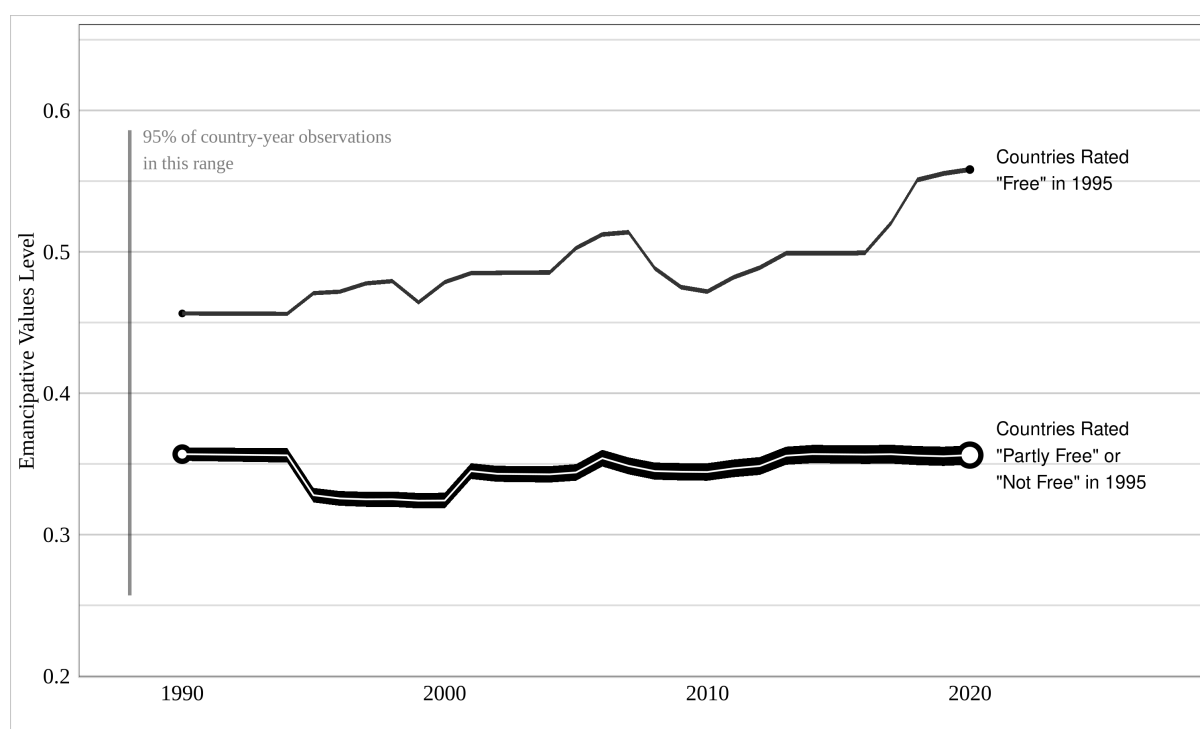# Online Appendix – Why the Future Cannot Be Predicted

1. Time-Series Trends in the Emancipative Values Index

In order to construct a panel that allows for intertemporal comparison, we pool all countries in the World Values Survey for which at least a 15-year span of data is available between 1995 and 2020. Of the 74 countries that meet this criterion, 65 have data spanning more than 20 years, while just 9 have data spanning 15-20 years.[1] The exclusion of countries without a wide span of observation is done so as to prevent country selection from artificially deflating the magnitude of changes in values over time. A panel is then constructed for all years and all countries (subject to the above restriction), entering the most recent available survey data for each country-year. This ensures that the sample of countries remains constant, and that changes in average scores over time are not due to the entry or exit of countries from the sample.

Do rising emancipative values predict a future wave of democratization? A minimal criterion for this to be true, would be that such values are rising in countries that may transition to democracy in future. However, there is no time series increase in the Emancipative Values index among such cases.

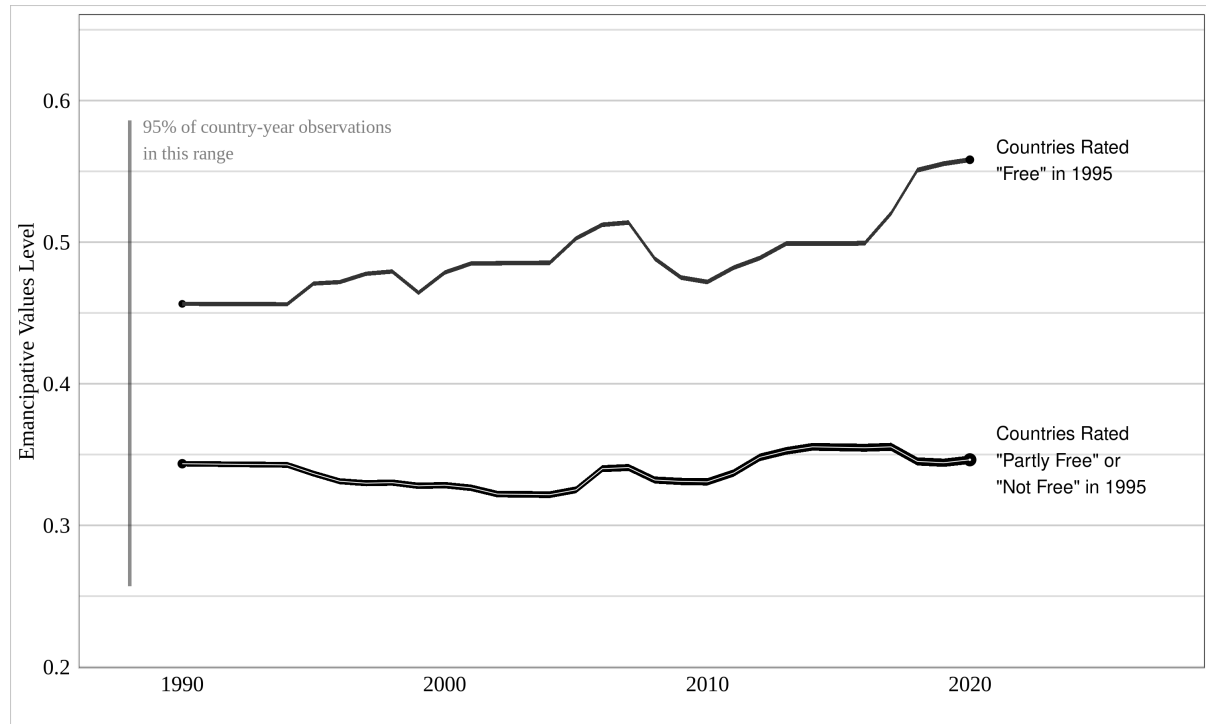Figure A.1: Emancipative Values Index Over Time, Democracies vs. Non-Democracies

Notes: Population-weighted country average of the Emancipative Values index, using constant country sample. Thickness of lines proportionate to size of population in each grouping. Of the countries in the "Free" category, the largest contributors by 2021 population are the United States (27%), Japan (10%), Germany (7%), France (5%), the United Kingdom (5%), Italy (5%), South Africa (5%), South Korea (4%), Spain (4%), Argentina (4%), Canada (3%) and Australia (2%).

Figure A.1 shows the changes over time in the Emancipative Values index among two sets of

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[1]These countries are: Greece (18 years), Guatemala (16 years), Indonesia (17 years), Jordan (17 years), Kyrgyzstan (17 years), Singapore (18 years), Vietnam (19 years), Zimbabwe (19 years) and Egypt (17 years).

countries: those which were democracies in 1995 (rated at the time as "free" by Freedom House)[2] and countries that were in transition or under authoritarian rule (rated as "partly free" or "not free").[3] While countries that were already democracies by the mid-1990s have seen an increase in the Emancipative Values score, no such increase exists, on average, among the non-democracies or partial democracies of that period.

Figure A.2: Emancipative Values Index Over Time, Democracies vs. Non-Democracies (Excluding India and China)

Notes: Population-weighted country average, using constant country sample. Line thickness proportionate to size of population in each grouping. The grouping of countries in the "Partly Free" and "Not Free" category excludes India (rated "Partly Free" in 1995) and China (rated as "Not Free"), which due to their large populations, would otherwise account for the majority of the population-weighted sources within this category (57% of the population of this grouping as of 2021). Of the remaining countries in this category, the largest contributors by population are Indonesia (13%), Pakistan (11%), Brazil (10%), Nigeria (10%), Bangladesh (8%), Russia (7%), Mexico (6%), Egypt (5%), the Philippines (5%), Vietnam (5%), Iran (4%), Turkey (4%), Ukraine (2%) and Colombia (2%).

The averages in Figure A.1 are population-weighted, and this may lead us to suspect that especially populous countries – and in particular, India and China – exert undue leverage over trend averages. Therefore Figure A.7 shows the same estimates, except this time, excluding both India and China from the sample. While the population of the "not free" series is substantially reduced as a result of this change, the trend lines are not: there is no increase over time in the Emancipative Values index among the "potential" democratizing countries of the 1990s.

An important limitation of our critique is that we are constrained to using only real data. In

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[2]Countries rated as "free" in 1995: Norway, Switzerland, Belgium, Iceland, France, Italy, Spain, Greece, Portugal, Ireland, Netherlands, Denmark, Germany, Sweden, Finland, Austria, Malta, Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia, United States, United Kingdom, Canada, Australia, New Zealand, South Africa, Argentina, Bolivia, Chile, Japan, South Korea, Uruguay.

[3]Countries rated at that time as "partly free" or "not free" in 1995: Albania, Armenia, Azerbaijan, Bangladesh, Belarus, Bosnia, Brazil, China, Colombia, Croatia, Egypt, Georgia, Guatemala, Hong Kong, India, Indonesia, Iran, Iraq, Jordan, Kyrgyzstan, Mexico, Montenegro (Serbia), Nigeria, North Macedonia, Pakistan, Peru, the Philippines, Russia, Serbia, Taiwan, Turkey, Ukraine, Vietnam, Zimbabwe.

his article Welzel cites the use of additional "data from the 1970s and 1980s" which can show that "Argentina, Chile, Czechoslovakia, East Germany, Hungary, the Philippines, South Africa, and Uruguay were more aligned with democracy than their governing institutions." This claim is puzzling, as the Philippines and Uruguay were first included in the World Values Surveys in 1996, the Czech Republic in 1991, and Chile in 1990, while no countries were surveyed at all prior to 1981. On closer inspection it seems this "data" refers to not actual surveys but rather to values imputed to the past. Yet if these same imputation models would predict value-change following the initial country survey, they must be incorrect, because this did not occur (Table 1).

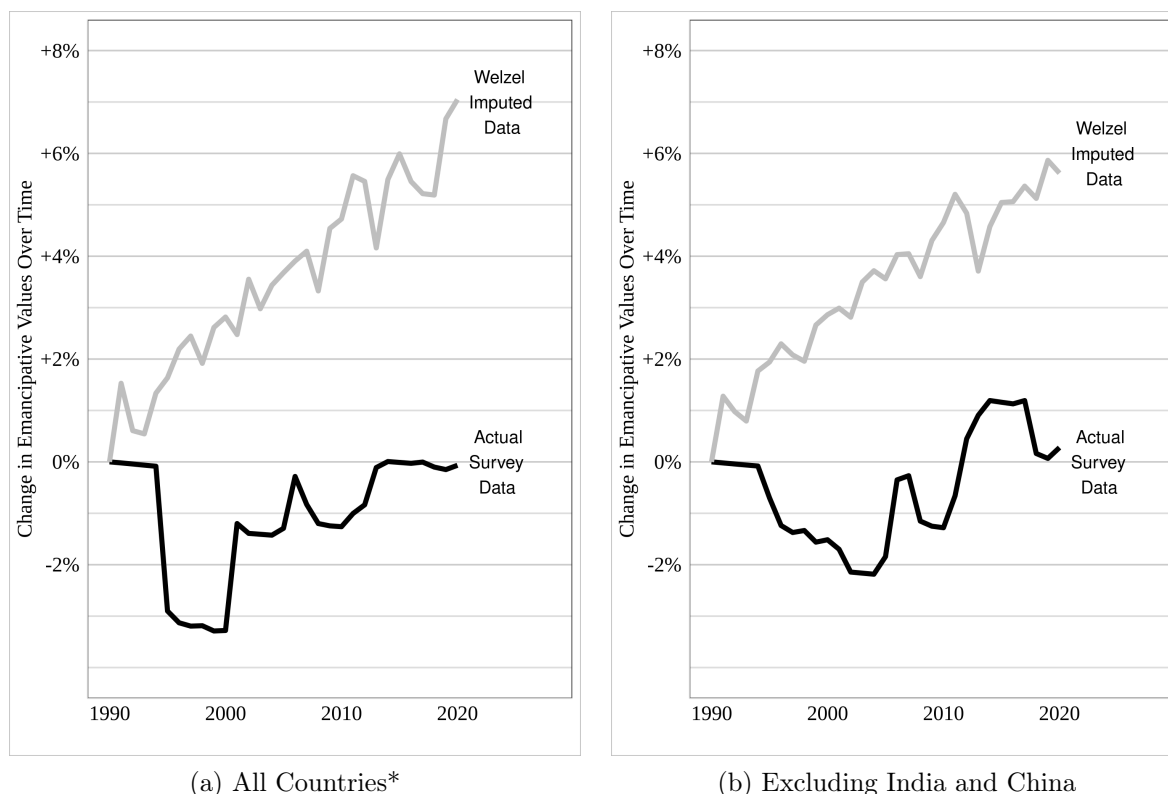Table 1: Changes in the Emancipative Values Index, 1990-2021

Country	First Survey	Latest Survey	Change
Armenia	0.34	0.32	-0.02
Azerbaijan	0.33	0.36	0.03
Bangladesh	0.38	0.30	-0.09
Bosnia	0.36	0.41	0.04
Brazil	0.37	0.47	0.09
Belarus	0.41	0.41	0.00
Colombia	0.29	0.43	0.14
China	0.41	0.39	-0.02
Egypt	0.29	0.23	-0.06
Georgia	0.32	0.35	0.02
Guatemala	0.40	0.45	0.04
India	0.30	0.34	0.03
Indonesia	0.32	0.32	0.00
Iran	0.31	0.33	0.03
Jordan	0.22	0.26	0.04
Kyrgyzstan	0.38	0.28	-0.09
Mexico	0.43	0.44	0.01
Montenegro	0.37	0.41	0.04
Nigeria	0.30	0.27	-0.03
Pakistan	0.26	0.24	-0.02
Peru	0.40	0.40	0.01
Philippines	0.37	0.38	0.01
Russia	0.38	0.40	0.02
Serbia	0.40	0.41	0.01
Singapore	0.40	0.45	0.05
Turkey	0.38	0.36	-0.02
Ukraine	0.36	0.41	0.05
Vietnam	0.33	0.40	0.07
Zimbabwe	0.30	0.31	0.01
Average (Equal-Weighted)	0.35	0.36	0.01

Notes: Changes in the Emancipative Values Index among countries rated "Partly Free" or "Not Free" by Freedom House in 1995, from first available survey (since 1990) to most recent available survey, among all countries with at least a fifteen-year span of data.

2. Discrepancy Between Imputed and Actual Emancipative Values

This discrepancy merits further investigation. If the actual survey data shows no increase over time in socially progressive values among the partially or non-democratic countries of the mid-1990s, then how does Welzel present charts suggesting this to be the case? The answer is by not presenting the actual survey data, but instead, re-estimating the data via an imputation methodology that generates a rising trend that was not originally present (Figure A.3).

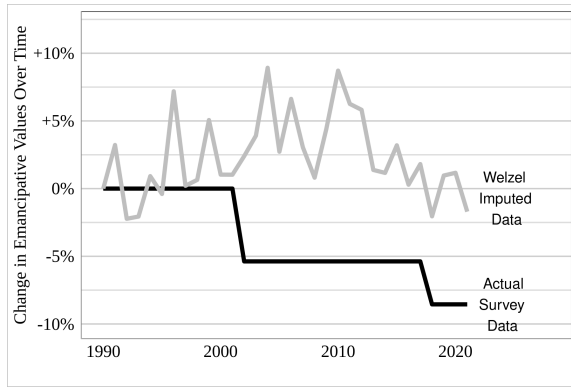Figure A.3: Emancipative Values Index: Welzel Imputed Values vs. Actual Survey Data (1)

(a) All Countries*   (b) Excluding India and China

* Sample of all countries with the potential for democratization (not rated as "free" by Freedom House in 1995).

Notes: Comparison of trends over time in the Emancipative Values index, between the original survey data (black) and Welzel's re-estimated version (grey). All lines are population-weighted averages. Due to the leveraging effect of India and China, the second chart (right) shows the comparison once these two countries are excluded.
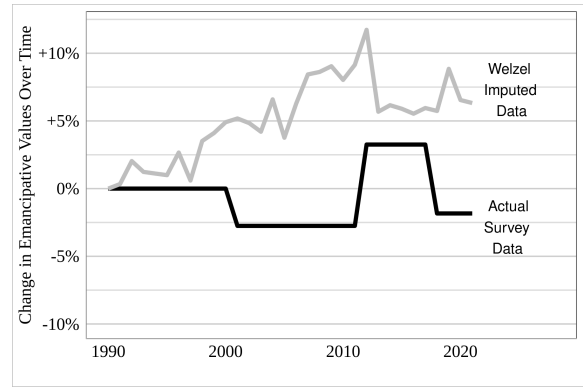
How can the two series be so divergent? The answer becomes clear once we see how the imputed series was constructed. Welzel first attributes the entirety of current age differences as a cohort effect, and then adds on top of this an adjustment such that, for each passing year, a country receives an *automatic increase over and above the estimated level.* The rising trend is therefore a product of construction. No empirical data could ever *not* show a long-term rising trend in Emancipative Values after being reprocessed via such a method. To see why this is a problem, consider Figures A.4, which show actual data against Welzel's imputed values among eight major developing countries. Declining trends are reprocessed into rising ones, making the thesis of "rising" Emancipative Values unfalsifiable by design.

As noted, Welzel relies on estimates from this imputation method to construct a time-series prior to 1980s. We are unable to conduct the same comparison of imputed vs. actual data during this earlier period, so can only assess the results upon their face validity. That said, the results raise some interesting questions. According to the results, societal attitudes on issues
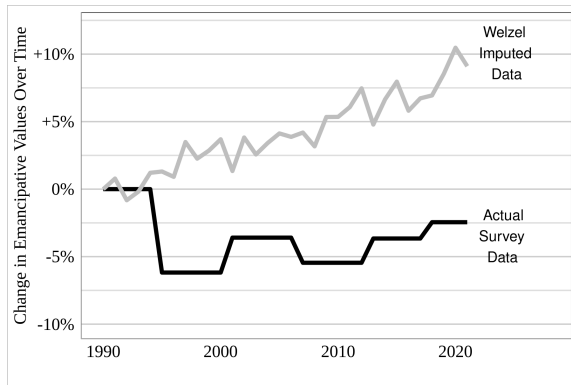
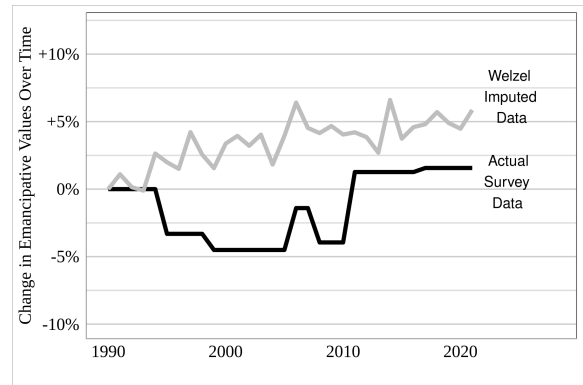Figure A.4: Emancipative Values Index: Welzel Imputed Values vs. Actual Survey Data (2)
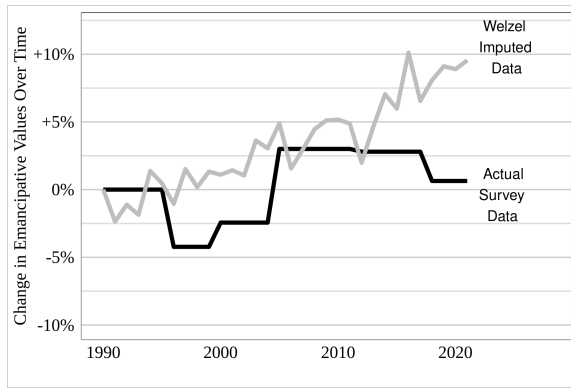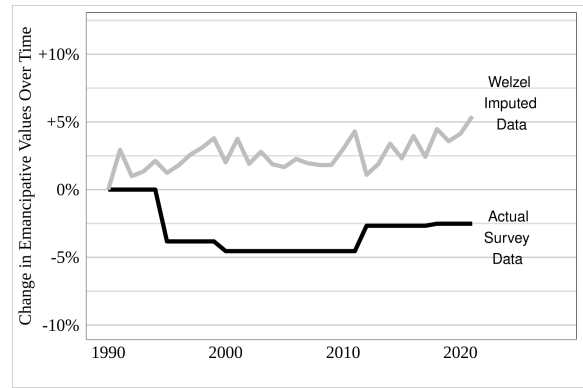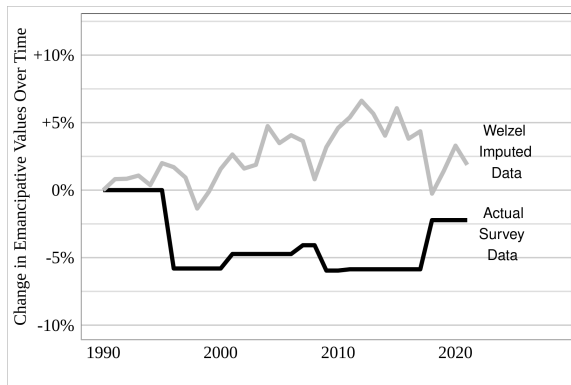

(a) Bangladesh

(b) Pakistan
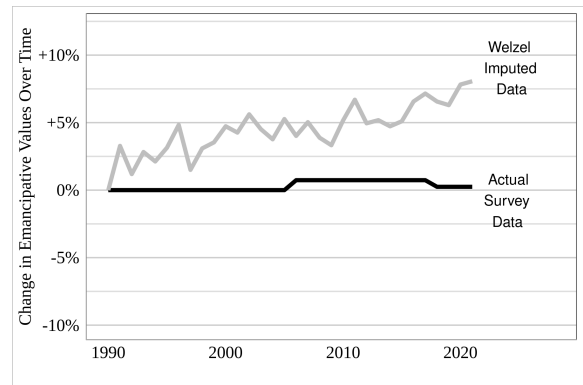
(c) China

(d) Russia

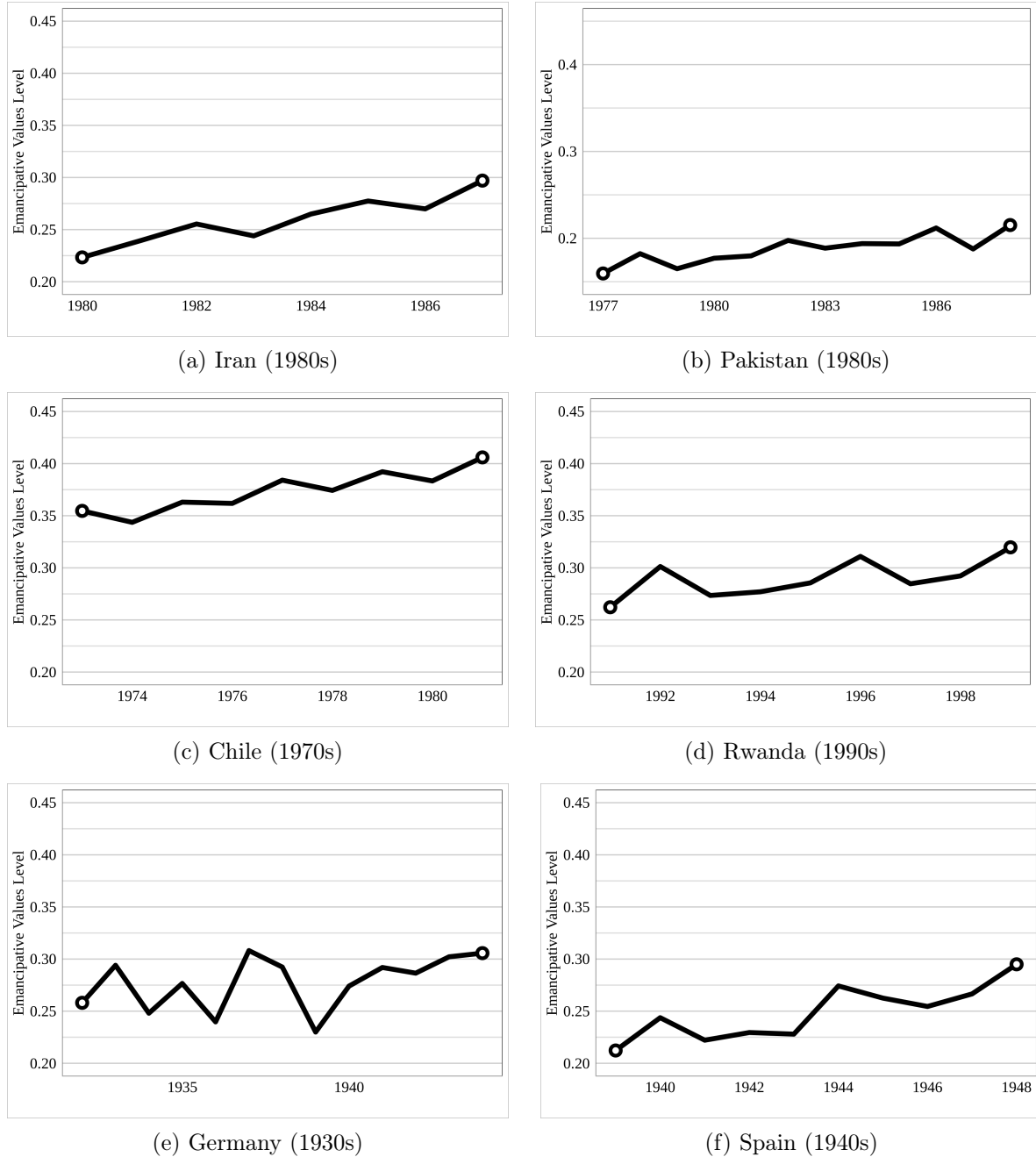(e) Mexico

(f) Nigeria

(g) Turkey

(h) Indonesia

Notes: Comparison of trends over time in the Emancipative Values index, between the original survey data (black) and Welzel's re-estimated version (grey). After re-estimation, declining trends are transformed to positive ones.

such as women's rights and democracy became more socially progressive in the decade following Franco's ascent to control over Spain, during the first decade of the Islamist regime in Iran, in Pakistan during the military dictatorship of Zia ul-Huq, in Latin America following military coups of the 1970s, and Rwanda during the civil war and genocide of the 1990s.

Figure A.5: Authoritarian Regime Transition and Rising Estimated Emancipative Values

(a) Iran (1980s)

(b) Pakistan (1980s)

(c) Chile (1970s)

(d) Rwanda (1990s)

(e) Germany (1930s)

(f) Spain (1940s)

Notes: Based on Welzel historical estimates for Emancipative Values, projecting current cohorts to age 25.
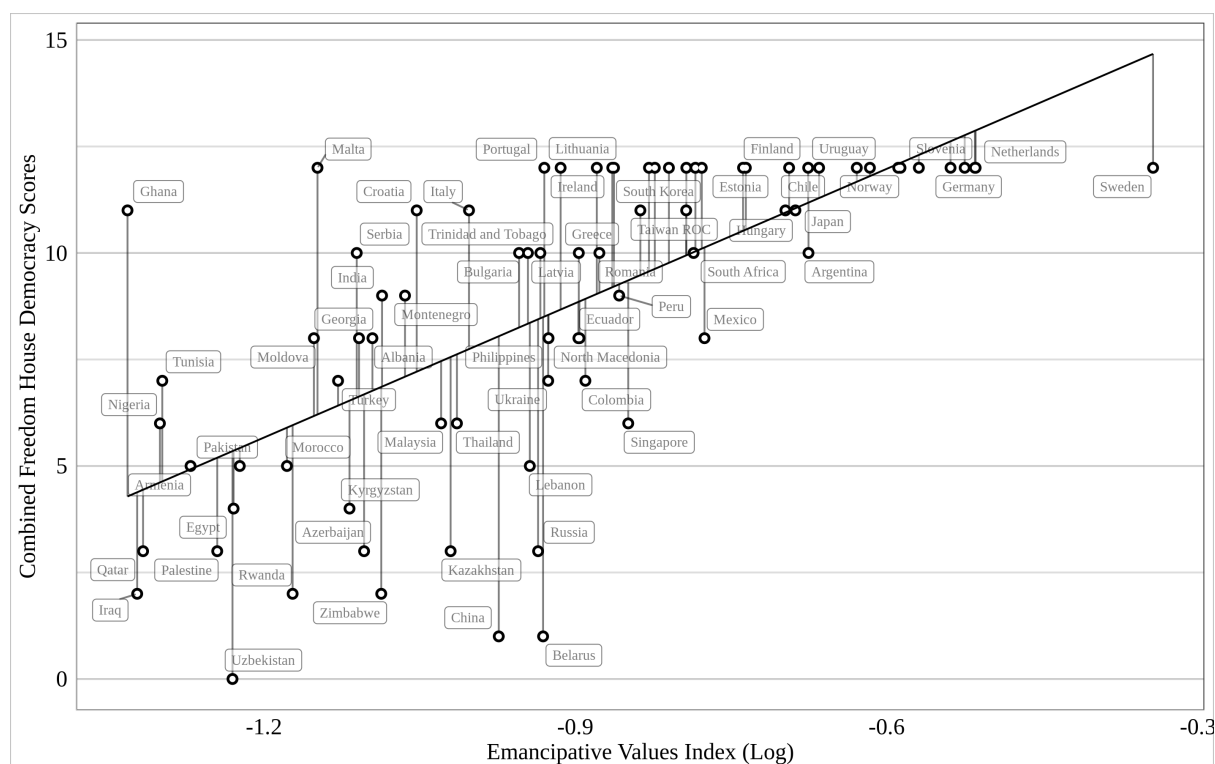
Moreover, Welzel estimates that societal attitudes on gender, democracy and human rights are more liberal in contemporary Saudi Arabia than they were in interwar Sweden or postwar America. Without being able to go back in time, we cannot disprove this; though it may offer a good example of why linearly projecting trends half a century before data collection is generally best avoided.

3. Predictive Track Record of the Emancipative Values Index

Welzel asserts that the Emancipative Values index is predictive of shifts in democracy, including some of recent events that have surprised many in the field, including democratic backsliding in Poland and Hungary. The method of asserting this claim is to show gaps between actual and expected levels of democracy in prior years (based on surveyed values), and then subsequent shifts in democratization.

An example that is correct to the time of the publication of the Emancipative Values index (2009-2013 data) is displayed in Figure A.6 below; where countries are above the line, their level of democracy is in "excess" of its predicted level, and therefore expected to decline; where countries are below the line, their level of democracy falls short of the expected level, and therefore is expected to rise.

Figure A.6: Gap Between Emancipative Values Index and Democracy in 2013.

Notes: Most recent available data from the World Values Survey as of 2013, taken from the Wave 6 round of surveys. Democracy scores are the combined Freedom House scores for Political Rights and Civil Liberties.

The predictive record of a measure can only be assessed during its out-of-sample period, i.e. the period following its design, as otherwise the construction of the measure will be endogenous to the dataset used to validate/train an algorithm. However this means we can begin to assess the record of the index thus far, but comparing predicted to actual shifts in democracy scores from 2013-2021.

This is shown in Figure A.7 below. Of the expected changes, the record is as follows.

<u>Shifts toward democracy</u>: Of 37 countries predicted to move towards democracy by the Emancipative Values index, only seven in fact did so (Ukraine, Zimbabwe, Uzbekistan, Japan, Iraq, Colombia and Kyrgyzstan). 21 experienced no change, and nine moved in the opposite direction (Russia, Pakistan, the Philippines, Thailand, Kazakhstan, Egypt, Azerbaijan and Palestine).

<u>Shifts away from democracy</u>: Of the 40 countries predicted to move away from democracy, 13

did so (Poland, France, Turkey, Ghana, Malta, Nigeria, Chile, South Korea, Morocco, Pakistan and the Philippines). 21 saw no change, and six moved in the opposite direction (Italy, Greece, Japan, Taiwan, Tunisia, and Armenia). While this record seems better, we have to remember that on average during the period in question (2013-2020) Freedom House scores were falling – so by default, predictions of democratic backsliding were more likely to be realized. Of the 77 countries for which there is data between 2008 and 2013, the overall R^2 is 0.01 (adjusted R^2 of -0.01), implying no statistical association.

Figure A.7: Predicted and Actual Shifts in Freedom House Scores, 2013-2020 ($R^2 = 0.01$).

Notes: The predicted increase (decline) in democracy is the residual shown in Figure A.6, displaying the deficit (surplus) in the country level of democracy in 2013 with respect to its scores on the Emancipative Values index. The actual increase (decline) in democracy is the change in a country's combined Freedom House scores from 2013–2020. Correlation $R^2 = 0.01$.

4. Index Validation Using Randomly-Generated Alternative Scores

If an index has not been overfit to a target variable, we should expect it to rank averagely in the universe of potential conceptually valid indices that might have been constructed to measure that phenomenon. The items included in the Emancipative Values Index were selected from among a much broader range of potential items in the World Values Survey that would be conceptually valid for such a purpose; for example, its subindex for "autonomy" includes 3 items on values that respondents think are important for a child to learn (such as imagination or independence) but omits items asking individuals whether they consider themselves "an autonomous individual" or make decisions in life for themselves.

As the main purpose of the Emancipative Values index at the time of its development was to explain patterns of democratic governance across the world (Welzel 2013), if the index was designed impartially by selecting the most conceptually valid items but without consideration to their covariance (individually or jointly) with levels of democracy, then we should expect the bivariate correlation between democracy and the Emancipative Values index at the time of its development (the "in-sample" period) to rank averagely within the universe of all such possible alternative indices that could have been constructed, using semantically valid items. To the extent that the correlation between the Emancipative Values index and democracy during its design phase is above the average among this universe of potential such indices, this indicates overfitting (deliberate or circumstantial) of the index to the outcome variable by virtue of item selection.

Constructing A Sample of Valid Alternative Indices

The Emancipative Values index is designed by selecting three indicators from each of four sub-categories (choice, equality, autonomy and voice), and combining these in to a 12-item composite score. In order to test the sensitivity of the results from the Emancipative Values index to item selection, we have coded an "Emancipative Values Index Generator" that randomly selects three items from the full range of survey questions that could potentially be used to construct such a measure. We use this generator to produce 20,000 variations of the Emancipative Values Index, and then test whether the results obtained by using the original index are robust to alternative index specifications.

Tables 2, 3, 4 and 5 show the selection of items used when selecting three items in to each of the choice, equality, autonomy, and voice subindices. In order to prevent differences in country-year samples from biasing the results, the distribution of values in each selected item is first rescaled to match that of the joint sample included in the original Emancipative Values index. In this way, if a given indicator were biased in its sample coverage towards countries or periods in which emancipative values were especially high or low, this would be corrected for. Second, because some items were not continued in certain waves, in their absence the algorithm simply takes the average of the remaining available items to calculate the country-year score – in this way preventing item selection from biasing downwards any changes over time.

The index generator simply takes the average of the four subindices to generate a final index score. For purposes of comparability, we have retained the original four subindex categories decided by Welzel, and also include the original survey items in each subindex category so that, in theory, one of the indices generated by the algorithm could simply be the original Emancipative Values index. As there are 70.6 billion potential index variations that could be produced by the generator, however, this exact outcome is unlikely; though many of the indices produced by this method will retain at least some items from the original version.

Table 2: Emancipative Values Choice Subindex - Original and Additional Items.

Choice Index

Original Items

Lifestyle choice: homosexuality	Please tell me for each of the following actions whether you think it can always be justified or something in between. Homosexuality.
Lifestyle choice: abortion	Please tell me for each of the following actions whether you think it can always be justified or something in between. Abortion.
Lifestyle choice: divorce	Please tell me for each of the following actions whether you think it can always be justified or something in between. Divorce.

Additional Items

Lifestyle choice: prostitution	Please tell me for each of the following actions whether you think it can always be justified or something in between. Prostitution.
Lifestyle choice: soft drugs	Please tell me for each of the following actions whether you think it can always be justified or something in between. Use of soft drugs.
Lifestyle choice: adultery	Please tell me for each of the following actions whether you think it can always be justified or something in between. Adultery.
Existential choice: euthanasia	Please tell me for each of the following actions whether you think it can always be justified or something in between. Euthanasia.
Existential choice: suicide	Please tell me for each of the following actions whether you think it can always be justified or something in between. Suicide.
Mobility choice	How about people from other countries coming here to work. Which one of the following do you think the government should do? Let anyone come who wants to.
Moral choice	Please tell us if you strongly agree, agree, disagree, or strongly disagree. The only acceptable religion is my religion (disagree).
Lifestyle choice: work	Do you agree or disagree with the following statements? People should not have to work if they don't want to.
Lifestyle choice: family	If a woman wants to have a child as a single parent but she doesn't want to have a stable relationship with a man, do you approve or disapprove? Percentage approve.

Notes: Items used in the Emancipative Values Subindex for "choice." Shown here are the 3 items from the original index, together with the list of additional items used in the Emancipative Values index generator when generating random bootstrap indices.

In selecting a range of appropriate survey items for each category, we have had to rely on the approximate semantic meaning that each has been given. "Choice" therefore includes other items from the same question battery as that used by Welzel, but with respect to other lifestyle choices (such as the use of soft drugs or adultery), as well as items reflecting openness to letting individuals make decisions for themselves over different areas of life (e.g. work or spirituality) without restrictions due to government rules or social norms. Similarly, the equality subindex includes not only the 3 items selected by Welzel (all related to gender equality) but also items tapping other egalitarian beliefs and attitudes, for example regarding income, racial equality, or equal tolerance and respect for others.

Table 3: Emancipative Values Equality Subindex - Original and Additional Items.

Equality Subindex

Original Items

Gender equality	How would you feel about the following statements? <u>When jobs are scarce, men should have more right to a job</u> (disagree).
Gender equality	Can you tell me how strongly you agree or disagree: <u>On the whole, men make better political leaders than women do</u> (disagree).
Gender equality	Can you tell me how strongly you agree or disagree: <u>A university education is more important for a boy than for a girl</u> (disagree).

Additional Items

Gender equality	Can you tell me how strongly you agree or disagree: <u>On the whole, men make better business executives than women do</u> (disagree).
Gender equality	People talk about the changing roles of men and women today. For each of the following statements I read out, can you tell me how much you agree with each. <u>Both the husband and wife should contribute to household income.</u>
Gender equality	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>Women have the same rights as men.</u>
Income equality	How would you place your views on this scale? <u>Incomes should be made more equal.</u>
Income equality	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>The state makes people's incomes equal.</u>
Income equality	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>People receive state aid for unemployment.</u>
Income equality	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>Governments tax the rich and subsidize the poor.</u>
Income equality	Imagine two secretaries, of the same age, doing practically the same job. One finds out that the other earns $50 a week more than she does. The better paid secretary, however, is more reliable at her job. In your opinion, is it fair or not fair that one secretary is paid more than the other? <u>Percentage: Unfair.</u>
Age equality	How would you feel about the following statements? <u>When jobs are scarce, people should be forced to retire early</u> (disagree).
Racial/ethnic equality	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? <u>People of a different race</u> (not mentioned).
Racial/ethnic equality	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? <u>Immigrants/foreign workers</u> (not mentioned).
Racial/ethnic equality	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? <u>People of a different religion</u> (not mentioned).
Racial/ethnic equality	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? <u>People who speak a different language</u> (not mentioned).
LGBTQ+ equality	On this list are various groups of people. Could you please mention any that you would not like to have as neighbors? <u>Homosexuals</u> (not mentioned).
Child equality	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? <u>Tolerance and respect for other people.</u>

Notes: Items used in the Emancipative Values Subindex for "equality." Shown here are the 3 items from the original index, together with the list of additional items used in the Emancipative Values index generator when generating random bootstrap indices.

Table 4: Emancipative Values Autonomy Subindex - Original and Additional Items.

Autonomy Subindex

Original Items

Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Independence.
Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Imagination.
Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Obedience (not mentioned).

Additional Items

Autonomy (general)	How strongly you agree or disagree with each of the following statements about how you see yourself? I see myself as an autonomous individual.
Autonomy preference	How would you place your views on this scale? People should take more responsibility to provide for themselves.
Autonomy preference	If it were to happen [do] you think it would be a good thing, a bad thing or don't you mind? Greater emphasis on the development of the individual.
Autonomy preference	If it were to happen [do] you think it would be a good thing, a bad thing or don't you mind? Greater respect for authority (bad).
Child autonomy	Do you strongly agree, agree, disagree, or strongly disagree? One of my main goals in life has been to make my parents proud (disagree).
Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Determination.
Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Hard work.
Child autonomy	Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Responsibility.
Social autonomy	Could you tell me how strongly you agree or disagree with each of the following statements? I make a lot of effort to live up to what my friends expect (disagree).
Reproductive autonomy	Do you think that a woman has to have children in order to be fulfilled or is this not necessary? Answer: Not necessary.
Workplace autonomy	Here are some aspects of a job that some people have said are important. Please look at them and tell me which ones you personally think are important in a job. An opportunity to use initiative.
Workplace autonomy	How would you place your views on this scale? Competition is good. It stimulates people to work hard and develop new ideas.

Notes: Items used in the Emancipative Values Subindex for "choice." Shown here are the 3 items from the original index, together with the list of additional items used in the Emancipative Values index generator when generating random bootstrap indices.

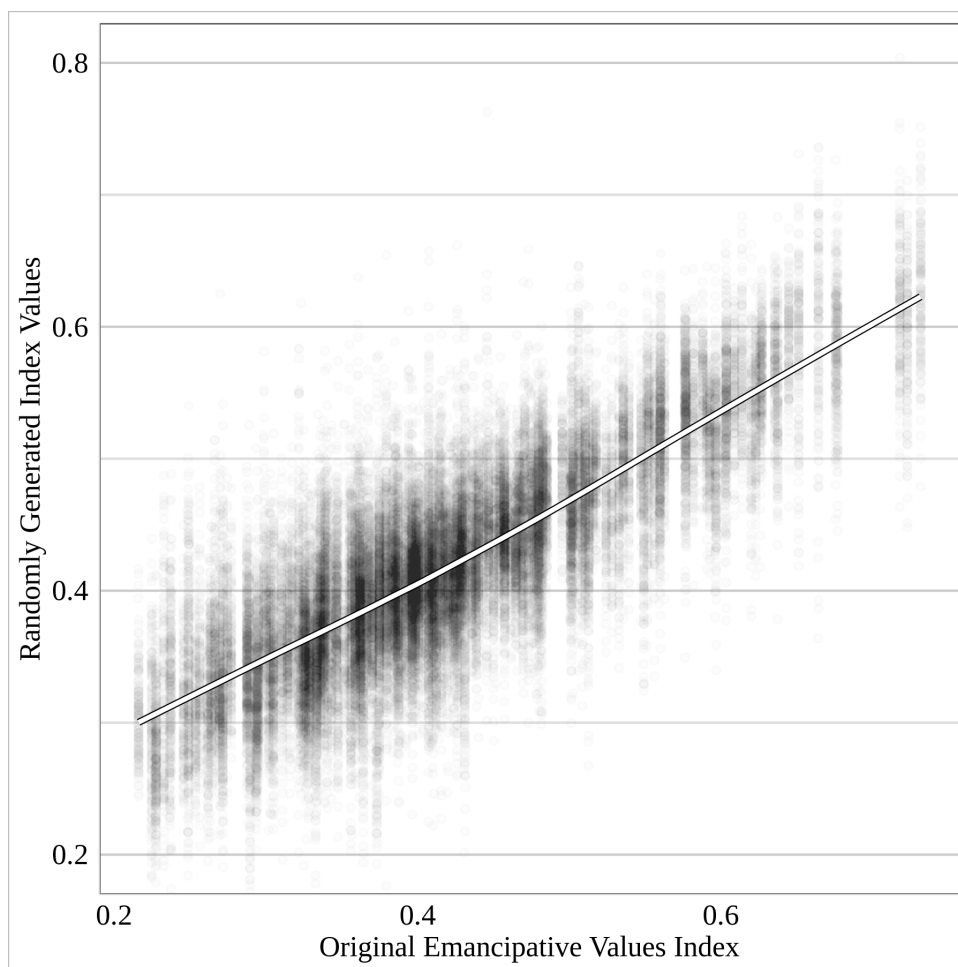Table 5: Emancipative Values Voice Subindex - Original and Additional Items.

Voice Subindex

Original Items

Voice	Would you please say which one of these you, yourself, consider the most important? <u>Seeing that people have more say about how things are done at their jobs and in their communities</u>.
Voice	Would you please say which one of these you, yourself, consider the most important? <u>Protecting freedom of speech</u>.

Additional Items

Voice	Tell me, for each one, whether you have done any of these things, whether you might do it or would never under any circumstances do it. <u>Signing a petition</u>.
Voice	Tell me, for each one, whether you have done any of these things, whether you might do it or would never under any circumstances do it. <u>Attending peaceful demonstrations</u>.
Voice	Tell me, for each one, whether you have done any of these things, whether you might do it or would never under any circumstances do it. <u>Joining in boycotts</u>.
Voice	Tell me, for each one, whether you have done any of these things, whether you might do it or would never under any circumstances do it. <u>Joining strikes</u>.
Voice	When you get together with your friends, would you say you discuss political matters frequently, occasionally or never? <u>Percentage: frequently</u>.
Voice	For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country? <u>Having a democratic political system</u>.
Voice	For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country? <u>Having the army rule (bad)</u>.
Voice	For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country? <u>Having experts, not government, make decisions according to what they think is best for the country (bad)</u>.
Voice	For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country? <u>Having a strong leader who does not have to bother with parliament and elections (bad)</u>.
Voice	Could you please tell me if you agree strongly, agree, disagree or disagree strongly? <u>Democracy may have problems but it's better than any other form of government</u>.
Voice	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>People choose their leaders in free elections</u>.
Voice	Please tell me for each of the following things how essential you think it is as a characteristic of democracy. <u>Civil rights protect people from state oppression</u>.
Voice	How important is it for you to <u>live in a country that is governed democratically?</u>

Notes: Items used in the Emancipative Values Subindex for "choice." Shown here are the 3 items from the original index, together with the list of additional items used in the Emancipative Values index generator when generating random bootstrap indices.

Results

First, we show in Figure A.8 the bivariate scatterplot between the original Emancipative Values index and the bootstrap-generated indices. The line of fit here is the result of loess estimation, and thus suggests a broadly linear relationship between the original index and its bootstrap-generated alternatives. Reassuringly, the median pairwise correlation is high (R = 0.84). Nonetheless, the absence of perfect collinearity implies that there is also a fair range of variation in how liberal beliefs and values could potentially have been operationalised from the World Values Survey, even within the bounds of the conceptual categories used by the original index.

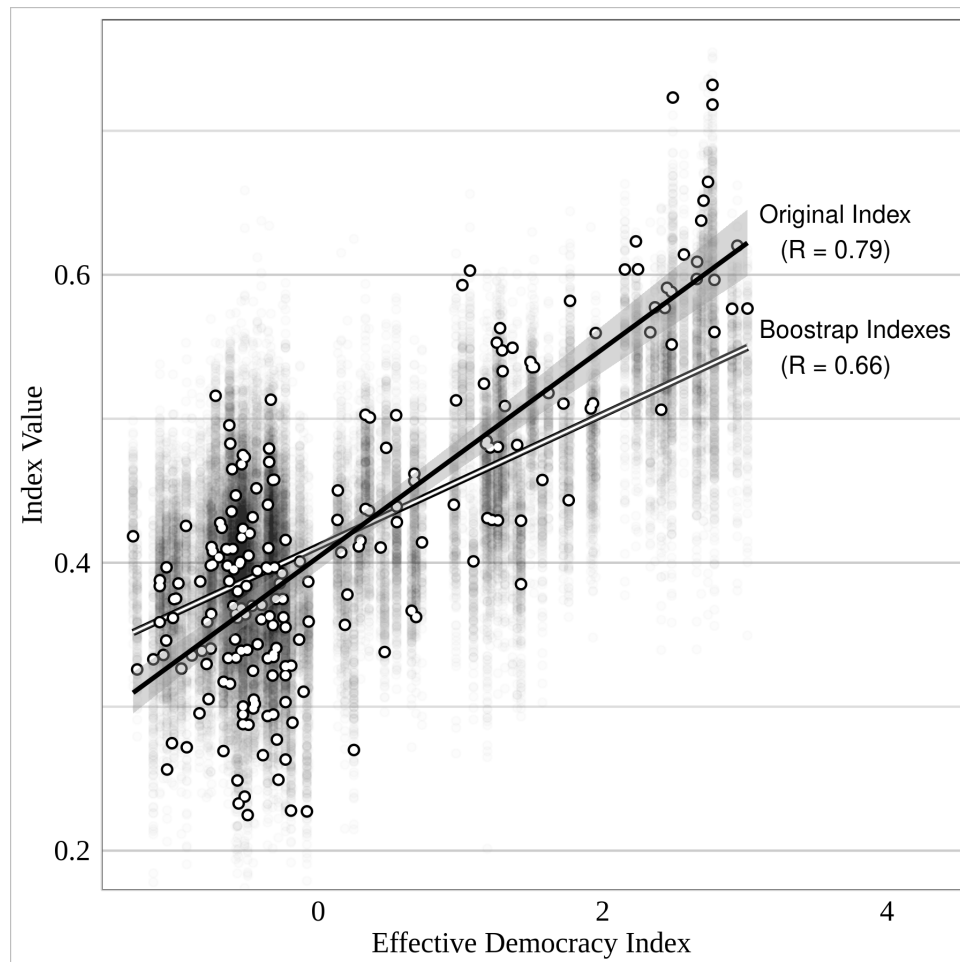Figure A.8: Original Emancipative Values Index vs. Alternative Possible Indices.

Notes: The bootstrap-generated alternative indices correlate highly (median R = 0.84) with the original Emancipative Values index, and are equivalently distributed around the same midpoints.

Testing for Index Overfitting (1) – Democracy

A central purpose of the Emancipative Values index is to predict shifts towards democratic governance. Leaving aside the issue of endogeneity – especially pertinent in light of the time-series trends in Figures A.1 and A.7, which show such values to have increased only in countries that were already full democracies – evidence for this assertion is presented by reference to the high correlation between this index and the distribution of democratic governance across the world. The correlation is especially high with respect to what Welzel has earlier termed "ef-

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fective" democracy, defined as the combination (multiplication) of democracy (measured using the combined Freedom House scores) and the absence of corruption (here using the Worldwide Governance Indicator for Control of Corruption) (Figure A.9).

Figure A.9: Effective Democracy Index and Emancipative Values Index Correlation.

Notes: Scatterplot of the original Emancipative Values Index and the Effective Democracy Index (the multiplication of the combined Freedom House Scores with the WGI indicator for Control of Corruption), in comparison to the average bootstrap-generated index. While both the original and the randomly-generated indices are correlated positively with the Effective Democracy Index, this is notably higher for the original measure than its conceptually valid alternatives.
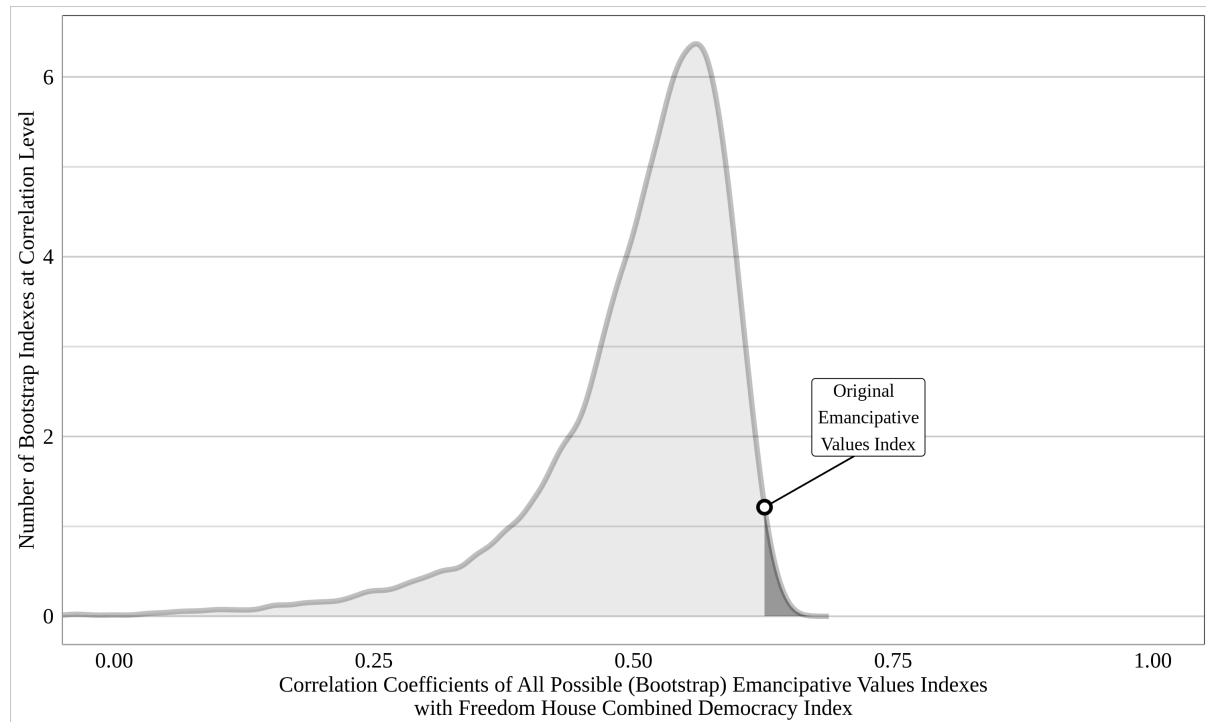
Figure A.9 suggests a broader concern: the fit of the original Emancipative Values index to measures of democracy, may be unusually high relative to equally valid alternatives designed with slightly different question items. In this case, the correlation of the original Emancipative Values index with the Effective Democracy scores is higher (R = 0.79), for example, than the average among alternative specifications (R = 0.66).

How high is the correlation of the Emancipative Values index with democracy, compared to this sample of valid alternative measures? For simplicity we operationalise democracy here using the combined Freedom House scores for Civil Liberties and Political Rights, which was the most widely-used measure during the period in which the Emancipative Values index was designed.

Figure A.10 shows the percentile position of the Welzel Emancipative Values index within the universe of all possible such indices with respect to its correlation with democracy. At the point

of publication in 2013, the index was in the top 1% of potential valid indices with respect to its fit with democracy. In short, it is unlikely that the Emancipative Values index could have been designed by chance, without item selection to overfit the index to the existing distribution of democratic governance in the world at that time. Such selection bias may well be unintentional, as certain indicators could be unconsciously known to covary more strongly with democracy than other conceptually valid alternatives. Yet it is unlikely that such a close fit could be arrived at without conscious or unconscious indicator selection to the data.

Figure A.10: Position of the Emancipative Values Index in Distribution of Possible Indices with Respect to the Pairwise Correlation with Democracy (Combined Freedom House Scores).

Notes: Among the sample of potential Emancipative Values indices that could have been constructed from the World Values Survey, the original Emancipative Values Index is at the 99th percentile with respect to its correlation with democracy, as measured by the combined Freedom House scores. This suggests that the high fit is due in part to item selection.

It is important to acknowledge here that there is still a correlation between the average potential index and democratic governance (R = 0.51), it is simply that this figure is far lower than that for original the Emancipative Values index. We can therefore infer that much - though not all - of this is due to overfitting of the index to the data.

Testing for Index Overfttting (2) – In-Sample vs. Out-of-Sample Comparison

The second test of overfitting of data to an outcome variable, is to compare how an index performs during "in-sample" and "out-of-sample" periods. The in-sample period includes the years up until 2013, i.e., when the Emancipative Values Index was formulated and then published. This is the sample of data that was available to scholars during the design period, and which could have therefore consciously or unconsciously influenced item selection. The out-of-sample period constitutes survey observations gathered after this date, which, by virtue of this fact, could not have been available during index construction, and therefore cannot in any way bias
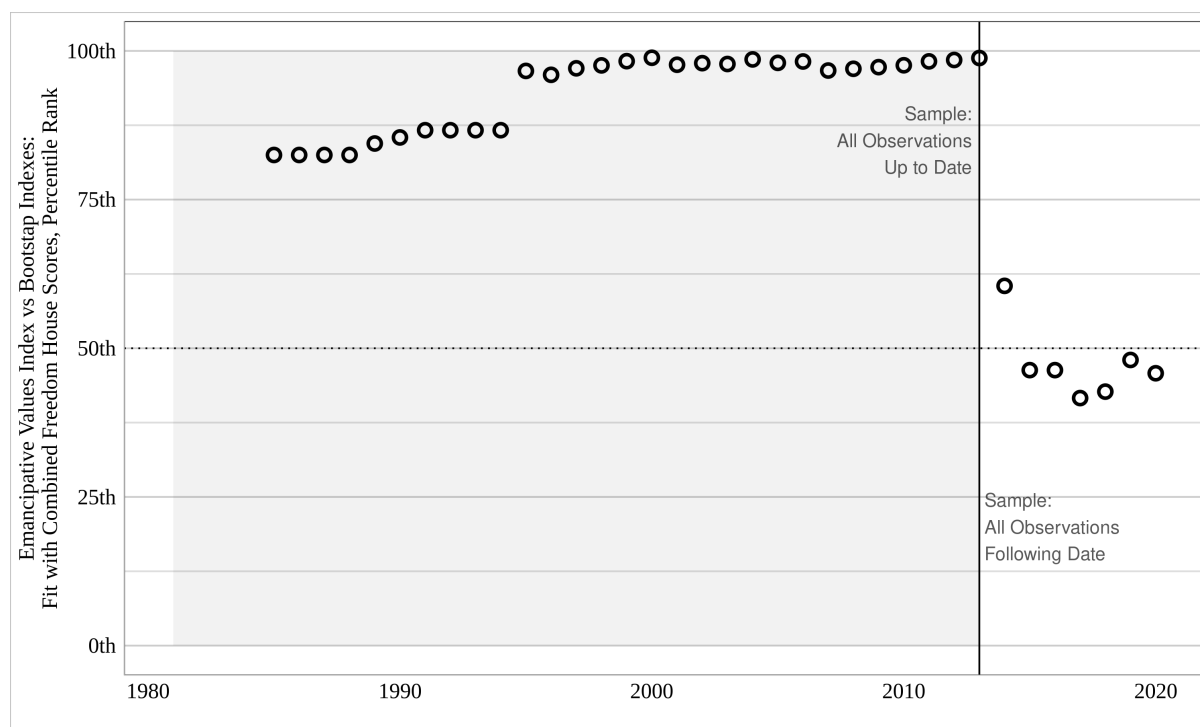
its development and design.

If an index has not been deliberately overfit to an outcome variable, such as the distribution of democratic governance in the world, then we should expect the index to exhibit similar positioning in its distribution of potential alternative operationalizations in both the "in-sample" and the "out-of-sample" phase. Ideally, the index should be positioned near the 50th percentile in both periods, as this implies that (a) the initial index was not deliberately overfit to the data, and (b) the index continues to function as a representative measure of its target concept (in this case, liberal values) in the period following its design.

The preceding analysis already shows that during its design phase, the Emancipative Values index was situated in the top percentile of valid alternatives with respect to its correlation with democracy, which implies that it was heavily overfitted to this outcome variable. However, if its position in the universe of potential alternatives remains at this level during the out-of-sample period, then one could argue that the item selection was more appropriate as a measure of its intended target (values supportive of democratic governance) – and that the additional items included in the construction of alternative potential indices were simply not as valid to this end.

Figure A.11: Position of the Original EV Index in Distribution of Possible Indices.

Notes: Among the universe of potential EV indices that could have been constructed from the World Values Survey, the original EV Index is in the 99th percentile with respect to its correlation with democracy (combined Freedom House scores) during the period of its design and publication. However, this drops to average using subsequently collected data, suggesting that the original index was overfitted to democracy through item selection.

The "in-sample" and "out-of-sample" comparison is shown in Figure A.11. There is an immediate and large decay in relative fit between the Emancipative Values index and democracy when comparing data from its design phase and data collected after its publication. The index goes from being in the 99th percentile of such indices in the period of development to being below average in data collected after 2014. The large drop in efficacy as a correlate of democracy from the in-sample to the out-of-sample period strongly suggests overfitting, and this would explain
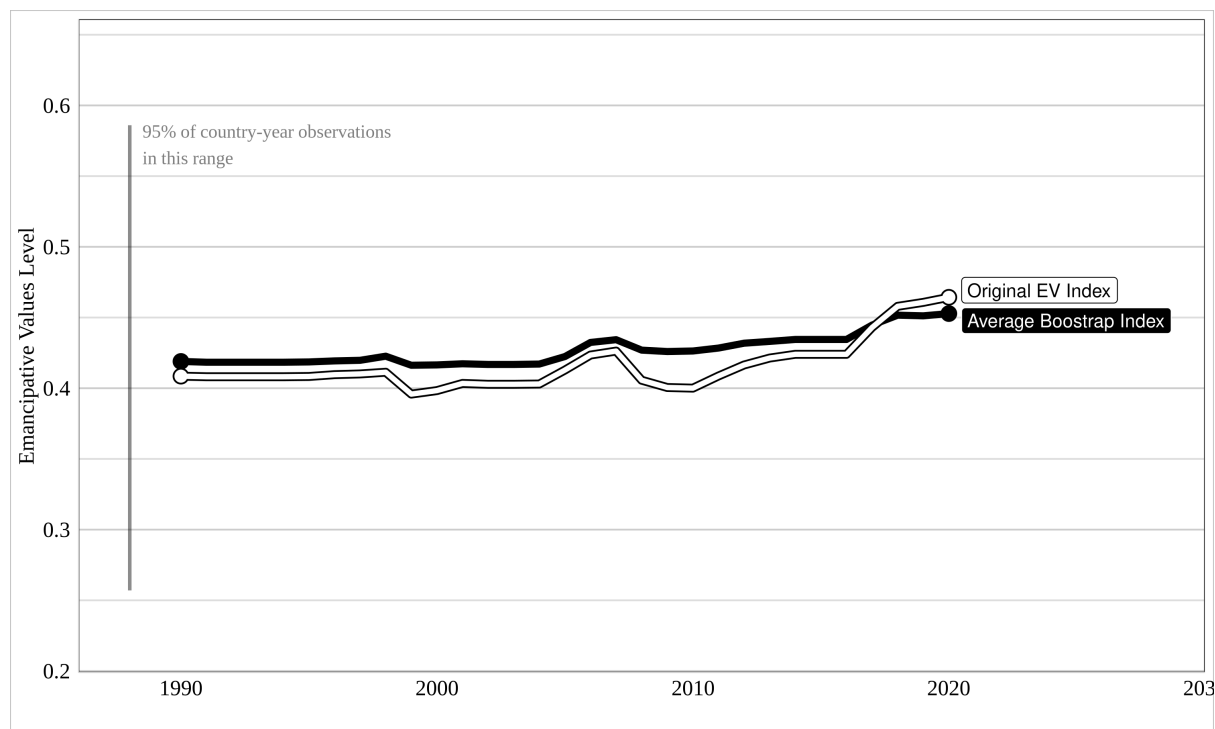
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the relative lack of efficacy of the index in predicting democratic shifts after this point.

4. Recalculating Time-Series Trends Using Bootstrap Indices

Finally, having generated a large number of alternative specifications of the Emancipative Values index, we can revisit the analysis of time-series trends. Given the concerns regarding overfitting, how do the time-series trends of the Emancipative Values index compare to those among its alternative possible specifications? Is the evidence of a shift towards more liberal values only present when using a particular selection of survey items – those of the original index – or can it be found more broadly across different measurements?

The initial evidence suggests that item selection does account for a significant proportion of the increase in the Emancipative Values index. First, figure A.12 shows the equal-weighted all-country averages for the Emancipative Values index, versus the average of its alternative specifications, from 1990 to 2020. As in the first section, in generating these figures, we limit the sample to only countries with at least a 15-year span of data, and apply a constant country sample in each year using the most recent available survey observation.

Figure A.12: Comparison of the Emancipative Values Index and Average Bootstrap Index, 1990-2020
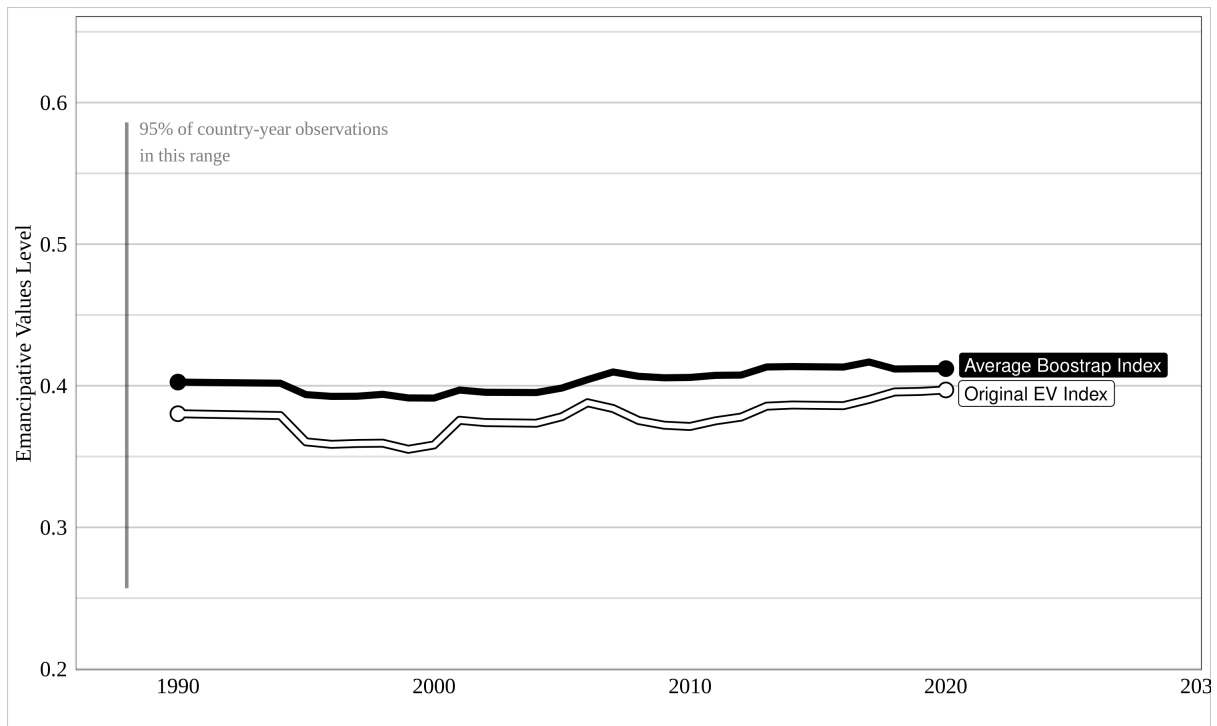

Notes: Unweighted country average, using constant country sample. While the original Emancipative Values index shows a rising trend over time, there is a much weaker change in the average potential index generated by the bootstrap process.

While the Emancipative Values index increases by a fairly large amount at the cross-country (equal-weighted) level, the alternative specifications increase by only a more limited degree. Substantively the different is around 50%, suggesting that a large proportion of the increase in the original index is due to item selection effects, and not an underlying change in value orientations.

Second, as our intention is to see whether there is a global trend towards emancipative values, Figure A.13 presents the same data but this time, using population-weighting when aggregating countries, so as to produce a trendline that is representative of change at the global level. After population weighting, neither the original Emancipative Values index nor its alternative specification show any clear trend. While the former is marginally higher in 2020 than thirty years prior, the latter is exactly flat, and shows minimal variation over time.

Figure A.13: Comparison of the EV Index and Average Bootstrap Index, 1990-2020

Notes: Population-weighted country average, using constant country sample. After population weighting, there is no evident trend in the Emancipative Values index over time, either in the original index or the bootstrap alternative indices.

There is no trend in aggregate towards more liberal values. To the extent that a trend exists, it is to be found in countries that are longstanding democracies, but whose declining share of world population counteracts their contribution to value change at a global level. Nor is there evidence that any index of liberal values can predict shifts towards or away from democracy in the past decade. That said, the foregoing analysis implies no conclusion as regards future trends in liberal values, which may rise, or fall, or continue to remain constant. Nor does it imply any conclusion regarding prospects for democratic transition – which, if not related to the levels of such values, could occur despite the absence of any clear value-shift in partly democratic and non-democratic countries.