Attitudes in Travel Forecasting Models:

Can't live with 'em; can't live without 'em

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Arguments *in favor of* including attitudes

- They matter to behavior, according to
  - Self-introspection
  - Statistical analysis
  - Numerous psychological theories
  - Prominent scholars McFadden 2001

TPB, TRA, EMGB, TAM, TIB, etc…

- In an increasingly complex, technology-driven world, they may matter more now than ever
- Excluding them biases the coefficients of *included* variables
  - Muddies interpretation, leads to incorrect predictions, requires "asserting" parameters

Domarchi et al. 2008; Kuppam et al. 1999; Mokhtarian & Salomon 1997

Arguments *against* including attitudes, & rebuttals (1a)

Data collection stage:

- Harder to measure

Model-building stage:

- Specialized knowledge to analyze
  - EFA, CFA, SEM, ICLV/HCM, MIMIC, MIS, PLS-PA...

- But there *are* long-established ways to measure them well, and the specialized knowledge can be taught, just as we've taught/are teaching specialized knowledge on logit models, machine learning, etc.

Dillman et al. 2009; Stopher 2012; Vij & Walker 2016

Arguments *against* including attitudes, & rebuttals (1b)

Data collection stage:

- Imposes additional burden on respondents

- Survey design authorities say that it *improves* response rate to ask attitudes at the beginning
  - People are flattered to be asked, enjoy giving opinions
  - Draws them into the survey, solidifying commitment; creates trust in designer's impartiality

TRB 2005; Dillman et al. 2009; Stopher 2012

Arguments *against* including attitudes, & rebuttals (2a, 3a)

Interpretation:

- Temporal mismatch in using current attitudes to explain prior behavior

Forecasting:

- How stable *are* attitudes, anyway?

- Can measure test-retest reliability; if attitudes are stable and no extreme events have occurred between past behavior and survey date, can feel safer in assuming current attitudes resemble those in force when the behavior occurred
- Some measurement error is inevitable by using current attitudes instead of prior ones; is it better than exclusion?
- Can test both directions of causality

Arguments *against* including attitudes, & rebuttals (2b)

Interpretation:

- Behavior influences attitudes at least as much

- Has been found true *occasionally*; can examine each/both direction/s of causality conceptually as well as empirically, to ascertain which direction is more likely
- Of course, longitudinal (panel) data is better!

Golob 2001; Chorus & Kroesen 2014; Kroesen et al. 2017; Kroesen & Chorus 2018

Rebuttals to arguments *against* including attitudes (2c)

Interpretation:

- How to interpret the coefficient of a standardized attitude variable?
  - Elasticities don't make sense when a variable can be negative

- *All* variables can be standardized, to compare importances
- Can benchmark one population/time, and compare others to it
  - Can test scenarios: if GA came to have the same distribution of attitudes as CA currently has, what would it mean for … (e.g.) Millennials? Baby Boomers?

Rebuttals to arguments *against* including attitudes (3)

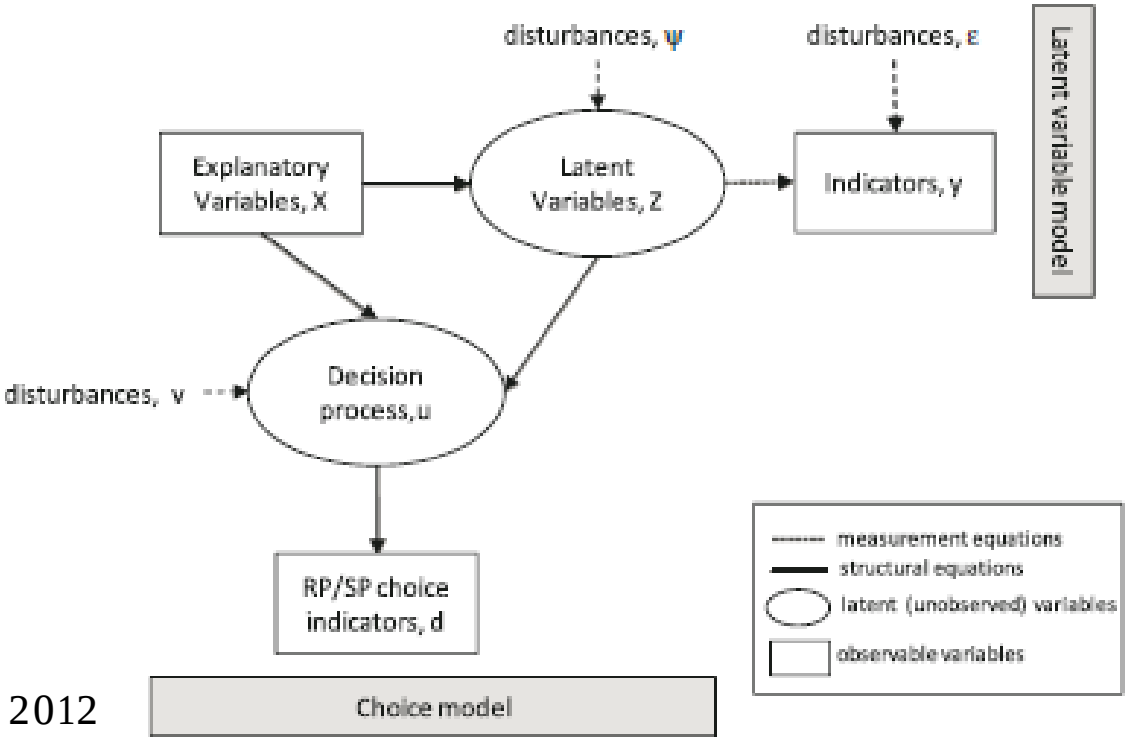
Forecasting:

- How can we forecast attitudes, as we must do for other model inputs?

- It's not like our other forecasts are perfect…
- Longitudinal collection of attitude data
  - Study attitude formation, trends (which can be projected)
  - Develop causal relationships explaining attitude formation

Innovations (1)

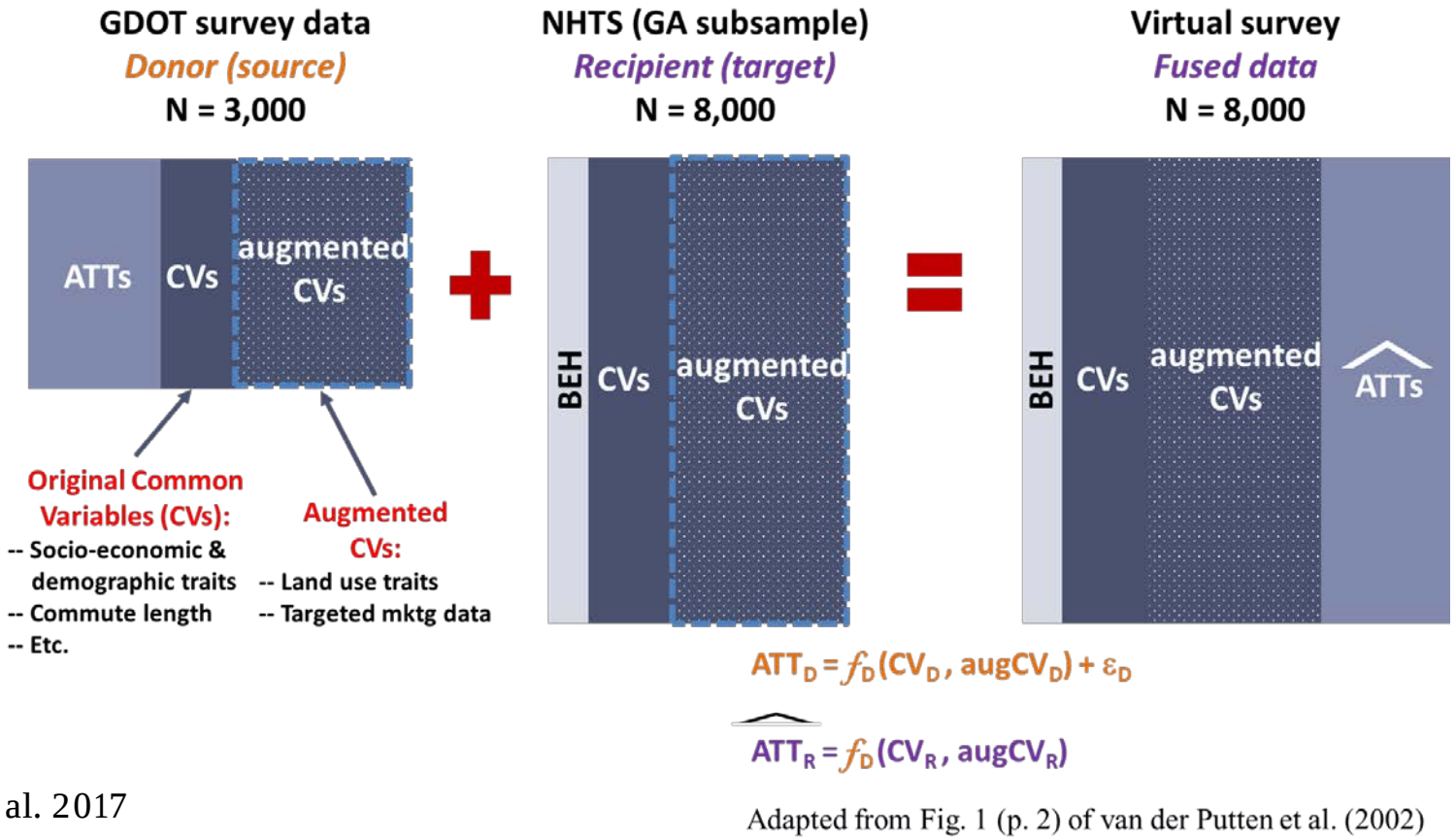
- Smartphone apps that can capture attitudes in real time (Thomas and Azmitia, 2016)
- Integrated Choice/Latent Variable Models



Source: Daly et al. 2012

Innovations (2)

- Using machine learning to transfer attitudes from smaller-scale specialized survey databases to large-scale travel behavior databases (like NHTS)

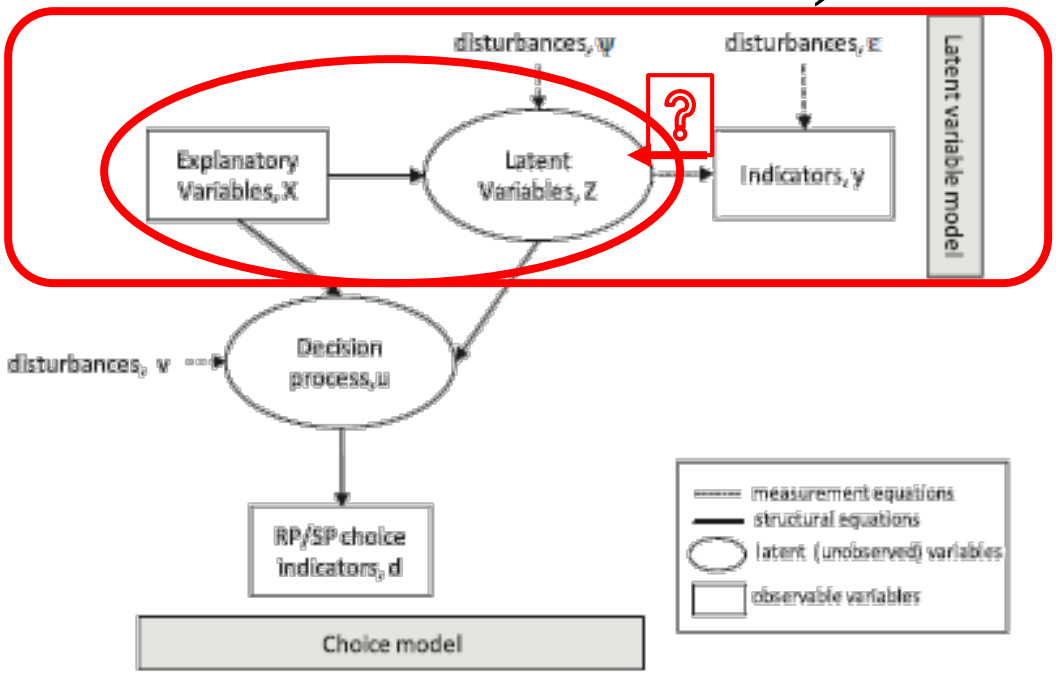


Malokin et al. 2017

Adapted from Fig. 1 (p. 2) of van der Putten et al. (2002)

Challenges

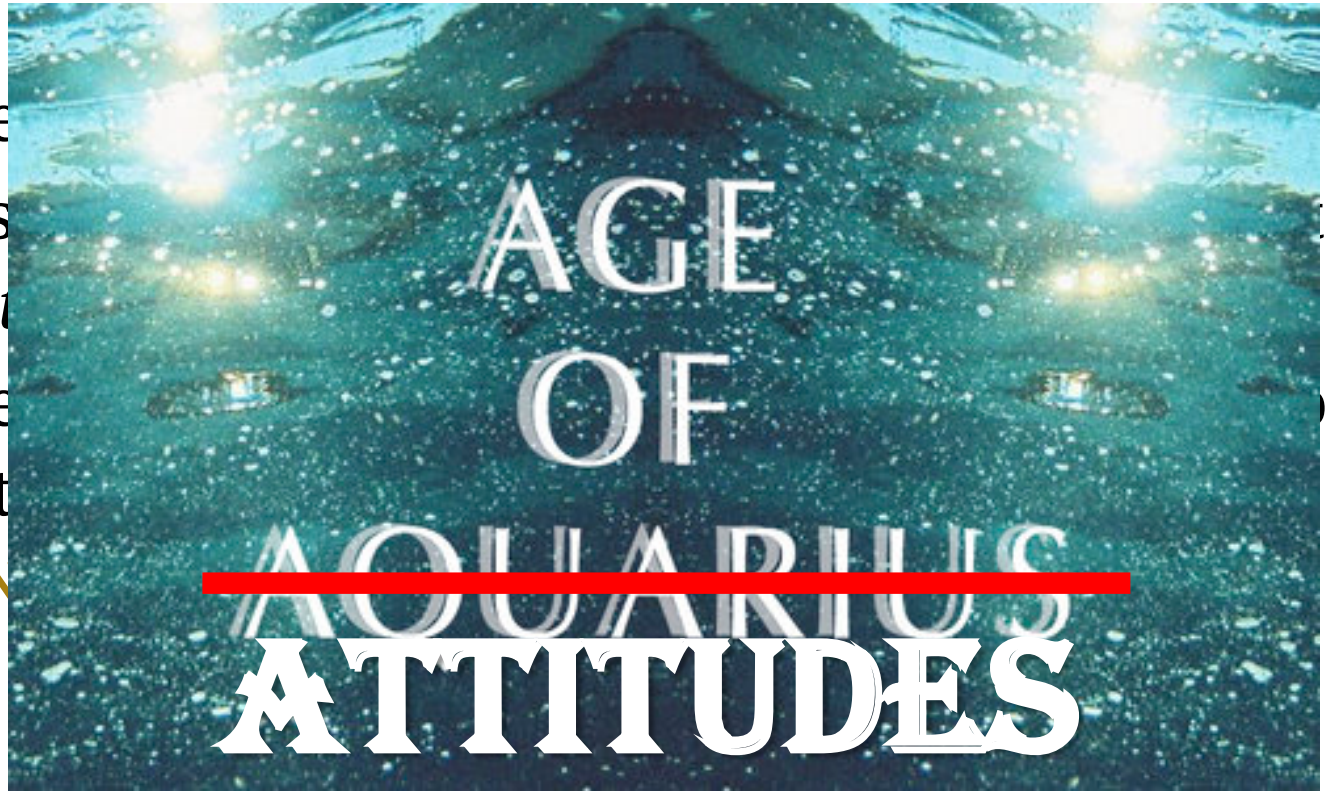
- How do we evaluate the "goodness" of the model (esp. attitudinal measurement)? Motoaki & Daziano 2015



- Structural models of attitudes in ICLVs are not generally very good
- Do (all) the arrows have to go this way? (Kline 2006)

Summary

- We
- It's
- We



- I'm looking forward to the "Age of Attitudes" in travel forecasting...

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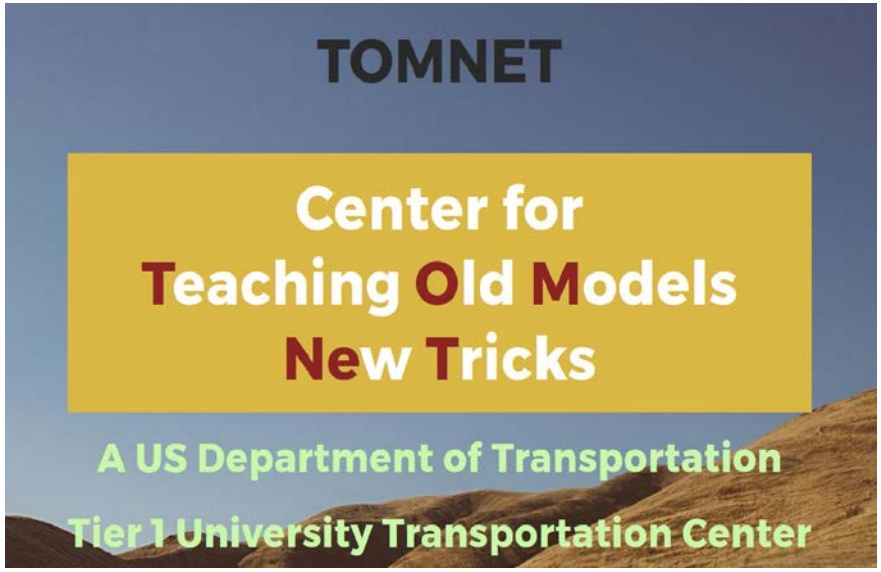

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