Index of Emancipative Values: Measurement Model Misspecifications

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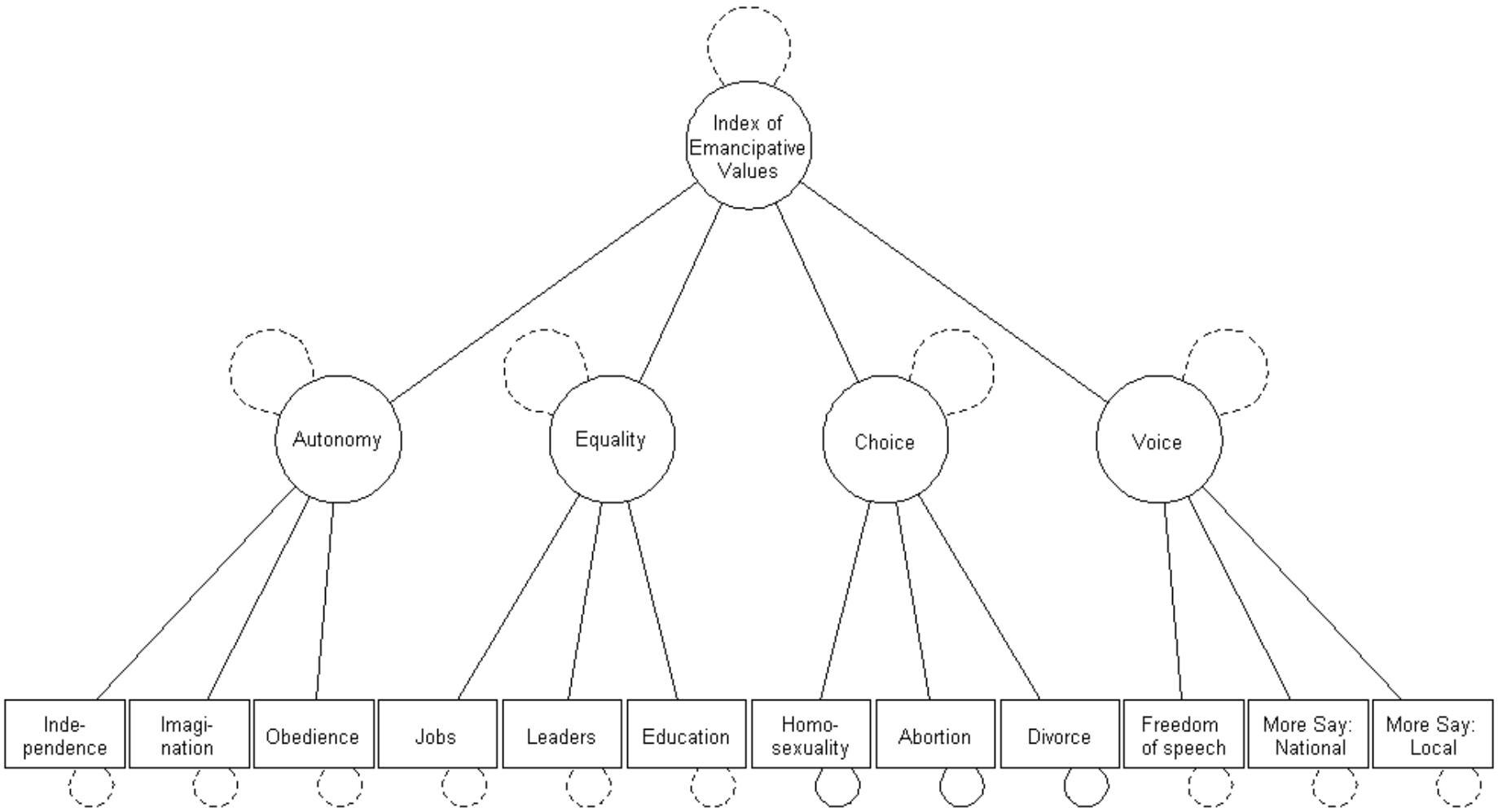
Introduction

- Emancipative value orientations are associated with
  - the increase in support for democracy (Inglehart and Welzel 2003; Welzel, Inglehart and Klingemann 2003; Welzel and Inglehart 2006)
  - tolerance for minorities (Andersen and Fetner 2008) and gender equality (Inglehart and Norris 2003; Bergh 2007; Alexander and Welzel 2011).
- Self-expression and emancipative value orientations were proved to
  - maintain interpersonal trust (Welzel 2010)
  - lead to decline in violence, both domestic (Welzel 2010; Welzel and Deutsch 2012) and international (Inglehart, Puranen and Welzel 2015).
- Values change also contributes to:
  - democratization (Welzel 2006; Welzel 2007; Inglehart and Welzel 2010)
  - secularization (Inglehart and Appel 1989; Inglehart and Norris 2003) across the world.

Index of Emancipative Values



Index Construction

- 12 variables from WVS
- Four first order factors
- 9 categorical and 3 approximately continuous (those defining “choice”-sub-index).
- All indicators are rescaled to 0-1 range.
- The index is an average score of all item-specific scores (also within 0-1).
- The purpose of the index of emancipative values (henceforth EVI) is to detect the evolutionary change in values across the world. It allows for single ordering of countries along the emancipation scale.

Dimensionality and monotonicity

One individual does not agree at all that education is more important for boys than for girls. He/she responds similarly on other “Equality”-related questions. That is, his/her score on this particular sub-index is 1. But he/she has a sub-score equal to 0 on “Voice”.

Conversely, other individual completely agrees that education is more important for boys than for girls and responds similarly on other “Equality”-related questions (sub-score = 0). But he/she strongly supports broad citizens rights and freedoms (sub-score on “Voice” = 1)

Both individuals have the same response pattern on all other items (i.e. they emphasize “Autonomy” and “Choice” at the same rate, say, 1)

Make a simple arithmetic exercise and compute their total scores on emancipative values.

Who is more emancipative?

Now imagine an individual with sub-scores on “Autonomy”, “Equality”, “Choice” and “Voice” equal to 0.5, 0.66, 0.77 and 0.83 respectively. What is his/her total emancipative score? Whether he/she actually less emancipative that the former two?

Dimensionality and monotonicity II

When only few individuals have completely opposite preferences on particular sub-indices of the EVI, we can ignore such situation

When significant fractions of population demonstrate response patterns similar to described for single individuals above, it may indicate that more than one value dimension correspond to the set of observed items used to measure emancipative values.

Measurement Equivalence

Again, consider two individuals, one living somewhere in Southern Europe and another living in South-East Asia.

When they are asked whether they agree with a statement that “education is more important for boys than for girls”, the first individual chooses the extreme answer, “completely disagree”, whereas the other chooses a moderate negative response category, “disagree”.

Actually, both disagree with the statement. Why they respond differently?

1) The true differences in personal emphasis on gender equality.
2) Some unmeasured individual psychological traits
3) Country(culture)-specific response style
4) Other country-specific sources of measurement error (e.g., differences in sampling procedures or interview modes, poor translation, and so on).
5) Impact of local cultures (social desirability or elevator effect [Welzel and Inglehart ,forthcoming])

Systematic group-specific bias in individual responses reflects so called measurement invariance issue, or non-equivalence of model parameters between different sub-populations (e.g. countries).

Previous findings

Post-materialist values

- Mackintosh (1998 ASR): non-unidimensionality, differential item functioning
- Sacchi (1998): multi-dimensionality
- Davis, Dowley and Silver (1999): multi-dimensionality and different between-sub-indices correlation patterns in cross-national perspective
- Moors (2007), Moors and Vermunt (2007): multi-dimensionality
- Ippel, Gellisen and Moors (2013): cross-national non-invariance

Survival vs. Self-Expression and Traditional vs. Secular-Rational values

- Hermann Dülmer (2012 LSCR Summer School): cross-national non-invariance
- Alemán and Woods (CPS 2015): poor fit, non-invariance

Emancipative values

- Kirill Zhirkov (2014 LSCR Summer School): non-invariance
- Alemán and Woods (CPS 2015): poor fit, non-invariance

CFA of 12 variables from WVS, 3th- 6th waves (1995-2014): Parameter Estimates

Variable	Factor	Pooled	Round 3	Round 4	Round 5	Round 6
Independence	Independence	***0.459***	0.554	0.512	***0.398***	***0.466***
Imagination	Independence	***0.472***	0.544	***0.391***	0.543	***0.414***
Obedience	Independence	0.542	0.566	0.560	0.546	0.520
Jobs	Equality	***0.387***	***0.368***	0.441	***0.340***	***0.387***
Leaders	Equality	0.817	0.710	0.819	0.838	0.864
Education	Equality	0.583	0.608	0.568	0.647	0.533
Homosexuality	Choice	0.844	0.78	0.761	0.878	0.858
Abortion	Choice	0.671	0.562	0.618	0.743	0.706
Divorce	Choice	0.700	0.664	0.615	0.742	0.720
Speech	Voice	***0.329***	***0.362***	**0.234**	***0.384***	**0.278**
Say_nat	Voice	**0.292**	***0.437***	***0.386***	**0.224**	**0.218**
Say_local	Voice	***0.458***	***0.447***	0.56	***0.466***	***0.388***
Autonomy	EVI	0.532	0.628	***0.413***	0.543	***0.495***
Equality	EVI	0.572	0.610	***0.492***	0.593	0.549
Choice	EVI	0.718	0.690	0.744	0.724	0.742
Voice	EVI	0.766	0.746	0.602	0.851	0.791

Note: Entries are standardized factor loadings. All estimates are significant at 0.001 level. Variable intercepts, thresholds and variances are not shown.

CFA of 12 variables from WVS, 3th- 6th waves (1995-2014): Model Fit

	Pooled	Round 3	Round 4	Round 5	Round 6
N	218592	48759	41551	57849	70433
Scaled CFI	**0.902**	0.856	0.892	**0.922**	0.897
Scaled TLI	0.871	0.810	0.858	0.897	0.864
Scaled RMSEA	0.047	0.058	0.049	0.046	0.047
P-value Scaled RMSEA < 0.05	1.000	0.000	0.927	1.000	1.000
PPP	n.e.	n.e.	n.e.	n.e.	0.000

Note: Models were estimated in an R package lavaan. Estimation method used was WLSMV (robust version of DWLS). N = number of observations used. CFI = Comparative Fit Index. TLI = Tucker-Lewis Index. RMSEA = Root Mean Standard Error of Approximation. P-value RMSEA < 0.05 = probability that RMSEA is lesser than 0.05. PPP stands for posterior predictive p-value. n.e. stands for "currently not estimated"

Tests for longitudinal invariance of the Index of Emancipative Values, WVS 3th- 6th waves (1995-2014)

Model	Degrees of Freedom	χ^2	Scaled χ^2	Scaled CFI	Scaled TLI	Scaled RMSEA	P(scaled RMSEA < 0.05)	Satorra-Bentler LRT p-value
Configural	181	**20402.155**	**25445.459**	**0.902**	0.857	0.051	0.045	NA
Equal: Loadings	216	28049.062	29291.324	0.887	0.862	0.050	0.897	0.000
Equal: Loadings and Intercepts	225	29304.117	30772.989	0.881	0.861	0.050	0.706	0.000
Equal: Loadings, Intercepts, and Thresholds	276	36712.062	39972.867	0.846	0.852	0.051	0.000	0.000
Partial: Loadings	205	24499.262	26892.300	0.896	0.866	0.049	1.000	0.000
Partial: Loadings and Intercepts	211	25047.601	27588.016	0.894	0.867	0.049	1.000	0.000
Partial: Loadings, Intercepts, and Thresholds	253	27181.060	30778.179	0.881	0.876	0.047	1.000	0.000
Second-Order Equal: Loadings	272	33558.099	32420.946	0.875	**0.879**	**0.047**	1.000	NA

Note: Models were estimated in an R package *lavaan*. Estimation method used was WLSMV (robust version of DWLS). N = number of observations used. CFI = Comparative Fit Index. TLI = Tucker-Lewis Index. RMSEA = Root Mean Standard Error of Approximation. P-value RMSEA < 0.05 = probability that RMSEA is lesser than 0.05. Satorra-Bentler LRT p-value is a p-value for Satorra-Bentler Chi-Square Difference test.

Tests for Cross-national Invariance

It is not clear from Alemán and Woods (CPS 2015) whether they treat the manifest variables defining the EVI as continuous or categorical (the latter is preferable, and the difference is important).

Alemán and Woods's MGCFA of emancipative values in fact uses only four groups; moreover, three of those four groups are single countries representing different cultural zones: Spain, Germany and Nigeria

Alemán and Woods use conventional ML approach for estimation of their MGCFA model.

I use more flexible approximate measurement invariance approach (Muthén and Asparouhov 2013; Van de Schoot et al. 2013) and allow for small variation in country-specific factor loadings.

AMI approach relies on Bayesian estimation techniques and, in large samples, is highly time-consuming.

Until now, I did manage to estimate a model allowing for 0.01 prior variance in deviations of country-specific loadings from their sample-averaged values in the four-first-order-factors model using the 6^{th} WVS round. PPP = 0.000

Prior variance = 0.01 means that 95% of country deviations are between -0.2 and 0.2 on a standardized scale

I also managed to estimate several models with different rate of invariance for a single sub-dimension of emancipative values, "Choice". Only a model with prior variance on parameter deviations = 0.03 (95% of country deviations are between -0.34 and 0.34) has an approximately normal fit (PPP = 0.27)

<u>These results are very preliminary!!!</u>

OLCA representation of self-expression vs. survival values

	Homosex	Happy1	Happy2	Happy3	Postmat1	Postmat2	Trust	Petition1	Petition2
Class 1	1.118	-3.495	-1.278	1.357	-0.598	2.631	1.174	-0.231	1.068
Class 2	3.452	-3.840	-1.692	1.348	-0.836	2.365	0.859	-0.798	0.735
Class 3	5.256	-4.300	-1.931	0.998	-1.038	1.991	0.690	-1.189	0.263
Class 4	7.557	**-4.555**	-2.084	0.865	-1.294	1.661	0.394	-1.637	-0.134
Class 5	9.819	**-4.492**	-2.430	0.604	-1.706	1.291	-0.208	-2.322	-0.723

Note: Entries are class-specific means (for "Homosex") and non-standardized class-specific variable thresholds (for all other columns). All estimates are significant at 0.001 level.

Five-class MH-model is the best possible model satisfying the interpretation of values as a single (unidimensional) monotonic latent scale.

One may interpret respective class belongings as response categories from single observed ordinal values scale.

Welzel and Inglehart's defense (W&I, forthcoming in CPS)

Inglehart and Welzel themselves have pointed out very explicitly a number of times "the variable and … weak inter-item coherence of our value constructs at the individual level within countries" (Inglehart and Welzel 2003; 2005: 231-244; Welzel 2013: 74-79, 110-112; Welzel and Inglehart, forthcoming).

However, they argue that:

(1) Individual-level properties of measurement instrument say nothing about the aggregate-level properties of that instrument:

- Individual score measures strength of *personal preference* for specific values
- Country-averaged score measures *prevalence* of emancipative values in a given society.
- Individual and country-level correlations between values and other attitudes are of different nature.
- EVI is designed to detect and to explain country-level change, and individual level correlations are not of great importance for its explanatory power

(2) The index of emancipative values was designed due to the compository logic, not the dimensional one. However, according to the compository logic, external validity is a more important criterion of measurement quality than internal coherence of the latent construct.

(3)Cross-national non-invariance does not per se make country-level scores incomparable. It is only the case when non-invariance eliminate the respective construct's association with its theoretically expected correlates.

(4) Cross-national consistency differences in emancipative values are themselves an aspect of the modernization process: these differences are induced by cognitive mobilization. Cultural tradition contributes much less than cognitive mobilization to emancipative values' inner consistency.

Micro-Macro puzzle

Country-averaged score is nothing but the expected score for some individual, most representative for this country, or if use W&I's terminology, expected "personal preference strength" for an average citizen of the country.

It is not a *prevalence,* as W&I call it. I think, that prevalence may be better measured by the percentage of people with preference strength above some threshold.

Measurement non-invariance may reflect different types of bias in individual responses. However, when individual biases have the same directions, the average score is also biased either upward or downward.

Compository vs. dimensional logic

- Dimensional logic: an index is valid when it has high internal consistency (its components strongly correlate with each other) – EFA, CFA, MGCFA

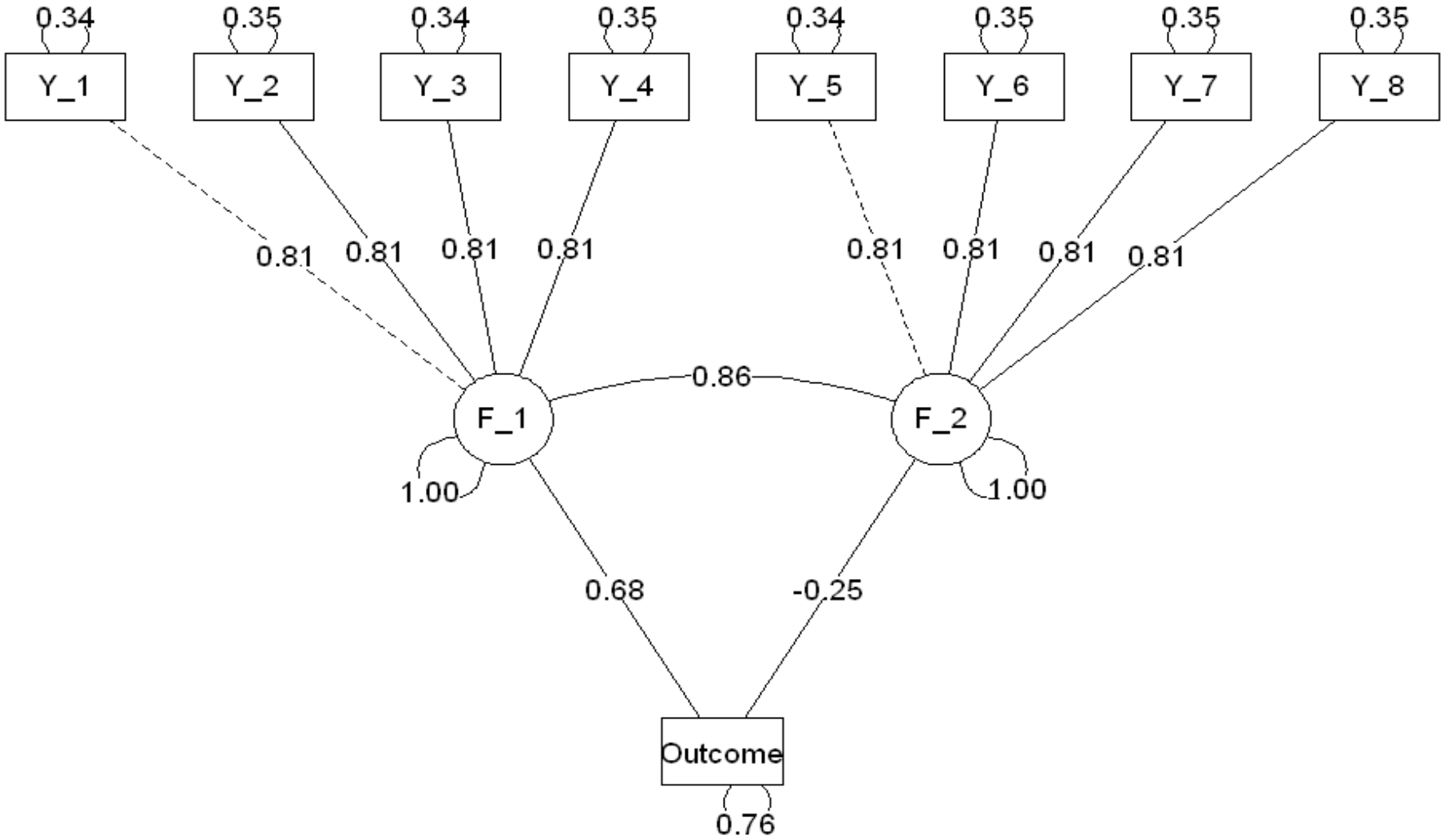
- Compository (combinatory) logic: (effective democracy; HDI; emancipative values as well): one summarizes single elements "not because they overlap empirically but because they complement each other conceptually. … The construct is seen as existentially posterior to the elements" (Welzel 2013, Box 2.1: 60)

(a) Despite the explicit statement of superiority of compository logic for the assessment of the EVI's validity, Welzel nevertheless uses EFA for additional validation of his index, that is refers to widely accepted (but, in fact, obsolete) dimensional-logic-based analytic technique.

(b) Issue of normativity: adherents of the combinatory logic may fall into the trap, reciprocal to **is–ought problem** famously described by Hume.

They replace the reality (**is,** or really existing values) by some normative ideal (**ought**, or emancipative values), and try to measure how strong reality satisfies to the ideal. In other words, emancipative values measure country's relative positions in respect to some external normative benchmark , but for societies with large deviations from that benchmark, emancipative values could not serve as a close approximations of its true value structure.

(c) Even index defined according to the combinatory logic may be biased when its particular component scores are biased in a systematical way in some countries (i.e., when country-specific method factors significantly affect response probabilities for particular items in some countries)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Outcome
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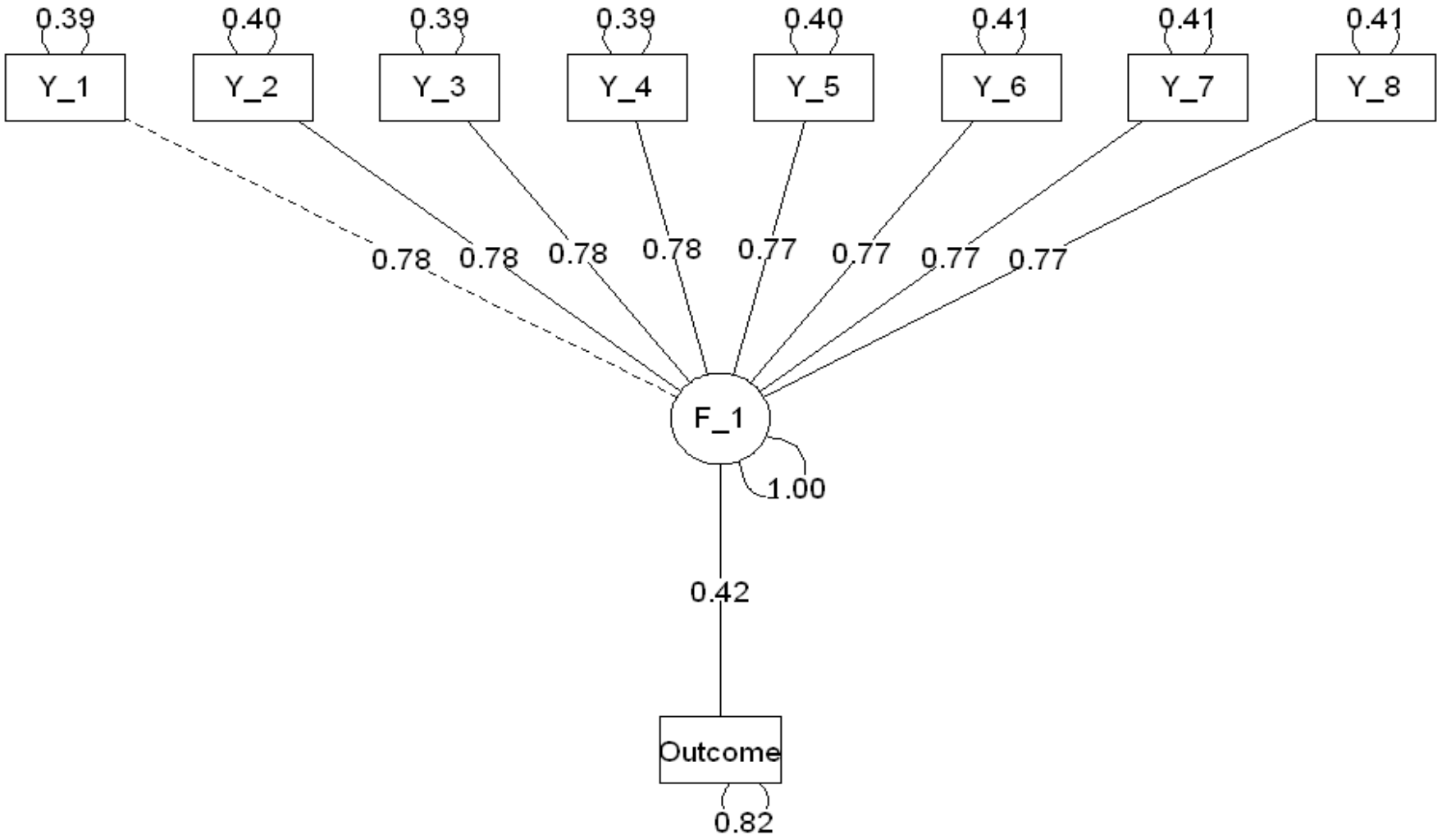
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Outcome
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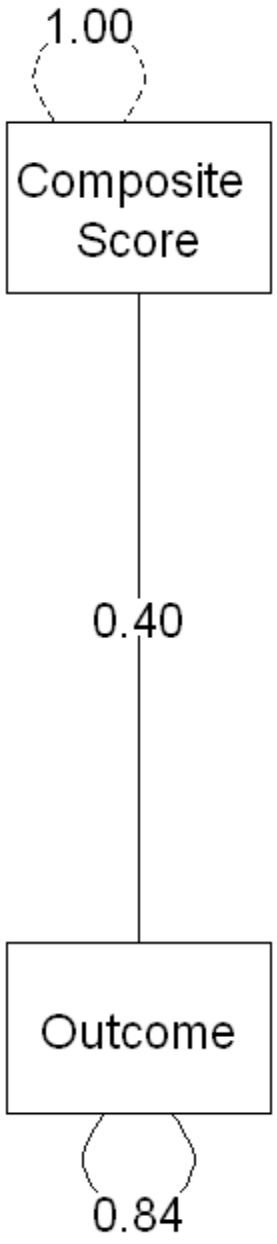

1.00
Composite Score
0.40
Outcome
0.84

Simulated Example (N = 30000)

True (two-factor) model:

- RMSEA = 0.002; CFI = 1, TLI = 1, R^2= 0.241
- Regression coefficients are 0.68 and – 0.25 respectively

Single-factor model:

- RMSEA = 0.105; CFI = 0.944, TLI = 0.925; R^2 = 0.180
- Regression coefficient = 0.42

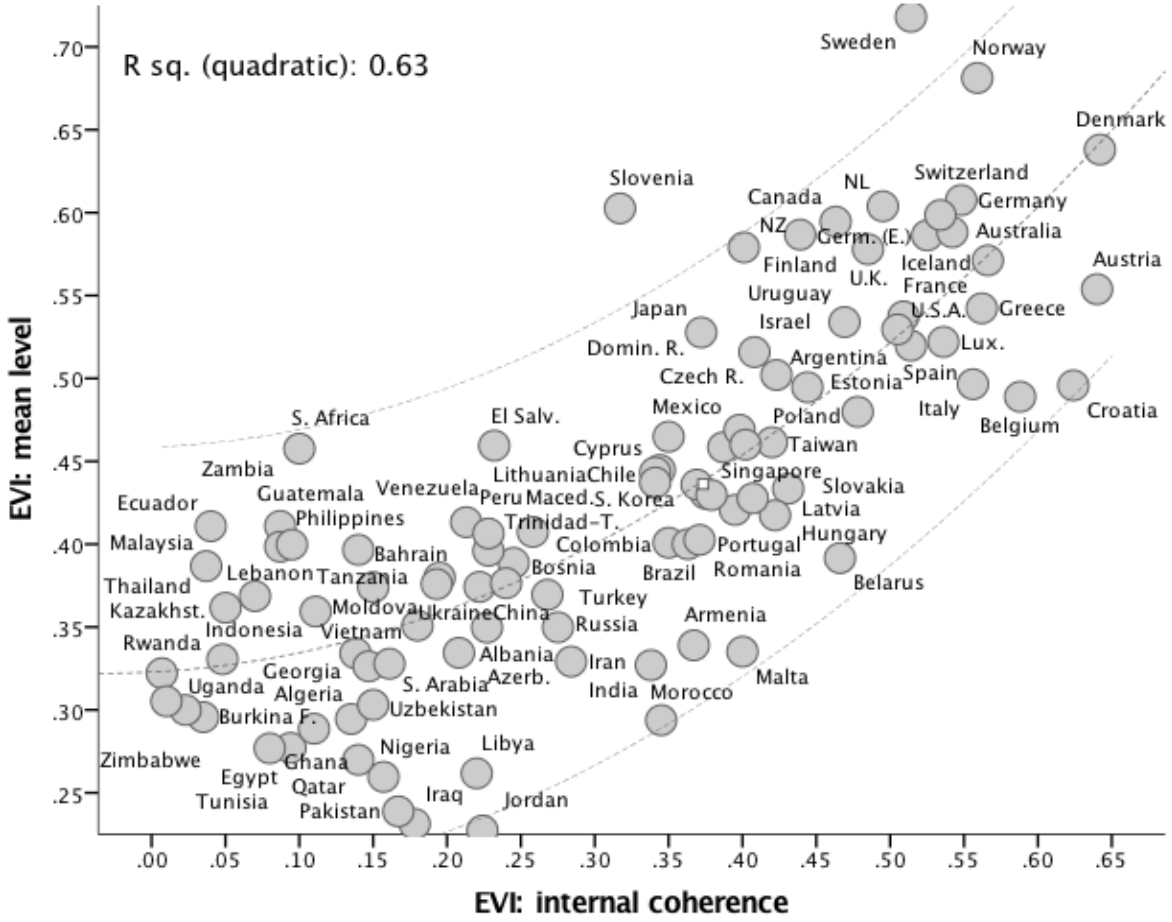
Regression using aggregated score:

- RMSEA = 0.002; CFI = 1, TLI = 1, R^2 = 0.165
- Regression coefficient = 0.40

- Misspecified models are not necessary bad according to some statistical criteria.
- But they may obscure true models, especially when have strong theoretical justification.
- Thus, indirect indicators of model misspecification (relatively poor fit, modification indices, non-invariance, etc.) should be taken seriously: they may indicate the presence of some better model – better not only in purely statistical terms, but also substantially.

Country Means and Coherence Strength in Emancipative Values

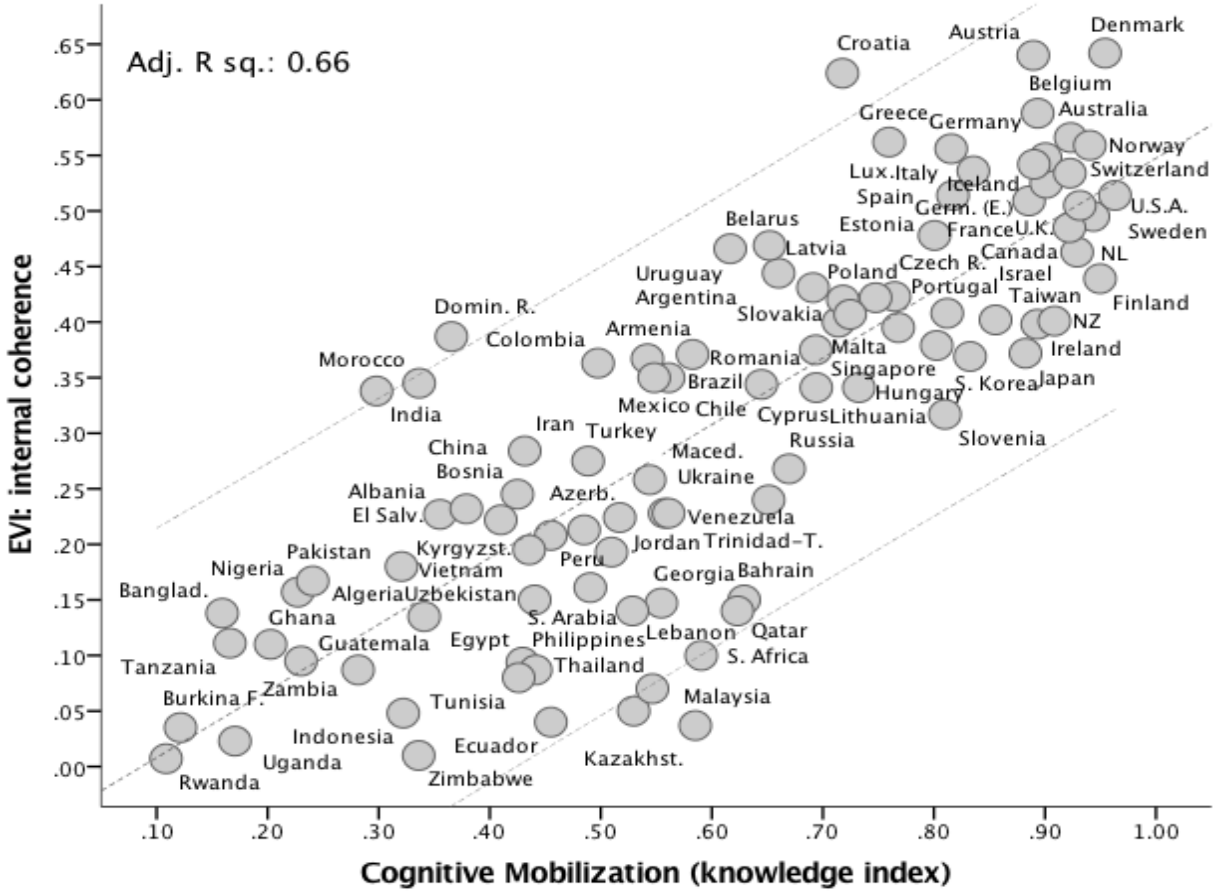
Figure 1 in W&I (forthcoming in CPS)



Notes: Data are from WVS, waves 4 to 6, taking the latest available survey from each country. Temporal coverage varies from 2000 to 2012, depending on when the latest survey has been conducted. The Emancipative Values Index (EVI)is measured as described in Welzel (2013: 69-73). Vertical axis shows per country the arithmetic population mean in these values; horizontal axis shows per country the Cronbach's alpha with respect to the four sub-components of the EVI.

Cognitive Mobilization as a Coherence-inducing Force in Emancipative Values

Figure 3 in W&I (forthcoming in CPS)



Notes: Horizontal axis measures the countries' advancement in cognitive mobilization, using a rescaled version of the World Bank's "Knowledge Index (KI)," as detailed in Welzel (2013: 18). The index summarizes country-level information on the spread of information technology, educational achievement and per capita scientific output. Temporal coverage varies from 1995 to 2005.Vertical axis shows per country the Cronbach's alpha with respect to the four sub-components of the Emancipative Values Index (EVI).Data are from WVS, waves 4 to 6, taking the latest available survey from each country. Temporal coverage varies from 2000 to 2012, depending on when the latest survey has been conducted.

Cognitive mobilization and shift to emancipative values

W&I argue that cognitive mobilization (measured via “knowledge index”) and several other factors, like technological advancement, lead to convergence of country-specific values to the ideal of emancipation.

This, however, does not mean that all country-specific tracks to emancipation are the same. The notion of convergence does not contradict the idea of distinct starting points.

Moreover, lower coherence of EVI in the countries with lower mean level of EVI and cognitive mobilization indicates higher incomparability of the averages values in those countries. If so, I see it incorrect to interpret change in mean level of values as a cause of some political changes (e.g., democratic transitions); even for moderate levels of convergence the emancipative values do not exist as a unique dimension.

So, the true cause of democratization may be convergence in values, not the linear shift from 0 to 1 on [non-existing] emancipative scale.

Alternatively, linear shift on sub-dimension of values may be such a cause.

Brief summary

While measurement model for the index of emancipative values does not perform well, the general theory behind the index seems to be quite persuasive and effective in explanation of a wide variety of social phenomena.

Nevertheless, multiple evidence suggest that more than one value dimension may exist; moreover country(culture)-specific value dimensions are possible.

These possibilities should not be ruled out only because their contradict the theory of modernization; rather, they should be tested (and rejected, if necessary) empirically.

So what?

Non-equivalence does not necessarily mean non-comparability (Oberski 2014; Davidov et al. 2014)

However, misspecification of the EVI goes beyond only cross-national non-invariance. Actually, the CFA model for EVI has a relatively poor fit. Moreover, evidence of presence of multiple cross-loadings and residual covariances, as well as different between-items correlation patterns in different countries indicate presence of multiple value dimensions.

Again, it does not mean that the theory based on this measure is completely wrong.

But it is a question which may and therefore should be resolved by empirical analysis. One cannot rely only on logical justification of some theory when multiple (let not decisive) evidence against it exist.

In addition, other popular values concepts in cross-cultural research were shown to be at least approximately invariant (see Cieciuch et al. 2014 for demonstration of approximate invariance of Schwartz's refined human values measurement instrument)

What further research is needed?

LCA-based measurement model for values

- LCA is a flexible analytic tool allowing for creating nominal or ordinal latent scales
- It allows easily handle non-normality and multidimensionality of latent trait by constructing ordinal or nominal approximation for continuous latent scales
- It is also a powerful confirmatory technique

EPC: Expected change in parameter(-s) of interest (Oberski 2014): direct measure of a bias in some SEM-model parameter crucial for substantial inferences (e.g., regression coefficient reflecting the size and direction of the effect of values on some political or social outcome).

Thank you for attention!