
- German Socio-Economic Panel
- Eurobarometer
- US General Social Survey
- Gallup
- And many national surveys

And in Monitoring SWB

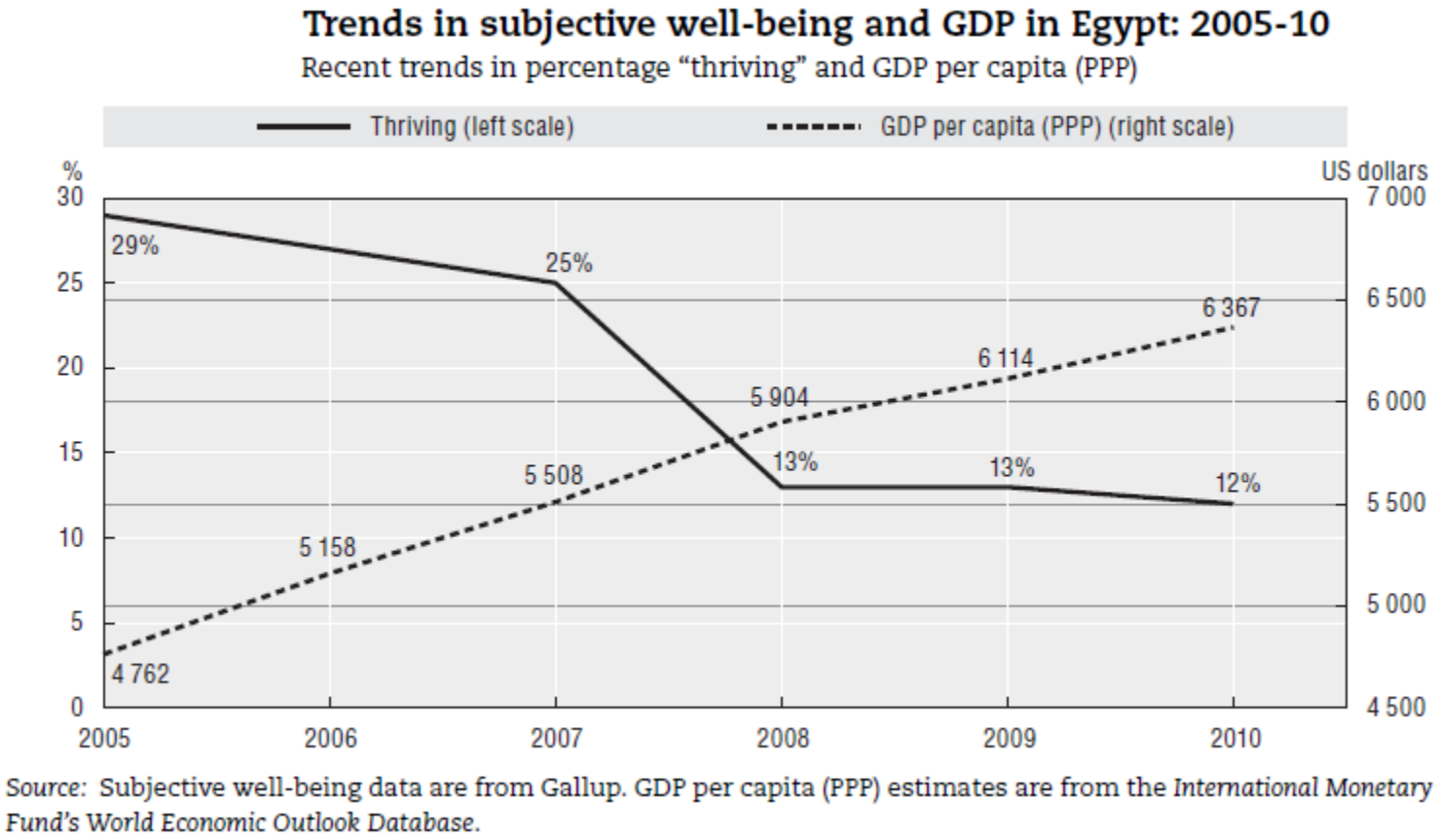
- Kahneman et al. (2004)
  - *The goal of public policy is not to maximize measured GDP, so a better measure of wellbeing could help to inform policy. Here we propose measuring national well-being by weighting the time allocated to various activities by the subjective experiences associated with those activities.*
- Bhutan: Gross National Happiness (GNH)

Source: Center for Bhutan Studies & GNH Research (2015)

Why Is SWB Relevant? (Layard, 2010; OECD, 2013)

- Intrinsic value of SWB and correlation with human functioning (marriage, income, health,…)
- Monitoring of trends
- Identification of problem groups in the population
- Understanding the drivers of SWB and how people make decisions
- Guiding policy and complementing other outcome measures (such as GDP) as a measure of progress

Example: SWB and GDP Trends in Egypt



Source: OECD (2013)

Components of Subjective Well-Being (SWB)

- Cognitive/evaluative (long term)
  - Satisfaction with life and with life domains
- Affective (short term)
  - Presence of positive feelings
  - Absence of negative feelings
- Eudaimonic
  - Purpose in and meaning of life, personal growth and flourishing

How Can SWB Be Measured?

Life and Domain Satisfaction

- Most surveys use a single-item measure
- Example: World Values Survey
  - Overall satisfaction question

    All things considered, how satisfied are you with your life as a whole these days?

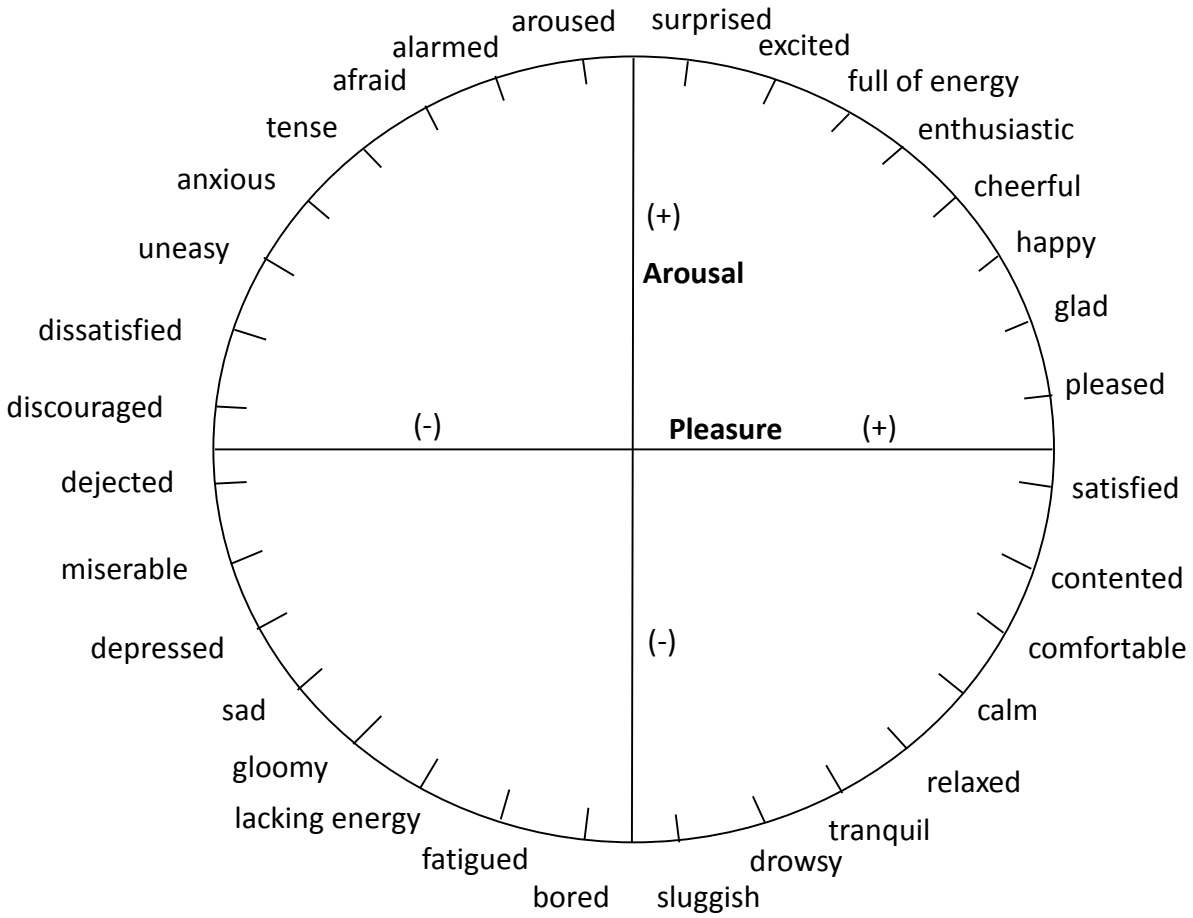
    1(completely dissatisfied) --- 10 (completely satisfied)
- Can ask similar questions for specific domains of life (job, income, marital, etc.)

Affect

- Affect is multi-dimensional
  - Positive and negative affect
  - Valence vs. Arousal
- Circumplex model of affect (Russell, 1980)

Affect

Circumplex Model



Affect

Example: Day Reconstruction Method

(Kahneman et al., 2004)

How did you *feel* during this episode?

Please rate each feeling on the scale given. A rating of 0 means that you did not experience that feeling at all. A rating of 6 means that this feeling was a very important part of the experience. Please circle the number between 0 and 6 that best describes how you felt.

	Not at all						**Very much**
Happy	0	1	2	3	4	5	6
Frustrated/annoyed	0	1	2	3	4	5	6
Depressed/blue	0	1	2	3	4	5	6
Hassled/pushed around	0	1	2	3	4	5	6
Warm/friendly	0	1	2	3	4	5	6
Angry/hostile	0	1	2	3	4	5	6
Worried/anxious	0	1	2	3	4	5	6
Enjoying myself	0	1	2	3	4	5	6
Tired	0	1	2	3	4	5	6

Eudaimonic Well-Being

- Overall measure (Office for National Statistics, UK):
  - *Overall, to what extent do you feel the things you do in your life are worthwhile?*

    0 (not at all worthwhile) --- 10 (completely worthwhile)

- Other multi-item measures exist (e.g. Ryff, 1989)

Types of Measurement Methods

- Psychological self-reported
  - Retrospective
  - Real-time
- Physiological
  - Facial
  - Autonomic
  - Brain

Psychological Measures

Self-Reports

- Retrospective (most common)
  - Household surveys, satisfaction surveys, etc.

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- Relatively easy to collect data

-

- Memory and aggregation bias
- Neglect of duration
- Assume that respondents are *able* and *willing* to provide subjective well-being measures

Psychological Measures (cont.)

Self-Reports

- Real-time
  - Often associated with time use surveys
    - Experience Sampling Method (ESM), Day Reconstruction Method (DRM – close to real-time)

+

- Less recall bias
- Can associate SWB with particular activities or contexts

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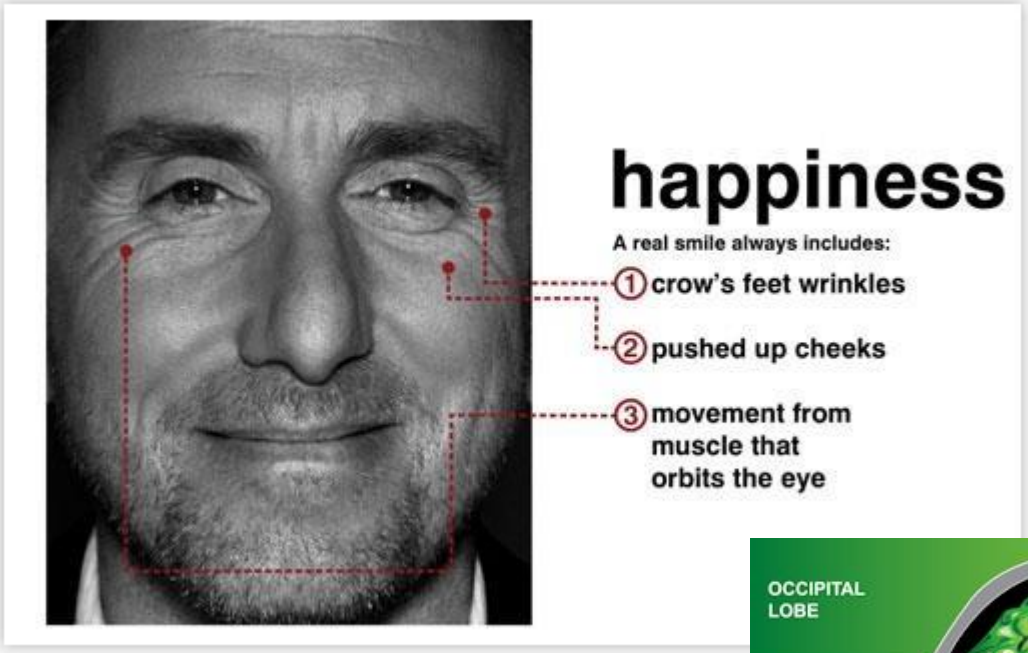
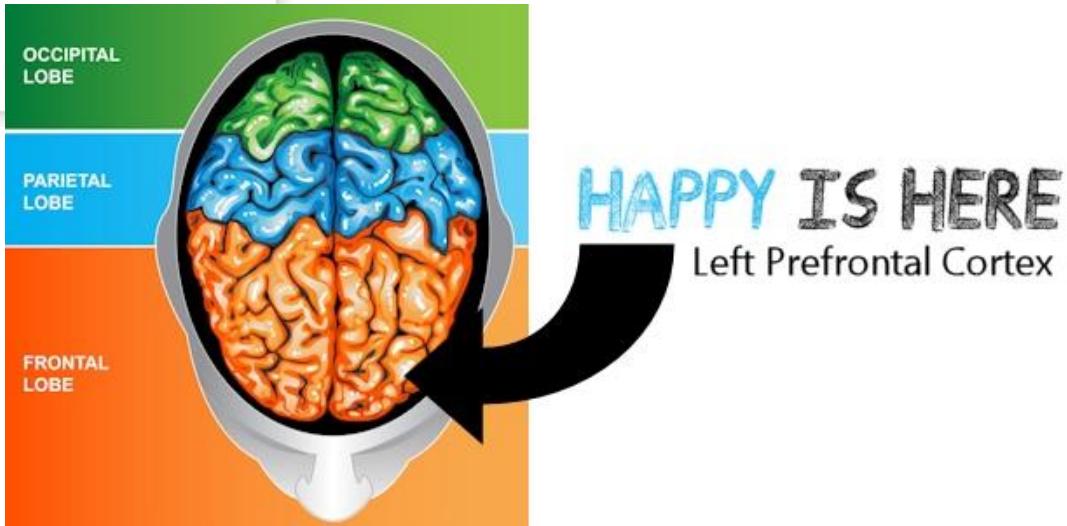
- Can be intrusive and more demanding
- Difficult to capture infrequent activities
- Assume that respondents are *able* and *willing* to provide subjective well-being measures

Physiological Measures



Detect emotions from facial expressions, brain activity, or physiological reactions (heart rate, respiration, …)



Physiological Measures (cont.)

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- Continuous measurement
- Useful to the extent that physiological reactions convey emotions

-

- Excessive data processing
- Muscle movements might reflect biological processes
- Cannot be used alone to infer the presence of emotions
- Can be intrusive

Which Method to Use?

- Self-report survey based measures remain the most popular
  - Empirical evidence for their validity
  - But there are several measurement issues to be careful about
- Collect multiple indicators where possible (including physiological)

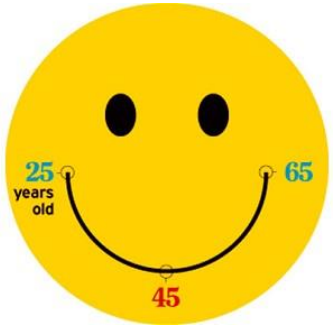
Causes and Correlates of SWB

SWB Determinants

- Demographic variables and personality (extraversion, neuroticism)

Effect of age
on happiness

(www.telegraph.co.uk)



- Socio-economic, life events, and lifestyle variables
  - E.g. income, unemployment, marriage, disability, time use
- Comparison processes
- Adaptation and aspirations

Time Use

- Significant variation by activity type

Activity	*Percentage of sample*	*Time spent (hours)*	*Net affect*
Intimate relations	12	0.23	4.83
Socializing after work	49	1.14	4.15
Relaxing	77	2.17	3.96
Dinner	69	0.81	3.94
Lunch	67	0.57	3.91
Exercising	16	0.22	3.85
Praying/worship	23	0.45	3.78
Socializing at work	41	1.12	3.78
Watching TV	75	2.19	3.65
Phone at home	43	0.93	3.52
Napping	43	0.89	3.35
Cooking	63	1.15	3.27
Shopping	30	0.41	3.23
Computer (non-work)	29	0.51	3.22
Housework	49	1.12	2.99
Childcare	36	1.10	2.99
Evening commute	63	0.61	2.77
Working	100	6.89	2.68
Morning commute	68	0.47	2.09

Source: Kahneman and Krueger (2006) – for a sample of employed women in Texas

Comparison Processes

(Schwarz and Strack, 1999)

- Comparison to self
- Comparison to others
  - Social media: “People feel depressed after spending a great deal of time on Facebook because they feel badly when comparing themselves to others” (Steers et al., 2014)
  - Relative income
  - Commute mode to work
  - Challenging to know which reference group to use
- Counterfactuals

Adaptation

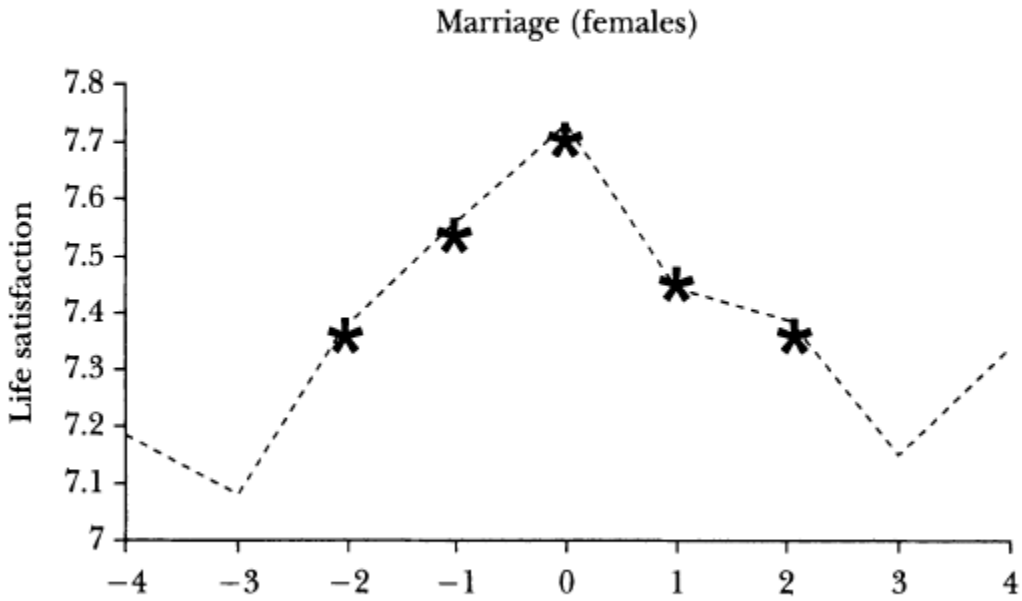
(Brickman and Campbell, 1971; Brickman et al., 1978)

- Evidence that people quickly adapt to life events and changes in well-being subside with time
  - Lottery winners, paraplegics / disability, marriage, bereavement
  - Reasons include shift in attention, change in aspirations, and substitution of activities
- This process has been called the *hedonic treadmill*

Adaptation (cont.)

Example of Hedonic Treadmill

Average Life Satisfaction for a Sample of German Women
(by year of marriage $t = 0$)



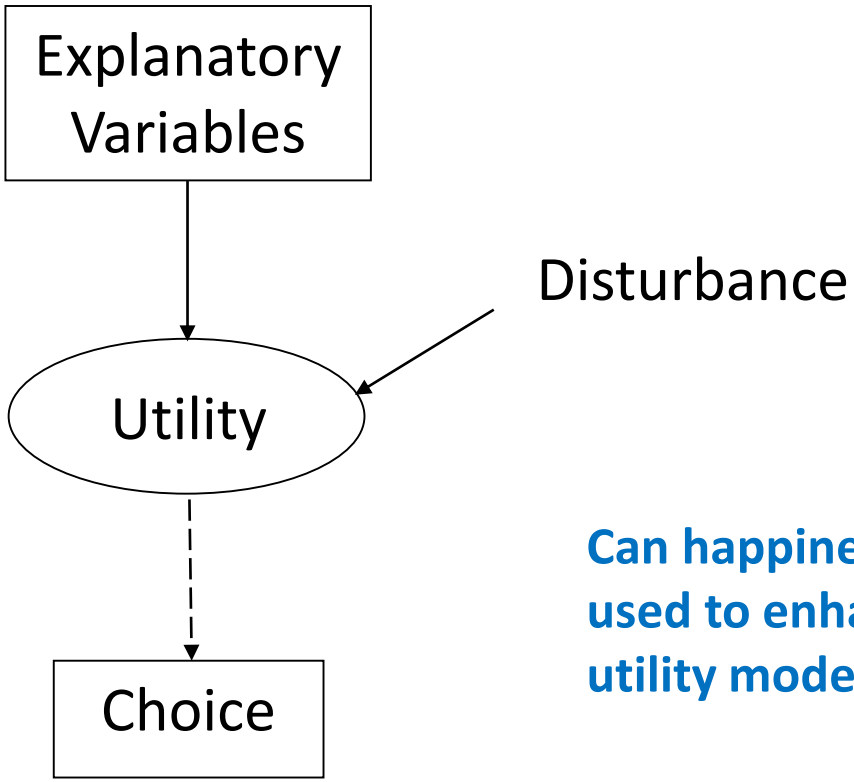
Source: Clark, Diener, Georgellis and Lucas (2003), using data from the German Socioeconomic Panel.
Note: An asterisk indicates that life satisfaction is significantly different from the baseline level.

Source: Kahneman and Krueger (2006)

Happiness and Utility

Random Utility Models

- Origins in consumer theory
- Behavioral foundations of discrete choice models
  - Rationality and utility maximization



Can happiness data be used to enhance random utility models?

Happiness and Utility

Historical Perspective

Bentham

(1789)

Kahneman

(1997, 2000)

Classical era:

Utility as the experiences of pleasure and pain

Neoclassical era:

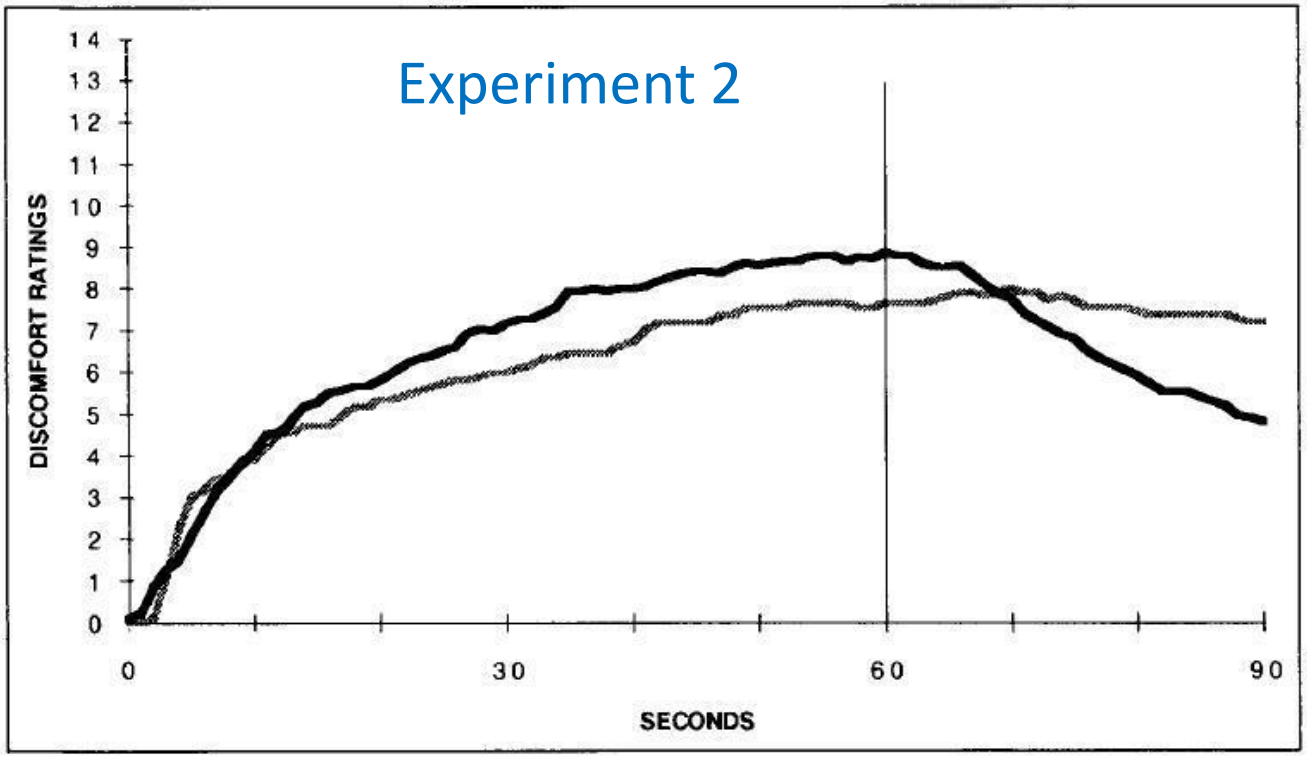
Preferences inferred from choices

Modern behavioral revaluation:

- Decision utility (modern usage)
- Experienced utility (Bentham's usage)

Kahneman's Notions of Utility

- Example: immersing hands in cold water (Kahneman et al., 1993)
  - Experiment 1: 60 sec at 14 C (57.2 F)
  - Experiment 2: 60 sec at 14 C + 30 sec at 15 C (59 F)
- **Moment utility**: real-time discomfort



Kahneman's Notions of Utility (cont.)

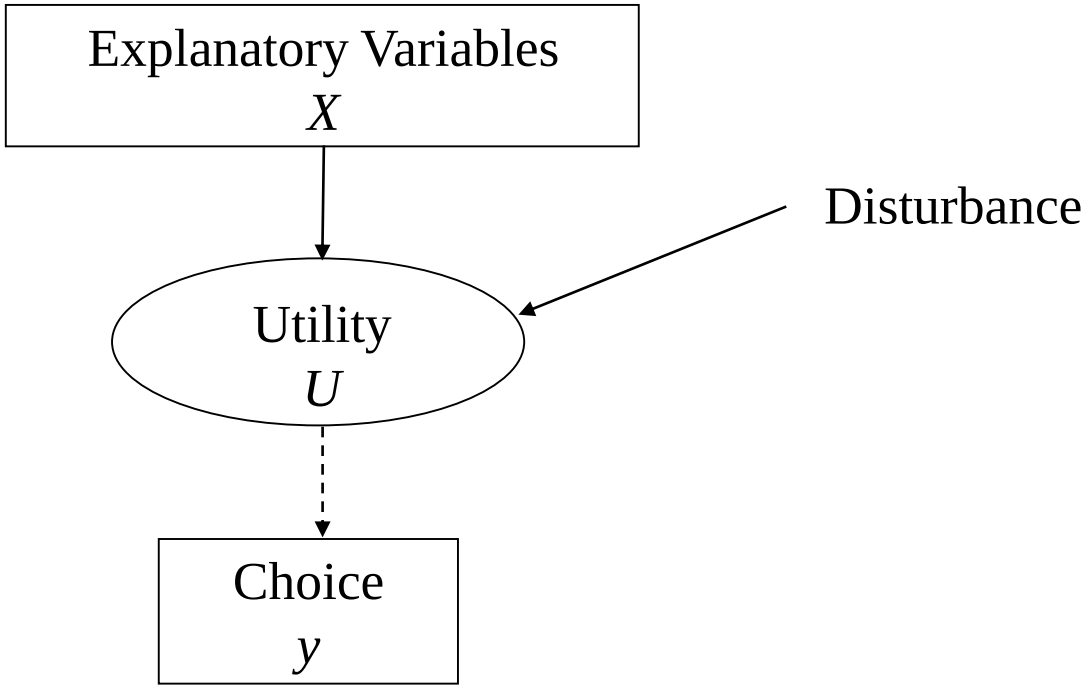
- **Remembered utility**
  - Retrospective evaluation of experience
  - Determined by selected moment utilities (peak-end rule / duration neglect)
    - E.g. most participants judged the longer experiment as less painful overall
- **Decision utility**
  - Includes affective forecast
  - Experiences remembered more favorably are more likely to be repeated
    - E.g. most participants chose to repeat the longer experiment

Is Happiness the Same as Utility?

- Happiness, broadly defined as satisfaction with all aspects of an experience, can be interpreted as utility
- Happiness is a way to measure utility and increase model efficiency
- However, a distinction needs to be made among the different types of utility (in a dynamic context)

Happiness and Utility: Static Framework

Random Utility Model



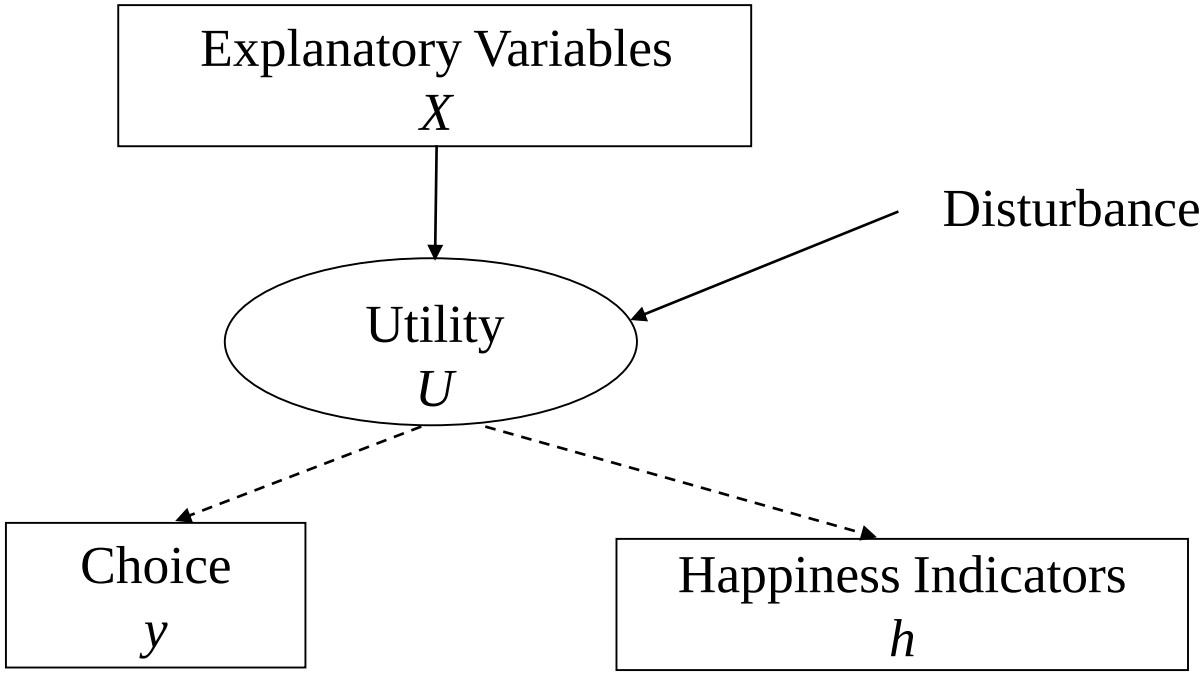
For alternative *i*:

Choice model

$$U_i = V(X_i) + \varepsilon_i$$

$$y_i = \begin{cases} 1 & \text{if } U_i \geq U_j \quad \forall j \neq i \\ 0 & \text{otherwise} \end{cases}$$

Extended Random Utility Model



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$$y_i = \begin{cases} 1 & \text{if } U_i \geq U_j \quad \forall j \neq i \\ 0 & \text{otherwise} \end{cases}$$

Happiness model

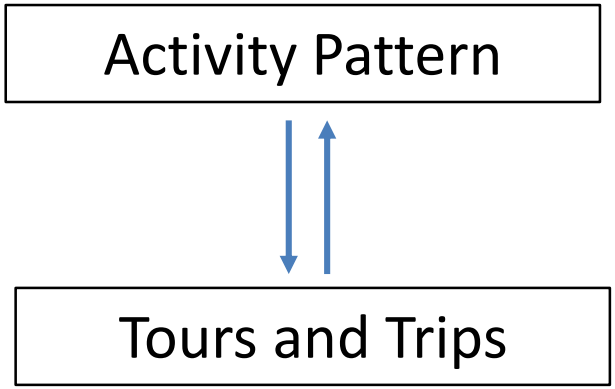
$$h_i = h(U_i) + \upsilon_i$$

Extended Random Utility Model

- Expected gain in efficiency of model estimates
- Expected decrease in the fit of the choice model
- Happiness indicators are used at estimation stage only, and only the choice model is used in application

Application 1: Activity Pattern Choice

- Denver activity-based model



- Activity pattern defined as number of home-based tours (0 or 1+) by purpose and number of secondary stops (0 or 1+) by purpose made on a given day
  - 7 purposes modeled
  - Choice set: activity 2080 patterns
  - Example of a pattern: 1+ work tour, 1+ shopping tour, 1+ escort stops

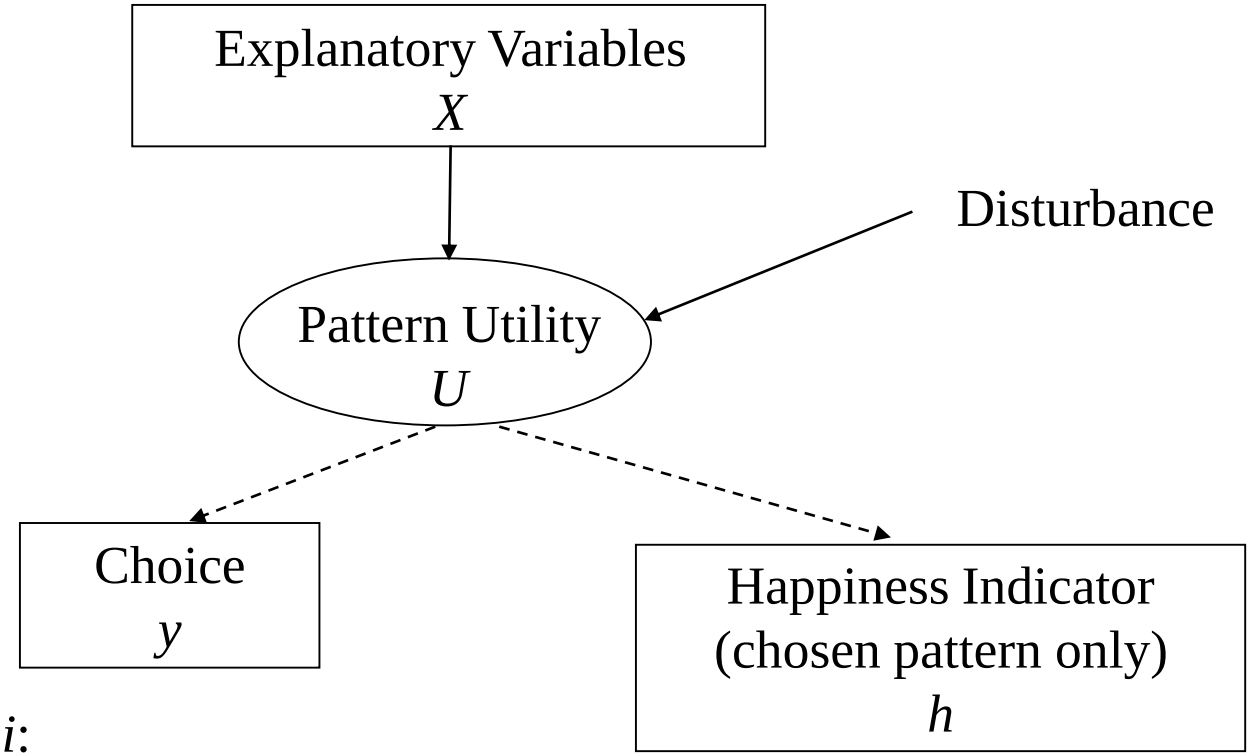
Application 1: Activity Pattern Choice

Measures (Abou-Zeid and Ben-Akiva, 2012)

- Added happiness measures as indicators of the activity pattern utility in an activity-based model (Denver)
- Measures:
  - *h*: Well-being for the chosen pattern (7-point scale)
    - *Thinking about yesterday, how satisfied were you overall with the way you traveled, the places you went to (including staying at home), and the things you did at these places?*
  - *E*: Deviation of the chosen pattern from plans
    - *Did you change your travel and activity plans as the day progressed? (Yes/No)*

Application 1: Activity Pattern Choice

Modeling Framework



For alternative i:

Choice model

$$U_i = V(X_i) + \varepsilon_i$$

$$y_i = \begin{cases} 1 & \text{if } U_i \geq U_j \quad \forall j \neq i \\ 0 & \text{otherwise} \end{cases}$$

Happiness model

$$h_i = h(U_i) + \upsilon_i \text{, for } i \text{ such that: } y_i = 1 \text{ and } E_i = \text{No}$$

Application 1: Activity Pattern Choice

Model Performance (Carrion et al., 2015)

Measure	Extended Model (Choice + Happiness)	Standard Model (Choice Only: Logit)	Standard Model (Choice Only: Error Component Logit)
Choice log likelihood	–62,548.26	–56,243.36	–56,744.21
$Var(\beta_{standard}) - Var(\beta_{extended})$	na	Not positive-definite	Not positive-definite
Trace (Var(β))	20,540	51,021.9	26,338.5
|Var(β)|	2.382 E+78	3.279 E+86	2.618 E+80

NOTE: na = not applicable.

- Gain in efficiency in the model estimates of the activity pattern model with happiness indicators (smaller trace and determinant of the var-cov matrix of model parameters)
- Significant loss in goodness of fit of the choice model indicating potential overfitting of original model

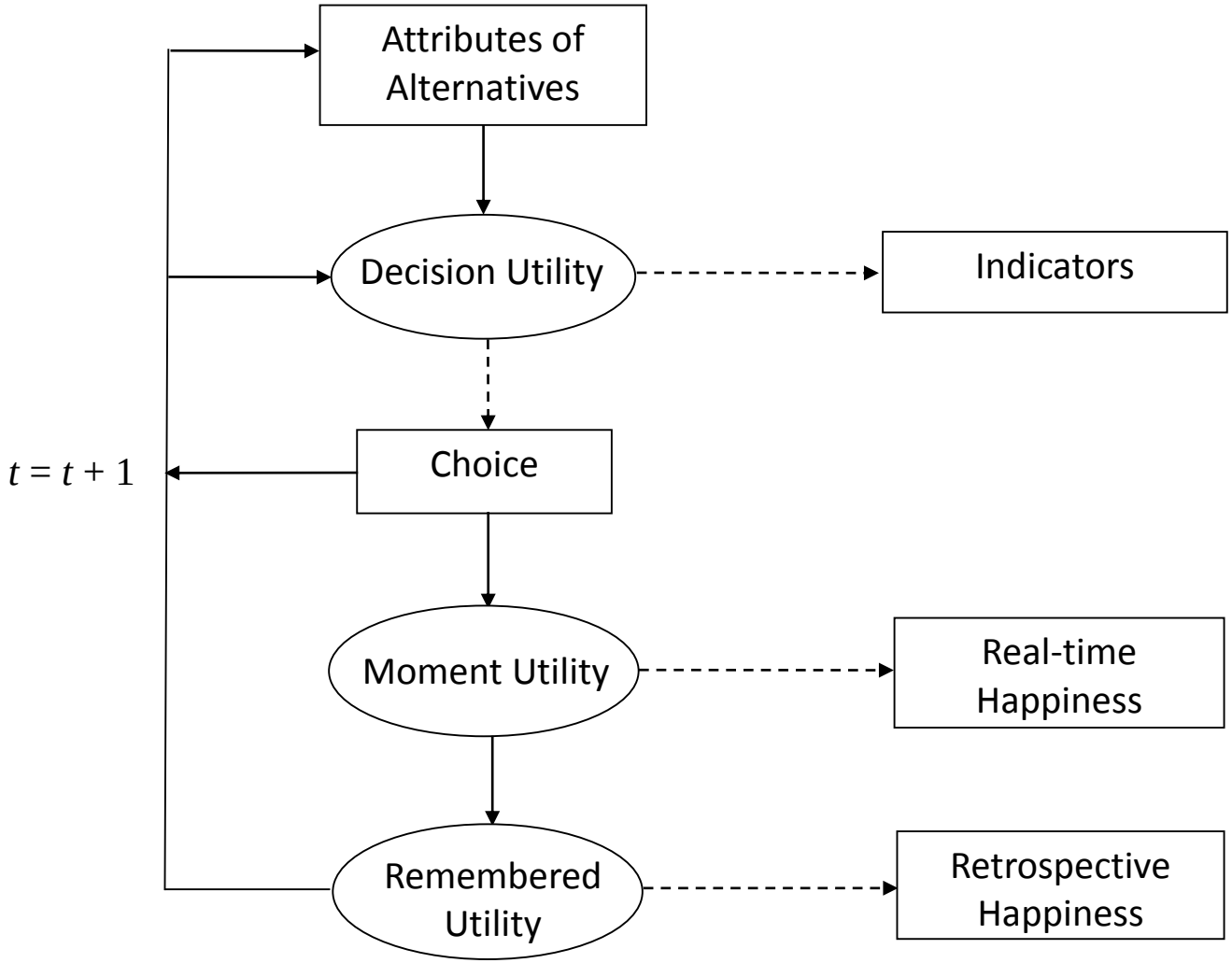
Happiness and Utility: Dynamic Framework

Happiness and Dynamic Behavior

- Behavior is dynamic and utility changes over time
- Happiness indicators can capture changes in utility and enhance dynamic modeling of behavior

Dynamic Modeling Framework

(Abou-Zeid and Ben-Akiva, 2010)



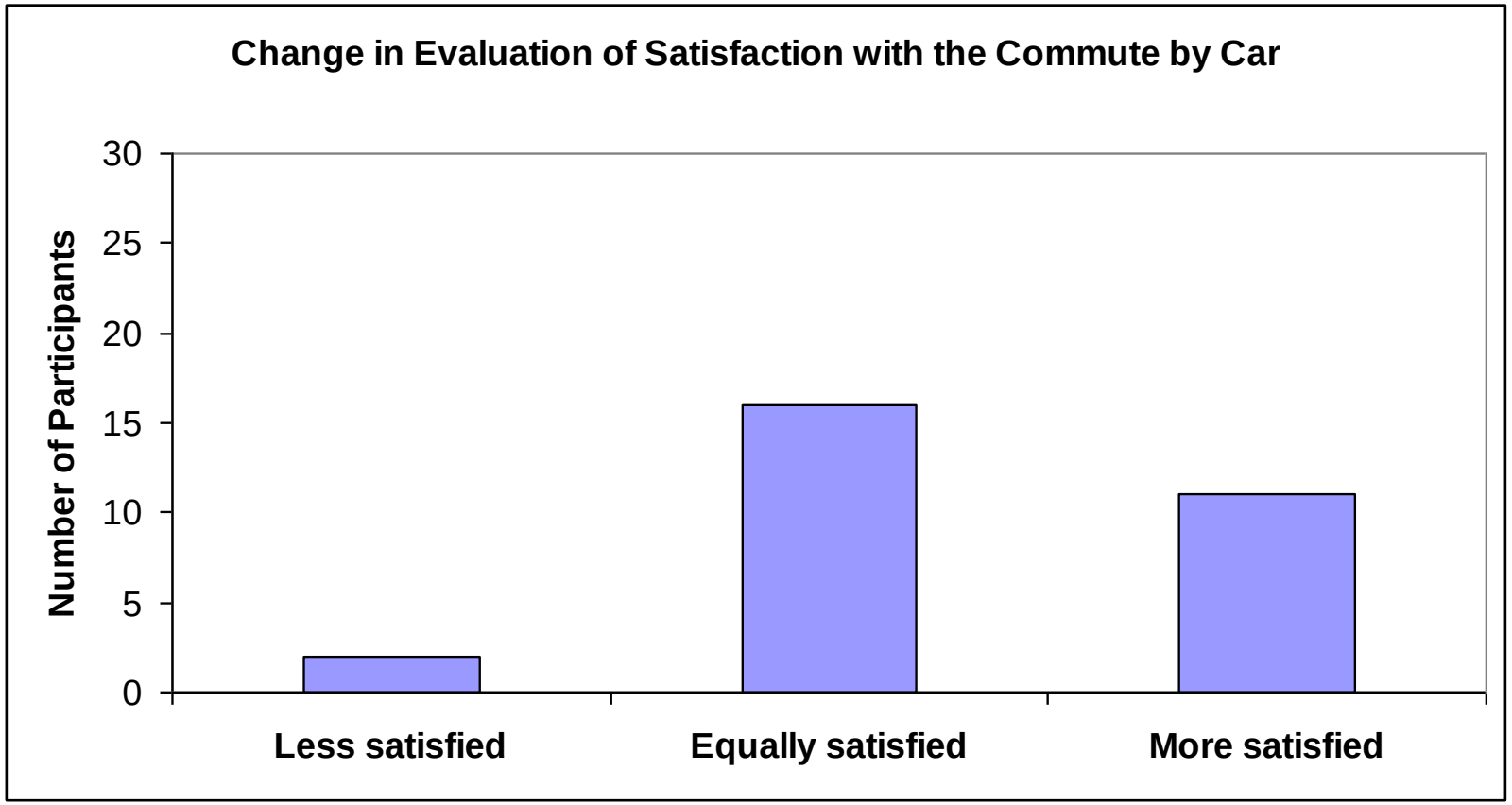
Application 2: Mode Choice

(Abou-Zeid et al., 2012)

- **Hypothesis:** people don't fully consider their travel well-being unless they evaluate their options and reconsider their decisions
- **Experiment:** habitual car drivers commuted by public transport (PT) for 2-3 days in Switzerland and MIT (treatment)
- **Measures:** car satisfaction pre- and post-treatment and PT satisfaction post-treatment
  - *Taking all things together, how satisfied are you with your commute by car between your residence and work?*

Application 2: Mode Choice

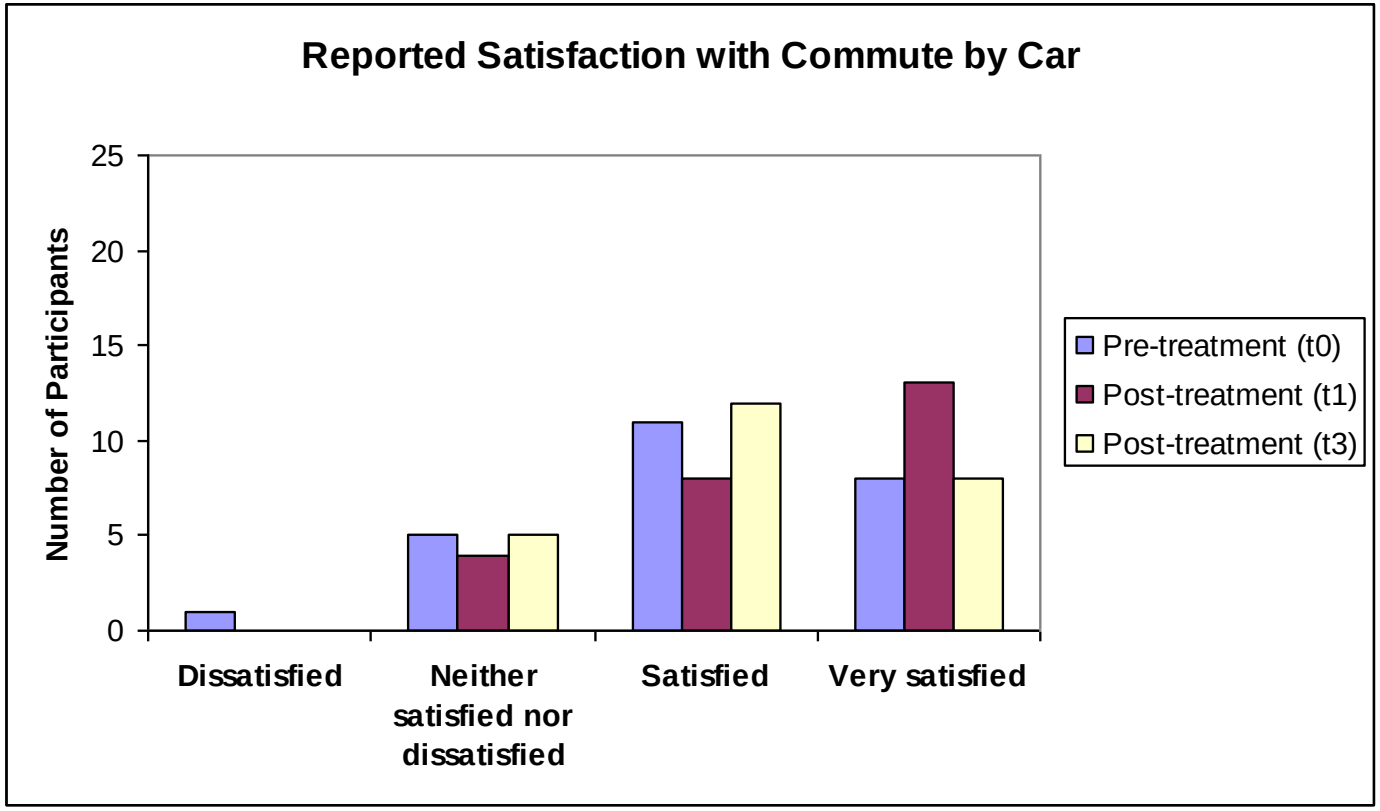
Measurement Results (Switzerland)



The pre- and post-treatment satisfaction ratings are significantly different at the 90% level of confidence.

Application 2: Mode Choice

Measurement Results (Switzerland)



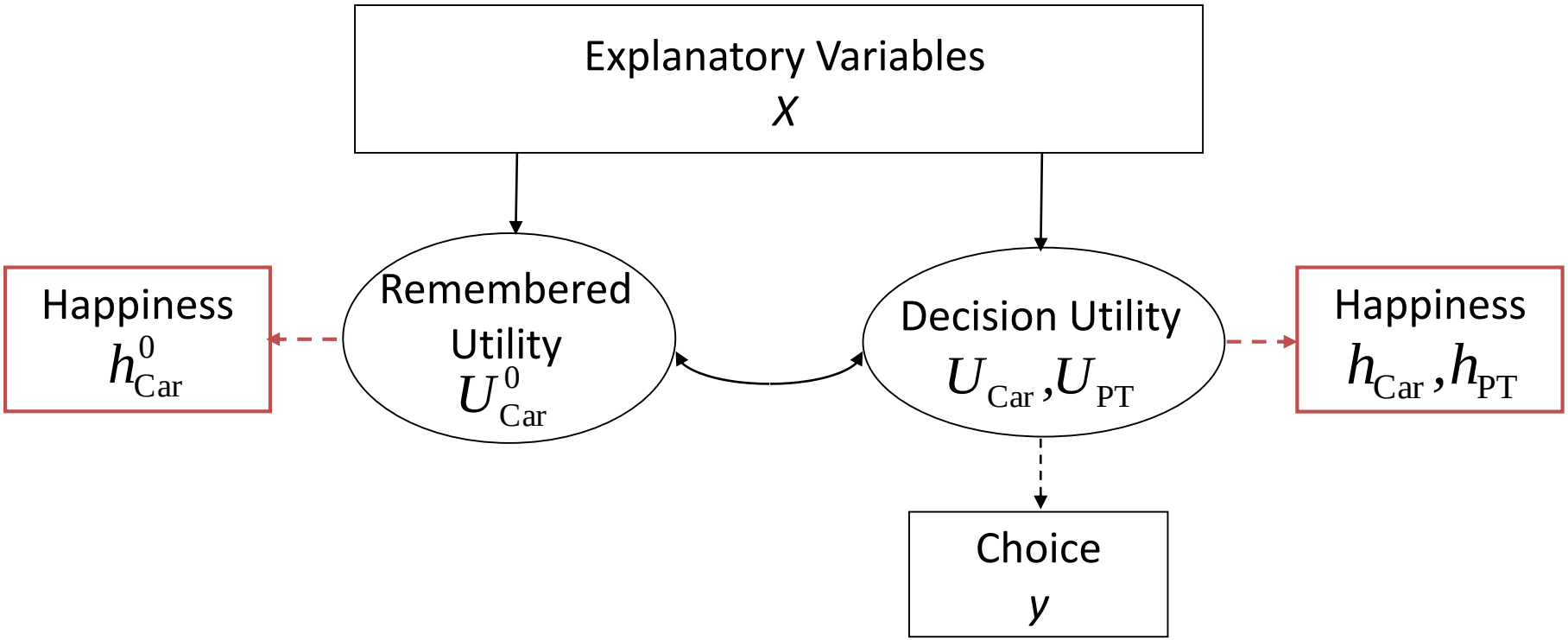
- t_0 and t_1: significantly different
- t_1 and t_3: significantly different
- t_0 and t_3: not significantly different

Treadmill effect

Application 2: Mode Choice

Modeling Framework

Pre-Treatment **Post-Treatment**



Application 2: Mode Choice

Structural Equations

Pre-treatment car utility

$$U^0_{\text{Car}} = V^0_{\text{Car}} + \varepsilon^0_{\text{Car}} = \beta_0 + \beta_1 * \text{Time}_{\text{Car}} + \beta_2 * \text{Cost}_{\text{Car}}/\text{income} + \varepsilon^0_{\text{Car}}$$

Post-treatment car utility

$$U_{\text{Car}} = V_{\text{Car}} + \varepsilon_{\text{Car}} = \beta_3 + \beta_1 * \text{Time}_{\text{Car}} + \beta_2 * \text{Cost}_{\text{Car}}/\text{income} + \varepsilon_{\text{Car}}$$

Post-treatment PT utility

$$U_{\text{PT}} = V_{\text{PT}} + \varepsilon_{\text{PT}} = \beta_1 * \text{Time}_{\text{PT}} + \beta_2 * \text{Cost}_{\text{PT}}/\text{income} + \varepsilon_{\text{PT}}$$

$$\begin{bmatrix} \varepsilon^0_{\text{Car}} \\ \varepsilon_{\text{Car}} \\ \varepsilon_{\text{PT}} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho_c & \rho_b \\ \rho_c & 1 & \rho_a \\ \rho_b & \rho_a & 1 \end{bmatrix} \right)$$

Application 2: Mode Choice

Measurement Equations

Choice

$$y = \begin{cases} 1 \text{ (Car)} & \text{if } U_{\text{Car}} - U_{\text{PT}} + \eta \geq 0, \quad \eta \sim \text{Logistic}(0,1) \\ 0 \text{ (PT)} & \text{otherwise} \end{cases}$$

Pre-treatment car happiness

$$h^{*0}_{\text{Car}} = \lambda_1 U^0_{\text{Car}} + \upsilon_1$$

Post-treatment car happiness

$$h^{*}_{\text{Car}} = \lambda_2 U_{\text{Car}} + \upsilon_2$$

Post-treatment PT happiness

$$h^{*}_{\text{PT}} = \lambda_3 U_{\text{PT}} + \upsilon_3$$

$$\upsilon_1, \upsilon_2, \upsilon_3 \sim \text{Logistic}(0,1)$$

$$h = \begin{cases} 1 & \text{if } \tau_0 < h^* \leq \tau_1 \\ 2 & \text{if } \tau_1 < h^* \leq \tau_2 \\ 3 & \text{if } \tau_2 < h^* \leq \tau_3 \\ 4 & \text{if } \tau_3 < h^* \leq \tau_4 \\ 5 & \text{if } \tau_4 < h^* < \tau_5 \end{cases}$$

$$\tau_0 = -\infty, \tau_5 = +\infty$$

Application 2: Mode Choice

Likelihood Function

$$P_n = \int_{\varepsilon_{\text{PT}}} \int_{\varepsilon_{\text{Car}}} \int_{\varepsilon^0_{\text{Car}}} \left(\begin{array}{l} \Lambda\left(y \middle| \varepsilon_{\text{Car}}, \varepsilon_{\text{PT}}\right) P\left(h^0_{\text{Car}} \middle| \varepsilon^0_{\text{Car}}\right) P\left(h_{\text{Car}} \middle| \varepsilon_{\text{Car}}\right) P\left(h_{\text{PT}} \middle| \varepsilon_{\text{PT}}\right) \\ f\left(\varepsilon^0_{\text{Car}}, \varepsilon_{\text{Car}}, \varepsilon_{\text{PT}}\right) d\varepsilon^0_{\text{Car}}\, d\varepsilon_{\text{Car}} d\varepsilon_{\text{PT}} \end{array} \right)$$

Application 2: Mode Choice

Estimation Results (MIT)

Parameter	Parameter Estimates	Std Error	t-stat
Car constant	0.799	0.313	2.55
ln Time (minutes)	-0.568	0.211	-2.70
Cost/income ($ per month/$1000)	-1.31	0.679	-1.93
ρ_c	1.00 (fixed)	-	-
$\rho_b = \rho_a$	-0.0644	0.155	-0.41

Cost was found to affect the choice only, but not the happiness judgments

Application 2: Mode Choice

Estimation Results (MIT)

Parameter	Parameter Estimates	Std Error	t-stat
Pre-Treatment Car Happiness			
λ_1	4.34	0.903	4.81
Post-Treatment Car Happiness			
λ_2	3.55	0.724	4.91
Post-Treatment PT Happiness			
λ_3	3.00	0.697	4.30
Thresholds			
τ_1	-12.7	3.09	-4.10
τ_2	-9.04	2.83	-3.19
τ_3	-4.55	2.64	-1.72
τ_4	-0.356	2.58	-0.14

Application 2: Mode Choice

Extended Vs. Standard Model

	Extended (Choice + Happiness)		Standard (Choice only - logit)	
Parameter	**Parameter Estimates**	**Std Error**	**Parameter Estimates**	**Std Error**
Car constant	0.799	0.313	1.24	0.735
ln Time (minutes)	-0.568	0.211	-0.648	1.24
Cost/income ($ per month/$1000)	-1.31	0.679	-2.03	0.803

- Three criteria:
  - Goodness-of-fit, efficiency, consistency

Application 2: Mode Choice

Goodness-of-Fit

	Extended (Choice + Happiness)	**Standard (Choice only)**
Choice Log-Likelihood	-35.4	-32.6

- Choice-only model fits the data better

Application 2: Mode Choice

Efficiency

	Extended (Choice + Happiness)	Standard (Choice only – error component logit mixture)
$\text{Var}\left(\hat{\beta}_{\text{Standard}}\right) - \text{Var}\left(\hat{\beta}_{\text{Extended}}\right)$	Positive definite	
$\text{Trace}\left(\text{Var}\left(\hat{\beta}\right)\right)$	0.604	4.83
$\left\| \text{Var}\left(\hat{\beta}\right) \right\|$	0.00128	0.494

- Choice + happiness model is more efficient

Application 2: Mode Choice

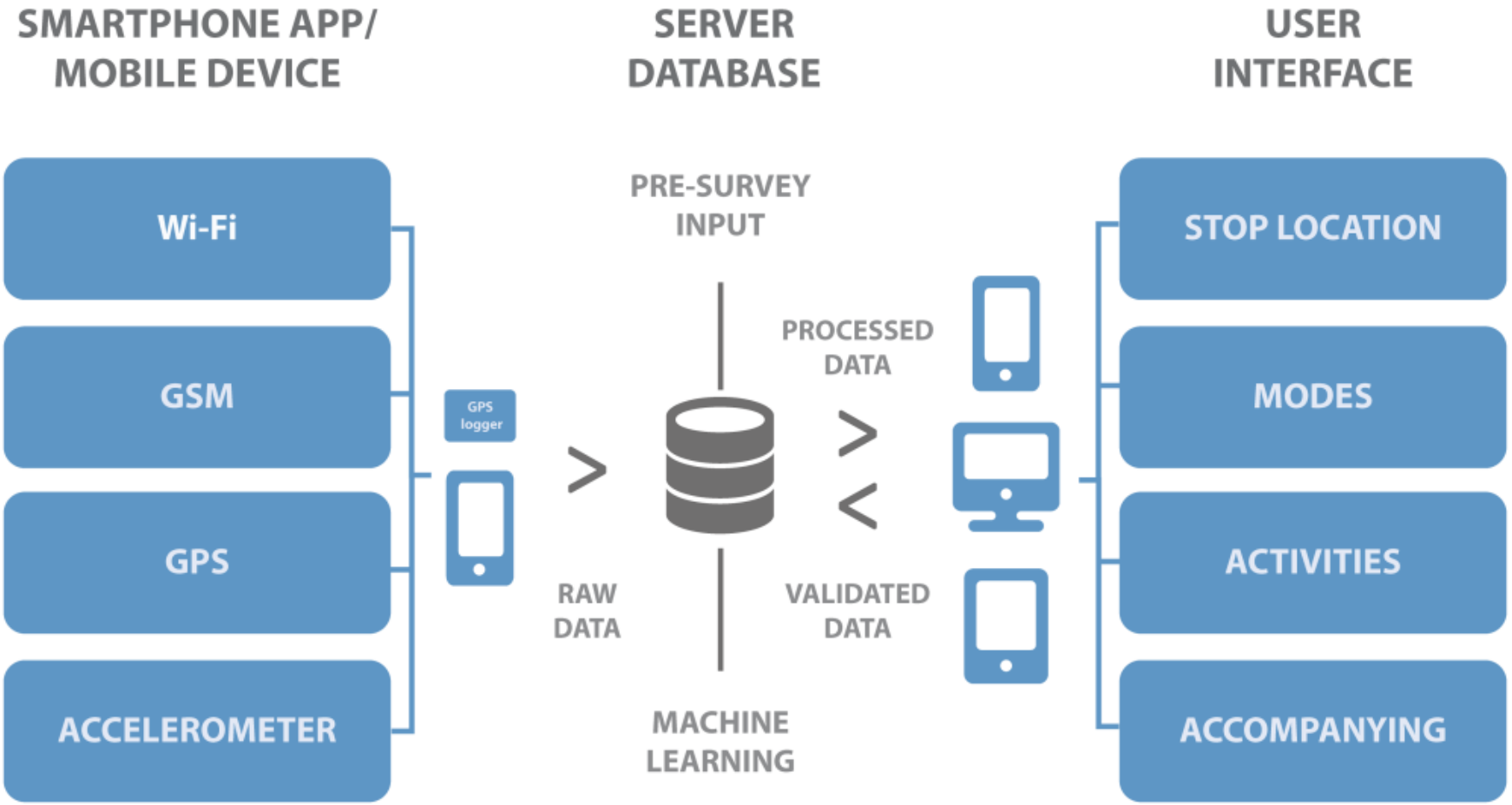
Consistency

- Two estimators: extended versus standard model
- Hausman specification test:
  - Under the null hypothesis, both are consistent, but the extended model parameter estimators are more efficient
- Applying Hausman test to MIT experiment results in accepting the null hypothesis at the 90% level of confidence

Application 3: Real-Time Measurement Using Smartphones

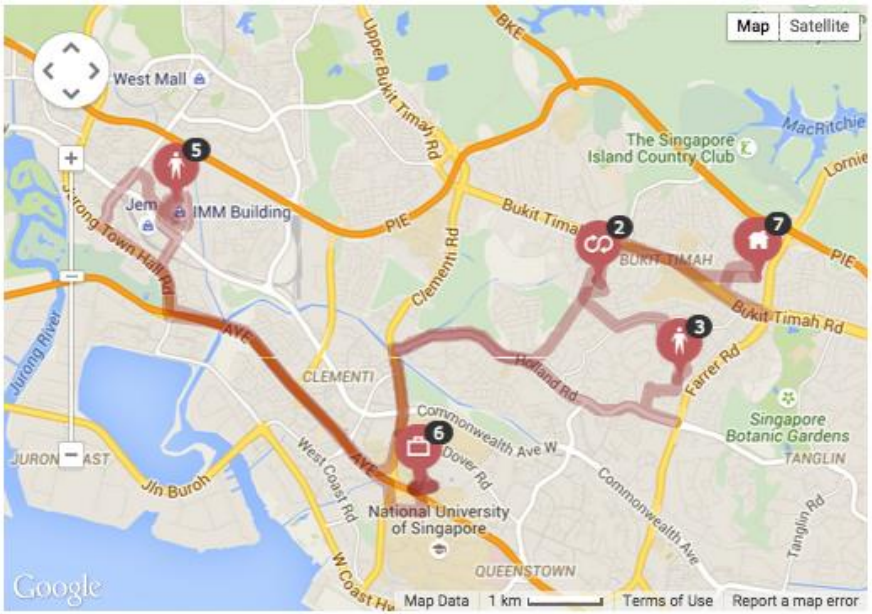
- Future Mobility Sensing (FMS) smartphone app and web validation tool (Cottrill et al., 2013)
  - Tracks activities and travel and detects travel modes
- Web validation tool
  - User validates the detected trajectory and inputs further info (trip purpose, travel company, etc.)
- https://happymobility.org/

FMS Framework



FMS Web Validation Interface

Date Selection Mon, 08-06-2015

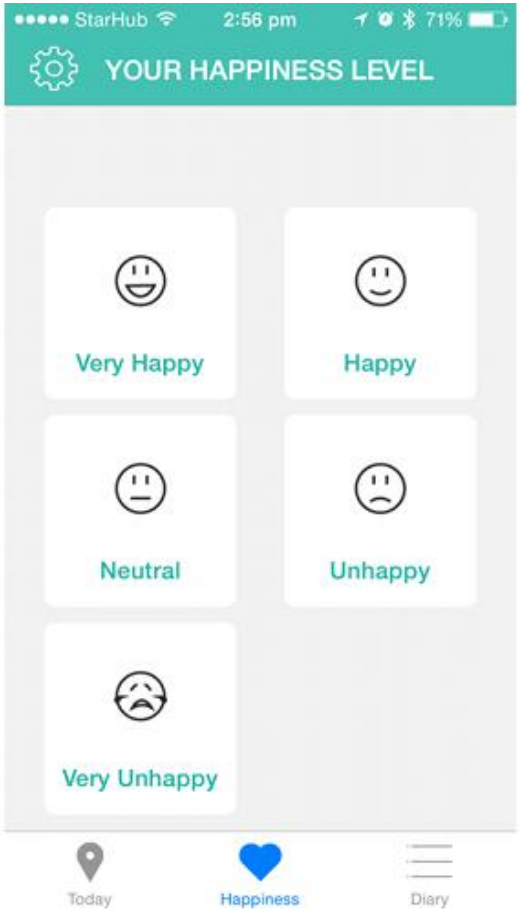


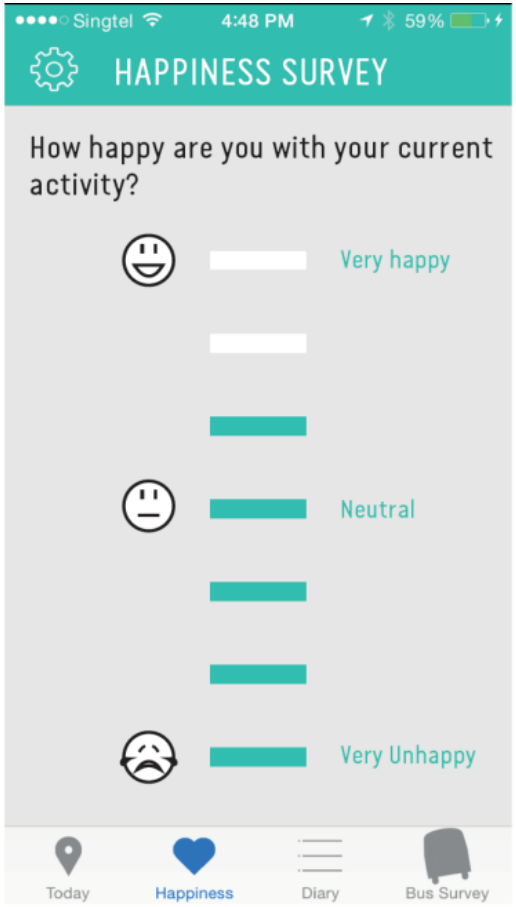
Add Non-Travel Activity

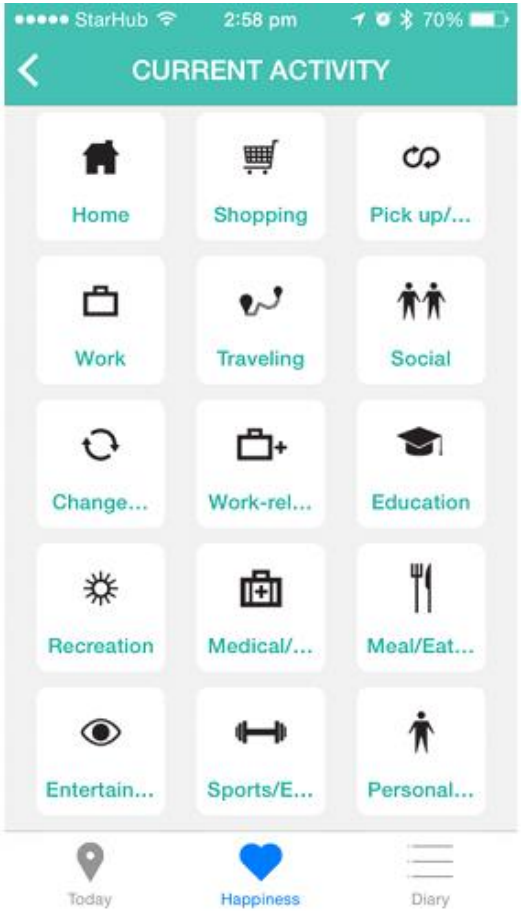
	Start/Duration				
✖	**21:02*** 12 h 39 min	1	**Shelford Road, Bukit Tima...**	✔	Verified
✖	**09:42** 10 min		Travel	✔	Verified
✖	**09:52** 6 min	2	**Namly Crescent, Bukit Tim...**	✔	Verified
✖	**09:58** 6 min		Travel	✔	Verified
✖	**10:04** 8 min	3	**King's Road, Bukit Timah**	✔	Verified
✖	**10:12** 23 min		Travel	✔	Verified
✖	**10:35** 1 h 25 min	4	**Create Way, Clementi**	✔	Verified
✖	**12:00** 55 min		Travel	✔	Verified
✖	**12:54**	5	**Jurong East**		

FMS Real-Time Happiness Question

- User responds to a happiness question, activated at a random time during the day.

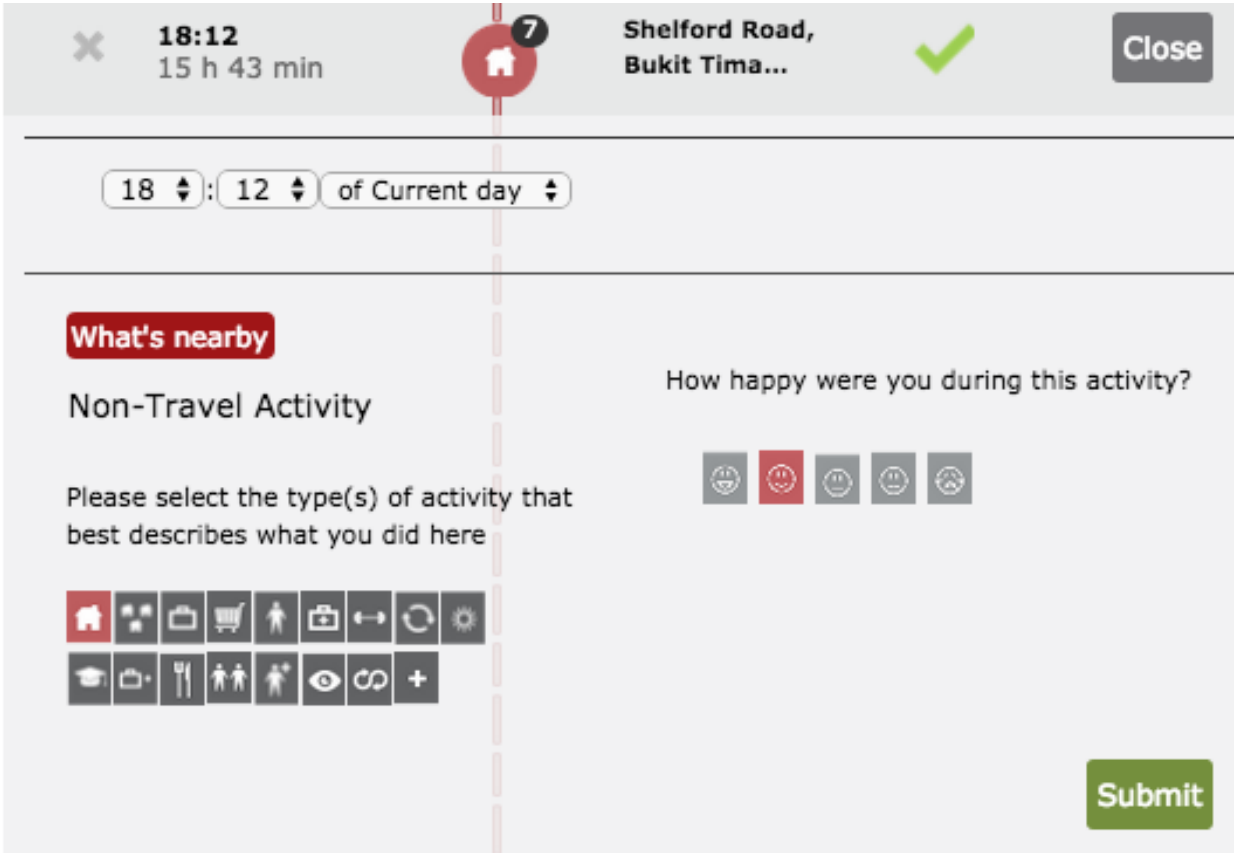






FMS Retrospective Happiness Question

- User also is presented with a retrospective happiness question while verifying the activity diary.

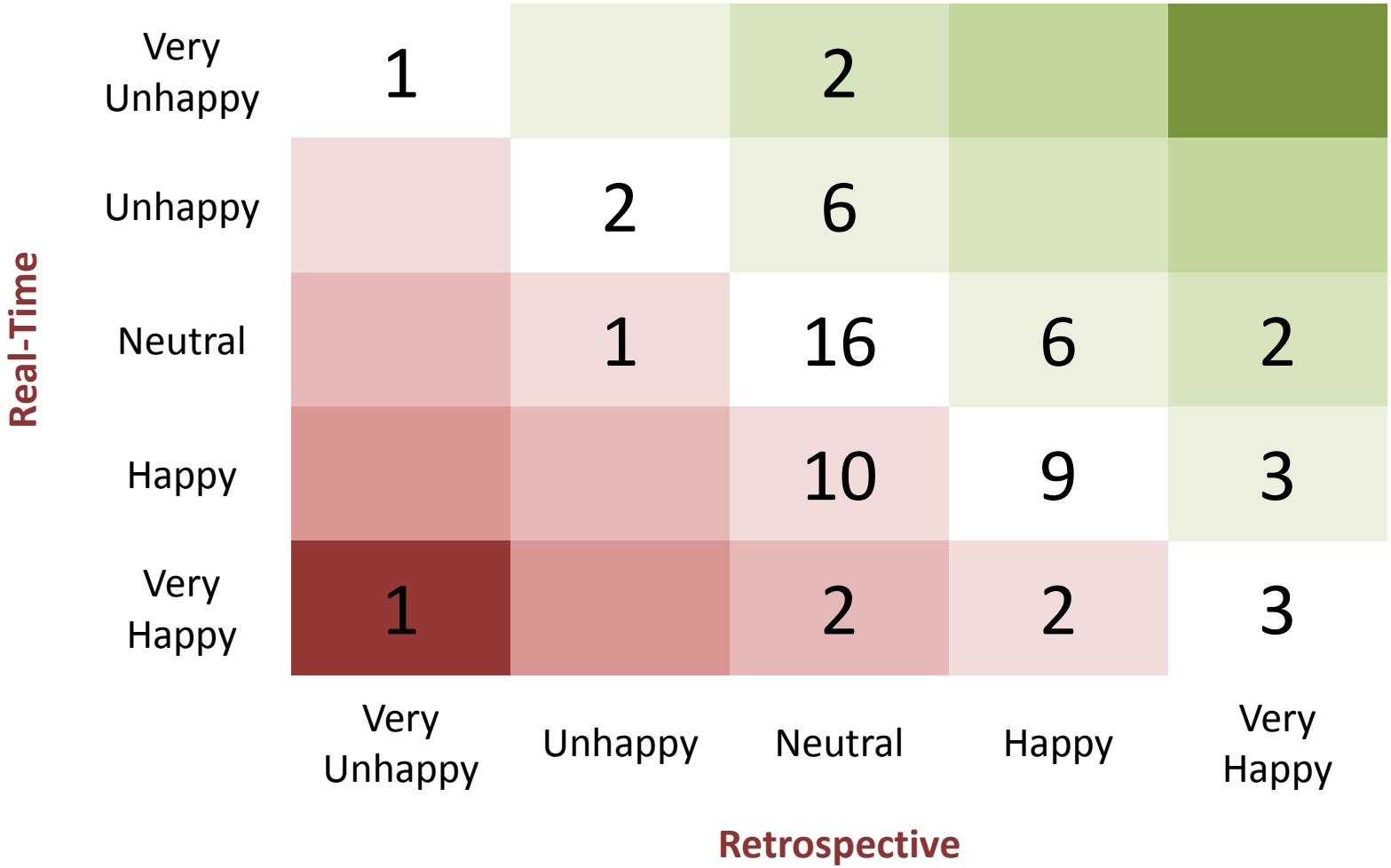


Data Collection

- 737 real-time happiness answers
- 147 retrospective happiness answers
  - 54% verified within 2 days
  - 26% verified between 3 and 7 days
  - 20% verified after a week

Real-Time Vs. Retrospective Happiness (Raveau et al., 2016)

(First Pilot Survey)



Real-Time Vs. Retrospective Happiness

- Hedonic Treadmill Effect: happiness tends to return to a stable level as time passes.

Happiness	Real-Time	Retrospective
Very Unhappy	5%	3%
Unhappy	12%	5%
Neutral	38%	55%
Happy	33%	26%
Very Happy	12%	12%

Modeling Happiness (Ordinal Logit)

Variables	Variable Type	Real-Time Happiness	Retrospective Happiness
Home Activity	Binary	0	0
Work Activity	Binary	-1.93×10^{-1}	-1.93×10^{-1}
Education Activity on Weekday	Binary	-1.01×10^{-1}	-1.01×10^{-1}
Education Activity on Weekend	Binary	-3.78×10^{-1}	-3.78×10^{-1}
Other Activity	Binary	5.42×10^{-1}	5.42×10^{-1}
Women	Binary	0	1.27×10^{-1}
Men	Binary	1.04×10^{-1}	0
(Education/Work Activity Duration)	Continuous	-1.82×10^{-2}	-6.72×10^{-3} *
(Education/Work Activity Duration)^2	Continuous	-6.91×10^{-3}	-2.12×10^{-3} *
(Other Activity Duration)	Continuous	2.76×10^{-2}	3.40×10^{-3} *
(Other Activity Duration)^2	Continuous	5.75×10^{-3}	1.45×10^{-3} *
Panel Effect (Mean)	Binary	1.52×10^{-1} *	1.52×10^{-1} *
Panel Effect (Std. Dev)	-	2.01×10^{-2} *	2.01×10^{-2} *

Modeling Happiness

Main Findings

- Activity type:
  - Compared to staying at home, performing work and education activities tends to result in lower levels of happiness.
  - Compared to staying at home, performing other activities tends to result in higher levels of happiness.
- Day of week:
  - Performing education activities on weekends instead of weekdays leads to lower levels of happiness.

Modeling Happiness

Main Findings

- Socio-demographics:
  - Men tend to report higher levels of happiness in real-time, but women tend to report higher levels of happiness retrospectively.
- Activity duration:
  - Activity duration has a more significant effect on real-time happiness than on retrospective happiness.
  - Longer work and education activity duration has a negative impact on happiness
  - Longer duration of other activities has a positive impact on happiness.

Issues

- Verification rates
- Capturing particular activities like travel
- Customizing the survey for different individuals (start and end time of time window for happiness question)
- Self-selection

Conclusion

SWB Measures Are Valid

- Evidence for the validity of SWB measures due to their correlation with (Layard, 2010):
  - Reports of friends
  - Causes of well-being (physical health, family status, employment, income, age)
  - Effects of well-being and correlation with behavior (job, marriage, etc.)
  - Physical functioning (salivary cortisol, blood pressure, heart rate, immunity)
  - Brain activity

And They Are Useful

- SWB indicators are useful:
  - As indicators of social progress
  - For measuring utility and capturing dynamics in behavior
  - For guiding public policy and valuation of non-market goods
- But need to handle carefully a number of measurement and modeling issues

Measurement Issues

- Question construction
  - Wording and length of reference period
- Response scale
  - Length, labeling, and unipolar vs. bipolar measures
- Question context and order
- Survey source and introductory text
- Wider survey context

Modeling Issues

- Omitted variables
- Reverse and two-way causality
- Adaptation
- Comparison / reference points
- Interpersonal comparisons of SWB data and cultural differences

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Appendix 1: SWB Measurement Issues

(see OECD, 2013)

Measurement Issues

- Question construction
  - Wording and length of reference period
- Response scale
  - Length, labeling, and unipolar vs. bipolar measures
- Question context and order
- Survey source and introductory text
- Wider survey context

Some Suggestions

1. Use multiple-item scales where possible to reduce the impact of variation in how respondents understand SWB questions
2. Reference period:
   - For satisfaction, use *“at present”, “these days”,* etc.
   - For experienced affect, recall period should not be too long (e.g. within 24 hours)

Some Suggestions (cont.)

3. Use numerical scales (up to 11-point) for single-item satisfaction questions
4. Use bipolar scales for satisfaction, and unipolar scales for affect

A unipolar scale:

0	1	2	3	4	5	6	7	8	9	10
Not at all happy					(Moderately happy)					Completely happy

A bipolar scale:

0	1	2	3	4	5	6	7	8	9	10
Completely unhappy					(Neither happy nor unhappy)					Completely happy

Some Suggestions (cont.)

5. Locate SWB questions as early on in the survey as possible
6. Start with the more general questions, then proceed to the more specific
   - E.g. ask general life satisfaction question before domain-specific satisfaction questions

   Schwarz et al. (1991):
   - When marital satisfaction is asked before life satisfaction, correlation = 0.67
   - When marital satisfaction is asked after life satisfaction, correlation = 0.32

Some Suggestions (cont.)

7. When comparing SWB data, ensure consistency w.r.t.:
   - Proportion of weekday/weekend measurement
   - Survey timing (w.r.t. seasons and holiday periods)
   - Absence of major news events or extreme weather
8. Stage SWB data collection over multiple days and throughout the year where possible

Question Construction

- Question wording
  - SWB questions can in general be answered in less than 30 seconds, suggesting no difficulty in comprehension
  - Use multiple-item scales where possible to reduce the impact of variation in how respondents understand SWB questions

Question Construction (cont.)

- Length of the reference period
  - Different reference periods may tap different SWB constructs (e.g. one-year period → evaluative; one-day period: current affect)
  - Long periods of recall may induce recall bias
  - Gallup uses *"at present"* and World Values Survey uses *"these days"* for evaluative measures
  - For experienced affect, recall period should not be too long (e.g. within 24 hours)

Response Scale

Length and Labeling

- Evaluative measures with numerical scales
  - Longer scales (up to a 11-point scale) are usually better
- Affective and eudaimonic measures
  - A smaller number of response scales have been used (e.g. 5 or 7) – multi-item measures – but no evidence as to the most optimal scale length
- Scale labeling
  - Anchors matter and affect the response frame (preferable to use most extreme response possible: e.g. always/never)
  - Numerical labeling is advantageous for single-item measures (longer scale), for respondent burden, and for comparability

Response Scale (cont.)

Unipolar vs. Bipolar Measures

A unipolar scale:

0	1	2	3	4	5	6	7	8	9	10
Not at all happy					(Moderately happy)					Completely happy

A bipolar scale:

0	1	2	3	4	5	6	7	8	9	10
Completely unhappy					(Neither happy nor unhappy)					Completely happy

- Evaluative measures tend to use bipolar scales, while affective measures tend to use unipolar scales
- Not clear if respondents fully understand the unipolar scales

Question Context and Order

- Earlier questions in a survey may create a context that affects responses to subsequent questions → priming
  - e.g. a question about unemployment or bereavement directly before a SWB question would set a negative tone
  - This could create undue influence of certain SWB determinants/events
  - E.g. Schwarz et al. (1991):
    - When marital satisfaction is asked before life satisfaction, correlation = 0.67
    - When marital satisfaction is asked after life satisfaction, correlation = 0.32

Question Context and Order (cont.)

- Locate SWB questions as early on in the survey as possible
- Start with the more general questions, then proceed to the more specific
  - e.g. general life satisfaction question before domain-specific satisfaction questions
- Use introductory text / transition questions to help reduce context effects
- Reduce redundancy in SWB questions
- When including domain-specific satisfaction, try to include a wide range of domains

Survey Source and Introductory Text

- Introductions and framings may lead to certain patterns of response (e.g. socially desirable responding or demand effects)
- The objectives of the overall survey and the manner in which it is administered may affect SWB responses
- Try to embed SWB questions in larger national household surveys rather than in surveys specifically focusing on SWB to reduce the above biases

Wider Survey Context

- Day-to-day events
  - Random daily events should not have much influence
  - Major events (economy, politics, public holidays) may impact SWB more systematically
- Day of week
  - Differences in patterns of activity
- Seasonal effects and weather

Wider Survey Context (cont.)

- When comparing SWB data, ensure consistency w.r.t.:
  - Proportion of weekday/weekend measurement
  - Survey timing (w.r.t. seasons and holiday periods)
  - Absence of major news events or extreme weather
- Stage SWB data collection over multiple days and throughout the year where possible

Appendix 2: SWB Modeling Issues

SWB Modeling Issues

- Omitted variables
- Reverse and two-way causality
- Adaptation
- Comparison / reference points
- Interpersonal comparisons of SWB data and cultural differences

Omitted Variable Problem

- SWB modeling is subject to omitted variable bias because many factors contribute to SWB
- Example:
  - Failure to find an effect of income growth on SWB despite cross-sectional relation between income and SWB
  - Potential omitted variables:
    - Changes in relative income
    - Changes in other determinants such as health, social connections, perceived freedom, etc.

Omitted Variable Problem (cont.)

- Omitted variables can cause endogeneity
- Use instrumental variables where possible to identify them

Reverse and Two-Way Causality

- Limited ability to make causal inferences in cross-sectional data
  - E.g. are married people happier, or are happier people more likely to be married?
  - Domain vs. overall SWB
- Two-way or reverse causality can cause endogeneity if not modeled
- Best to use panel data

Adaptation

- Measure SWB at different points in time (e.g. before, during, and after events of interest) and model the effects of adaptation explicitly
- Example: mode choice
  - SWB during routine travel
  - SWB during mode choice decision
  - SWB after mode choice decision

Comparison / Reference Points

- Measure the comparison group if possible for the context of interest
- Include comparison effects in the SWB model

Comparison (cont.)

Example – Commuting to Work (Abou-Zeid and Ben-Akiva, 2011)

Reference Group

Please think about a person in your metropolitan area and whose commute you are familiar with. This person could be your friend, colleague, neighbor, family member, etc.

How is this person related to you?

- ☐ Friend
- ☐ Colleague at work
- ☐ Neighbor
- ☐ Relative
- ☐ Family member
- ☐ Other acquaintance

Comparison (cont.)

Example – Commuting to Work (Abou-Zeid and Ben-Akiva, 2011)

SWB Comparison with Reference Group

On average, compared to this person's commute, your commute is:

- ☐ Much more stressful
- ☐ Somewhat more stressful
- ☐ As good/bad as his/her commute
- ☐ Somewhat less stressful
- ☐ Much less stressful
- ☐ Don't know

Comparison (cont.)

Example – Commuting to Work (Abou-Zeid and Ben-Akiva, 2011)

Attributes of Reference Group

How does this person commute to work?

- ☐ Car
- ☐ Bus or train
- ☐ Walk or bike
- ☐ Don't know
- ☐ Other [Please specify……]

On average, compared to this person's commute, your commute takes:

- ☐ Much more time
- ☐ Somewhat more time
- ☐ Almost the same time
- ☐ Somewhat less time
- ☐ Much less time
- ☐ Don't know

Interpersonal Comparisons

- Issue of interpersonal comparisons
  - Individuals may interpret and use the SWB scale differently

	SWB
John	4/10
Amy	6/10

Is Amy indeed happier than John, or is it a matter of scale use?

- Common to use SWB survey responses as cardinal and report averages
- Individual trends and some forms of regression do not assume cardinality

Interpersonal Comparisons (cont.)

- Cardinal measure:
  - Net affect = average positive affect – average negative affect
- Ordinal measure:
  - U-index = proportion of time that a person spends in activities where dominant feeling is negative

Interpersonal Comparisons (cont.)

Affect Balance and U-Index

Activity	*Percentage of sample*	*Time spent (hours)*	*Net affect*	*U-Index*
Intimate relations	12	0.23	4.83	0.040
Socializing after work	49	1.14	4.15	0.073
Relaxing	77	2.17	3.96	0.078
Dinner	69	0.81	3.94	0.074
Lunch	67	0.57	3.91	0.078
Exercising	16	0.22	3.85	0.088
Praying/worship	23	0.45	3.78	0.105
Socializing at work	41	1.12	3.78	0.100
Watching TV	75	2.19	3.65	0.095
Phone at home	43	0.93	3.52	0.126
Napping	43	0.89	3.35	0.131
Cooking	63	1.15	3.27	0.138
Shopping	30	0.41	3.23	0.157
Computer (non-work)	29	0.51	3.22	0.165
Housework	49	1.12	2.99	0.161
Childcare	36	1.10	2.99	0.199
Evening commute	63	0.61	2.77	0.209
Working	100	6.89	2.68	0.211
Morning commute	68	0.47	2.09	0.287

Source: Kahneman and Krueger (2006) – for a sample of employed women in Texas

Cultural Differences

- SWB ratings may differ across cultures for reasons related to true differences or to cultural bias and response styles
- Can use fixed effects models or other approaches to model differences between cultures

Appendix 3: SWB and Valuation

SWB and Valuation

- SWB data has recently been used in valuation studies that involve non-market goods
  - E.g. urban regeneration, marriage, unemployment, …
- Life satisfaction approach:
  - Basic premise: SWB reflects utility better than preference satisfaction
  - Regress life satisfaction against the non-market good, income, and other explanatory variables
  - The value of the non-market good is the change in income needed to maintain a constant level of satisfaction

SWB and Valuation (cont.)

- $LS = \alpha + \beta_1 M + \beta_2 Q + \beta_3 X + \varepsilon$

(LS = life satisfaction; M = income; Q = non-market good)

- $WTP_{LS} = \frac{\beta_2 (Q_2 - Q_1)}{\beta_1}$

Example: Value of Urban Regeneration (Dolan and Metcalfe, 2008)

- Urban regeneration scheme in UK
  - Improvement of house features (e.g. roofs) and property walls, road resurfacing, and improved street lighting
- Quasi-experiment:
  - One treatment neighborhood and one control neighborhood used in the analysis

Non-market good

Indirect effects

Comparison effect

WTP

Dependent: Life satisfaction	(1)		(2)		(3)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.738***	0.283	0.623**	0.283	0.652	0.427
Ln(Household income)	0.704**	0.305	0.629**	0.304	0.729***	0.197
Gender	0.036	0.318	0.073	0.313	0.271	0.273
Age	-0.150*	0.080	-0.140*	0.079	-0.116	0.083
Age^2	0.001	0.001	0.001	0.001	0.001	0.001
Married	0.609	0.383	0.602	0.377	0.571	0.214
Cohabiting	-0.776	0.568	-0.691	0.560	-0.764	0.514
Divorced	0.128	0.499	-0.109	0.499	-0.118	0.641
Separated	-1.818	1.139	-1.361	1.134	-1.193	0.723
Widowed	-0.596	1.125	-0.503	1.107	-0.569	0.379
Employed part-time	0.020	0.424	0.025	0.417	0.059	0.515
Self-employed	2.651***	0.720	2.291***	0.720	2.289***	0.466
Unemployed – looking for work	-1.314*	0.687	-1.394**	0.676	-1.415*	0.616
Unemployed – not looking for work	-0.182	0.491	-0.305	0.486	-0.246	0.572
Student	0.916	0.682	0.877	0.671	0.991**	0.405
Retired	0.334	0.707	0.492	0.697	0.579	0.425
Speaking to family	0.126	0.197	0.157	0.196	0.165	0.218
Speaking to friends	0.421**	0.196	0.447**	0.196	0.467**	0.184
Speaking to neighbours	0.096	0.148	0.068	0.146	0.059	0.176
Crime			-0.241*	0.132	-0.239***	0.059
Noise from neighbours			-0.210*	0.115	-0.219**	0.080
Ln(Reference income)					-1.755	1.204
Constant	0.169	3.625	1.160	3.593	16.904	11.182
N	185		185		185	
Adjusted R^2	0.33		0.36		0.37	
Average household income	£18,986		£18,986		£18,986	
IC for regeneration	£35,200		£32,100		£27,500	

Instrumented Regression

- Income may be endogenous
- Instrumental variables:
  - Whether an individual's partner is in employment
  - Whether an individual is in rented accommodation

Dependent: Life satisfaction	(1)		(2)	
	Coeff.	S.E.	Coeff.	S.E.
Regeneration	0.708**	0.290	0.811	0.531
Ln(Household income)	2.449***	0.891	2.418***	0.839
Other controls…				
First stage *F* statistic	12.20		6.05	
First stage partial R^2	0.13		0.10	
Over-identification test	0.707	(p=0.401)	0.444	(p=0.505)
Average household income	£18,943		£18,986	
Income compensation	£6,350		£7,600	

WTP

Life Satisfaction Approach

- LS approach to valuation can be used as a complement to preference-based approaches
  - Does not depend on rationality axioms of preference-based approaches
  - Less strategic responding
- WTP values estimated tend to be high
  - Difficulty in properly handling all statistical issues
  - Unknown time duration of life satisfaction measures