

# Cultural Consensus Theory Models: Applications for Multicultural Survey Design and Analysis

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# Inspiration

An Extended Cultural Consensus Theory Model to Account for Cognitive Processes in Decision Making in Social Surveys

By Zita Oravecz, Katherine Faust, and William H. Batchelder (U. of California Irvine)

*Sociological Methodology* 2014

# Structure in a Nutshell

- What is cultural consensus theory?
- How have Oravecz et al extended it to social surveys?
- What advantages does it have for 3MC work?
- Ideas for future research

# What Is Cultural Consensus Theory (CCT)?

- Cultural Anthropology: ethnographers try to understand cultural knowledge in a population
- CCT: Systematic method to infer consensus answers by pooling responses
- CCT models estimate shared answer key, accounting for individual knowledge levels, response styles
- Have been used extensively for decades across many research domains to explore shared cultural knowledge and beliefs

# What Sparked My Interest

- Like psychometric test theory CCT deals with abilities and item difficulties
- But answer key is latent
- Central tenet: cultural understandings arise from two sources
  - direct individual experience
  - learning from other members of the culture
- Contextual view of knowledge paralleled in social construction of reality (Berger and Luckman, 1966)

# Item Response vs Cultural Consensus Theories

- IRT

- Reveals lack of individual knowledge (knowledge defined by experts)
- Compares knowledge levels across groups, and determines whether items have a group bias

- ECT

- Determines if cultural consensus about knowledge exists
- Reveals lack of individual knowledge of cultural consensus
- Treats answers as opinions rather than facts, and compares to say, scientific knowledge
- Identifies potential existence of “counter-knowledge”

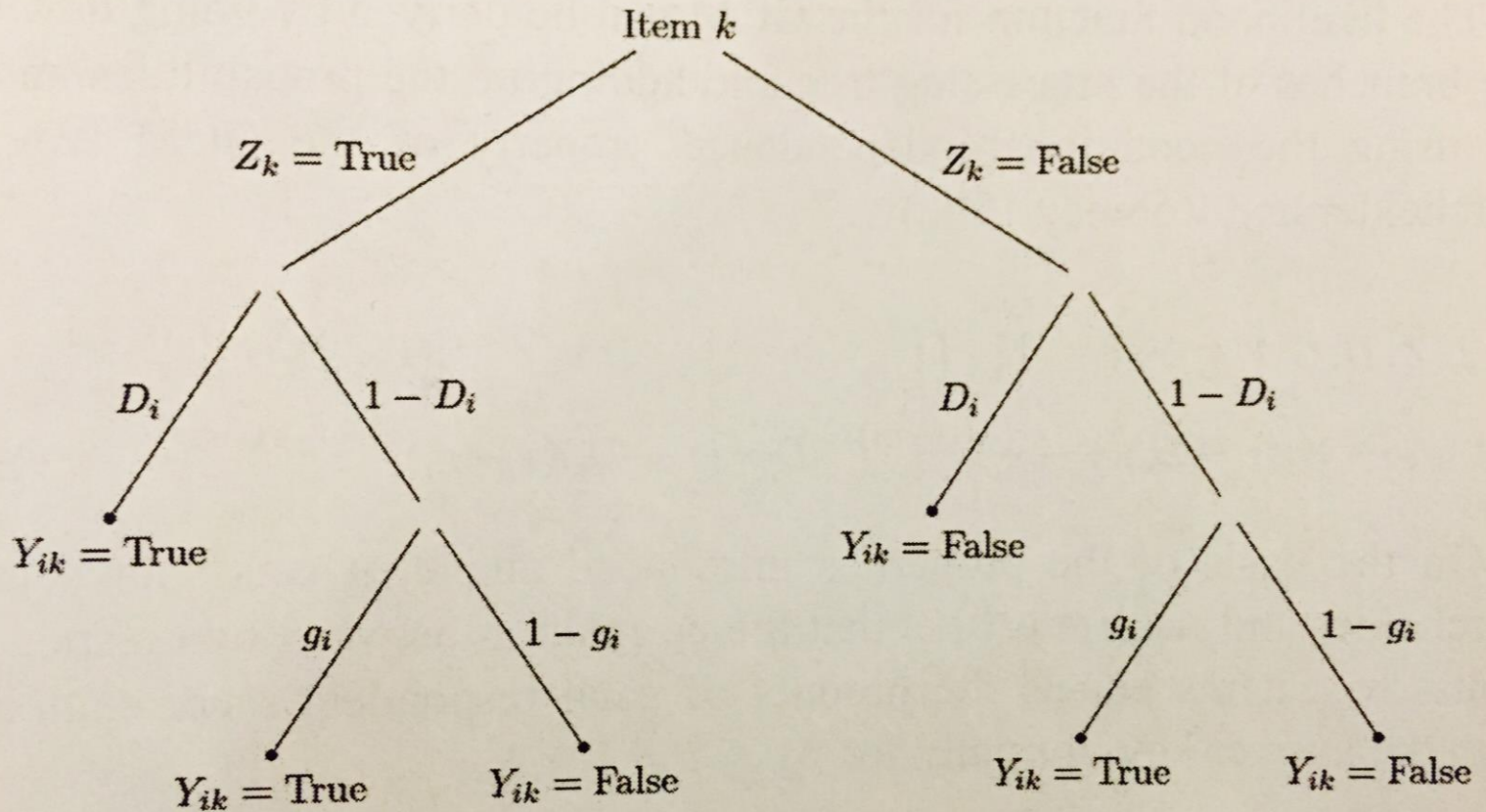


Figure 1. Processing tree of the general Condorcet model for an item  $k$ .

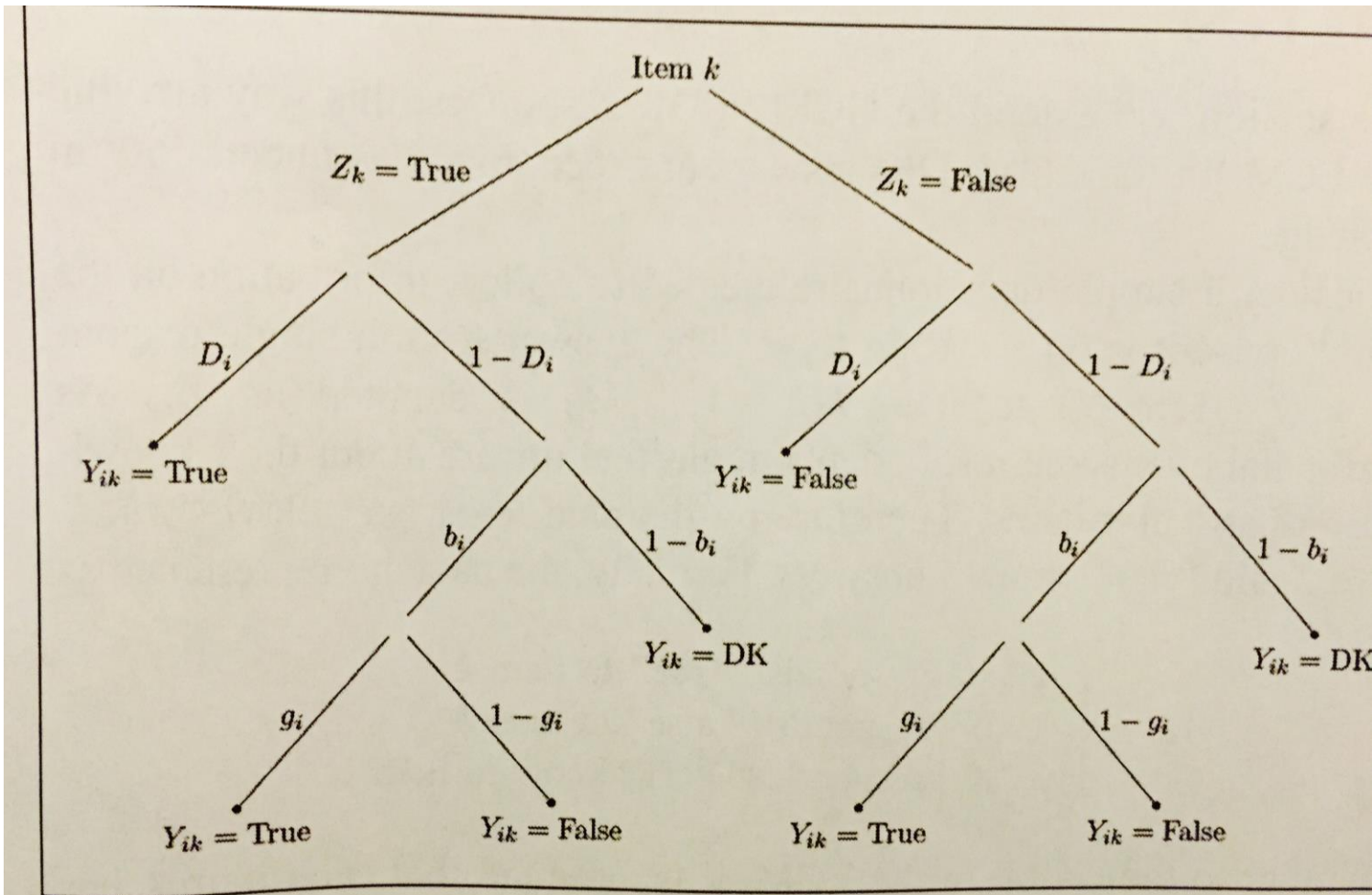
# CCT in Action...

- Produces quantitative measures
  - Cultural consensus in a group
  - Consensus answer
  - Cognitive characteristics of group members
- Typical use
  - General Condorcet Model, dichotomous variables (true or false)
  - Large number of items assessed in a domain
  - Small number of individuals reporting for a group
  - Uncertainty is treated arbitrarily (e.g., flipping a coin, or combining with false responses)



# How Oravecz et al Introduced CCT to Social Surveys: The Hierarchical Extended Condorcet Model (HECM)

- Examined survey questionnaire items on knowledge beliefs in a specific domain
- (Instead of scoring responses as correct or incorrect against expert established correct answer,) estimated consensus set of answers by fitting a CCT model
- Extended CCT to explicitly address uncertainty as legitimate answer, not missing data
- Made the revised model hierarchical by including respondent characteristics (e.g., gender), enabling information to be pooled across respondents and items



**Figure 2.** Processing tree of the extended Condorcet model.

*Note:* DK = don't know.

# Testing for One Underlying Culture

- HECM assumes a single culture
- Bayesian approach
  - Absolute model fit investigated through posterior predictive model checks (PPCs)
  - If real data statistics inconsistent with distribution of statistics from replicated data, proposed model unlikely to provide a good description of the real data
- Batchelder and Anders (2012) developed a PPC to test the one culture assumption, analogous to one-factor solution in factor analysis

# GSS 2010 Example: Scientific Knowledge (showing 3 of 12 items)

	Earth's center hot	Universe began explosion	Humans from animals
Raw: true	759	340	447
false	55	307	351
DK	102	269	118
Science	T	T	T
Scored answers	T	F	F
Majority answers	T	T	T
HECM answer key	T	T	T
HECM ID	-2.11	2.15	1.13

# GSS 2010 Population Level Results (all 12 items)

## Parameters

	Posterior mean
– Pop. Mean—ability	-0.61
– Pop. Variance—ability	1.69
– Pop. Mean—willingness to guess*	1.12
– Pop. Variance—willingness to guess*	1.51
– Pop. Mean—guessing bias*	-0.05
– Pop. Variance—guessing bias*	0.55
– Pop. Variance—item difficulty	2.89
– Answer Key “true” probability	0.64

\*logit scale

# IAA 1994 Example: Facts on Aging Quiz (showing 3 of 25 items)

	Fewer driving accidents	Slower to learn new things	Incomes below poverty
Raw: true	481	575	535
false	501	516	443
DK	185	76	189
Science	T	T	F
Scored answers	F	F	F
Majority answers	F	T	T
HECM answer key	F	F	F
HECM ID	1.25	1.06	1.55

# IAA 1994 Posterior Means of Covariates (all 25 items)

<b>Parameter</b>	<b>Ability</b>	<b>Willingness to Guess</b>	<b>Guessing Bias</b>
Education	0.31	-0.21	-0.20
Gender	-0.01	-0.19	-0.02
Age	-0.04	-0.13	0.08
Contact with Elderly (often to never)	0.01	-0.01	0.09

# Summary of HECM

- Demonstrated applications to knowledge questions in social survey data
- Provides insights about cultural knowledge:
  - Systematic variation in knowledge levels
  - Tendencies to guess
  - Acquiescence bias
- Separates knowledge from performance
- Answer key can differ from science and majority
- Conveys interpretation of consensus opinion in society based on principles of cognitive and personality psychology



# Benefits for 3mc Study Design and Instrument Development?

- Pretesting (Harkness):
  - Traditional field tests, cognitive testing
  - Less common: dif, eyetracking, testing in different languages
  - But trial and error: no unifying theory
- IRT allows identification of specification error for specific subgroups of the population
- But CCT/HECM may take us farther than that, mapping indicators of a construct and confirming existence of a common concept across specific populations.
- Works for small n's, 25-50

# Future Research

- How to model heterogeneity in cultural knowledge (Anders and Batchelder, 2012)
- Extending CCT models beyond dichotomous items to answer scales (strongly agree, etc.)
- Extending Oravecz et al GSS analysis to ISSP knowledge items?
- Investigating ways to apply CCT to attitudinal items (WVS?)
- Applying HECM to early stages of 3mc design?

# Thanks, and on to Chicago!

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