Online appendix to

Electoral integrity matters: how electoral process conditions the relationship between political losing and political trust

Marlene Mauk

A. Appendix

Table A-1: Question wordings for individual-level dependent, independent, and control variables

Asian Barometer	European Social Survey	Latinobarómetro	Recoding method
Political trust			
I'm going to name a number of institutions. For each one, please tell me how much trust do you have in them? … parliament … the courts … the police … political parties (1=a great deal of trust; 4=none at all)	Using this card, please tell me on a score of 0-10 how much you personally trust each of the institutions I read out. … [country's] parliament … the legal system … the police … political parties (0=no trust at all; 10=complete trust)	Please look at this card and tell me how much trust you have in each of the following groups/ institutions. … National Congress/Parliament … Judiciary … Police … Political Parties (1=a lot of trust, 4=no trust)	Linear transformation into scale from 0=no trust at all to 100=complete trust
Perceptions of electoral fairness			
On the whole, how free and fair would you say the last national election was? (1=completely free and fair; 4=not free and fair)	Using this card, please tell me to what extent you think each of the following statements applies in [country]. – National elections in [country] are free and fair. (0=does not apply at all; 10=applies completely)	Thinking of the last national election in [country], how fair was it regarding the opportunities of the candidates and parties to campaign? (1=very fair; 5=very unfair)	Linear transformation into scale from 0=not free and fair to 1=completely free and fair
Government satisfaction			
How satisfied or dissatisfied are you with the [name of president, etc. ruling current] government? (1=very satisfied; 4=very dissatisfied)	Now thinking about the [country] government, how satisfied are you with the way it is doing its job? (0=extremely dissatisfied; 10=extremely satisfied)	Do you approve or not of the performance of the government led by President (name)? (1=approve; 2=disapprove)	Linear transformation into scale from 0=very dissatisfied to 1=very satisfied
Economic performance evaluations			
How would you rate the overall economic condition of our country today? (1=very good; 5=very bad)	On the whole, how satisfied are you with the present state of the economy in [country]? (0=extremely dissatisfied; 10=extremely satisfied)	In general, how would you describe the country's present economic situation? (1=very good; 5=very bad)	Linear transformation into scale from 0=very bad to 1=very good
Political interest			
How interested would you say you are in politics? (1=very interested; 4=not at all interested)	How interested would you say you are in politics? (1=very interested; 4=not at all interested)	How interested would you say you are in politics? (1=very interested; 4=not at all interested)	Linear transformation into scale from 0=not interested to 1=very interested
Social trust			

Generally speaking, would you say that you can trust most people, or that you can never be too careful when dealing with others? (1=one can trust most people; 2=one can never be too careful when dealing with others)	Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? (0=you can't be too careful; 10=most people can be trusted)	Generally speaking, would you say that "Most people can be trusted" or that "You must be very careful in dealing with people"? (1=most people can be trusted; 2=you must be very careful in dealing with people)	Linear transformation into scale from 0=low social trust to 1=high social trust
Subjective socioeconomic status			
People sometimes think of the social status of their families in terms of being high or low. Imagine a ladder with 10 steps. At step one stand the lowest status and at step 10 stand the highest. Where would you place your family on the following scale? (1=lowest status; 10=highest status)	There are people who tend to be towards the top of our society and people who tend to be towards the bottom. On this card there is a scale that runs from top to bottom. Where would you place yourself on this scale nowadays? (0=bottom of our society; 10=top of our society)	People sometimes describe themselves as belonging to a social class. Which social class would you describe yourself as belonging to? (1=high; 5=low)	Linear transformation into scale from 0=lowest status to 1=highest status
Education			
What is your highest level of education? (1=no formal education; 10=post-graduate degree)	What is the highest level of education you have successfully completed? (0=not completed ISCED level 1; 800=ISCED 6, doctoral degree)	What level of education do you have? What was the last year you completed?	Recoded as follows. Asian Barometer: 1 = none 2-3 = (some) primary 4-7 = (some) secondary 8-10 = (some) tertiary European Social Survey: 0 = none 113 = (some) primary 129-323 = (some) secondary 412-800 = (some) tertiary Latinobarómetro: 1 = none 2-7 = (some) primary) 8-13, 16-17 = (some) secondary 14-15 = (some) tertiary
Female			
Gender (1=male; 2=female)	Gender (1=male; 2=female)	Gender (1=male; 2=female)	Recoded to 1=female, 0=male
Age			
Year of birth converted to actual age by interviewer.	Year of birth converted to actual age by interviewer.	What is your age?	Maintained original codings

Table A-2: Descriptive statistics for variables included in the analysis

Variable	N	Mean	Std. Dev.	Minimum	Maximum
Trust in parliament	39,760[a]	41.28	27.62	0	100
Trust in police	39,994[a]	56.27	28.63	0	100
Trust in courts	39,467[a]	47.00	29.07	0	100
Trust in parties	39,695[a]	34.64	25.34	0	100
Election loser	40,281	0.47	0.50	0	1
Perceived electoral fairness	40,281	0.72	0.29	0	1
Government satisfaction	40,281	0.46	0.33	0	1
Performance evaluations	40,281	0.43	0.26	0	1
Political interest	40,281	0.50	0.30	0	1
Social trust	40,281	0.42	0.34	0	1
Subj. socioeconomic status	40,281	0.50	0.21	0	1
Education level					
none	40,281	0.03	0.16	0	1
(some) primary	40,281	0.14	0.35	0	1
(some) secondary	40,281	0.51	0.50	0	1
(some) tertiary	40,281	0.33	0.47	0	1
Female	40,281	0.52	0.50	0	1
Age	40,281	49.13	17.28	16	103
Electoral integrity	45	0.87	0.16	0.37	0.99

Notes: Includes only cases for which loser variable could be coded, i.e. those who indicated they voted in the previous election. [a] Ns for trust in parliament, trust in police, trust in courts, and trust in parties are smaller than 40,281 because the empirical analyses in this paper use full-information maximum likelihood (FIML) estimation. FIML incorporates information from partially missing cases for the dependent variable (e.g., respondents who answered only 3 out of the 4 trust questions) and therefore can include cases with missing values on one or more of the trust questions. If we look at the descriptive statistics for each of these four trust variables independently, there is of course no information on those missing values, resulting in smaller sample sizes.

Sources: Asian Barometer 2010-2012, Latinobarómetro 2013, European Social Survey 2012-2013, V-Dem v9.

Discussion on measurement invariance

Measurement invariance entails that "respondents from different groups that have the same position on a trait of interest should provide a similar response" (Davidov et al. 2014, p. 58), i.e. that equal amounts of political trust result in equal values on the scale for political trust in each of the three survey projects despite them using different question wordings and response scales. Measurement invariance can be established on various levels. The most important are configural, metric, and scalar invariance (cf. Cheung and Rensvold 2002; Steenkamp and Baumgartner 1998). For the purposes of this analysis, metric invariance is decisive as it indicates that respondents in different groups (in this case: surveys) understand the questions similarly (Byrne 2012, pp. 212-221; Steenkamp and Baumgartner 1998, p. 80).

Empirically, all levels of measurement invariance can be tested using multi-group confirmatory factor analyses (MGCFA; Jöreskog 1971). MGCFA is the most popular tool for investigating measurement invariance (for a discussion of different approaches and an introduction to MGCFA, see Davidov et al. 2014). In MGCFA, a confirmatory factor analysis model is fitted to each individual group and, depending on the level of measurement invariance that shall be established, various constraints are imposed upon these models. For configural invariance, no equality constraints beyond equal factor structures are imposed; for metric invariance, factor loadings are constrained to be equal across groups; and for scalar invariance, not only factor loadings but also indicator intercepts are constrained to be equal across groups (Steenkamp and Baumgartner 1998; Wang and Wang 2012, pp. 208-237). For each level of measurement invariance, we then need to evaluate the fit of the MGCFA model. Each model is evaluated based on absolute model fit indices (RMSEA, CFI, TLI, and SRMR) and is accepted if these goodness-of-fit indices indicate a reasonable fit and changes in model fit compared to the less restrictive model do not exceed certain thresholds (on this approach and recommended cutoff values, see Chen 2007).[1]

[1] For the first criterion (reasonable fit), the same cutoff values are applied as for regular confirmatory factor analyses: the RMSEA should be lower than 0.1, the CFI and TLI should be higher than 0.9, and the SRMR should be lower than 0.08 (Acock 2013, pp. 21-24; Wang and Wang 2012, pp. 18-20). For the second criterion (changes in model fit), Chen 2007 recommends the following: We should not assume metric invariance if the CFI decreases by more than 0.01 and – at the same time – the RMSEA increases by more than 0.015 or the SRMR increases by more than 0.03 compared to the configural invariance model. We should not assume scalar invariance if the CFI decreases by more than 0.01 and – at the same time – the RMSEA increases by more than 0.015 or the SRMR increases by more than 0.01 compared to the metric invariance model.

As Table A-3 demonstrates, both configural invariance and full metric invariance are present across surveys: the absolute model fit indices indicate good fit and changes in model fit from the configural to the metric invariance model are within the acceptable margins (decrease in CFI is no more than 0.01). The results evidence that the factorial structure of political trust is the same in each survey project (configural invariance) and that factor loadings are identical as well (metric invariance).[2] This suggests that respondents interpret questions and response scales in similar ways and means that we can measure political trust in a meaningful and comparable way across survey projects.[3]

Table A-3: Measurement invariance for political-trust measure

	Model 1: Configural invariance					
	Asian Barometer		Latinobarómetro		European Social Survey	
	Unstand.	Stand.	Unstand.	Stand.	Unstand.	Stand.
Factor loadings						
Trust in parliament	14.51 (0.36)	0.56	21.68 (0.30)	0.71	19.60 (0.12)	0.73
Trust in police	14.61 (0.35)	0.56	14.49 (0.28)	0.44	20.11 (0.12)	0.74
Trust in courts	18.80 (0.39)	0.71	24.04 (0.31)	0.78	26.50 (0.11)	0.94
Trust in parties	12.62 (0.34)	0.51	18.37 (0.28)	0.64	15.67 (0.11)	0.65
Correlation between error terms						
Trust in parliament / trust in parties	190.8 (7.88)	0.42	72.21 (8.51)	0.15	167.99 (2.23)	0.51
Model fit						
RMSEA	0.006 [0.000; 0.014]	CFI	1.000	TLI	1.000	SRMR	0.001
	Model 2: Full metric invariance					
	Unstand.	Stand.	Unstand.	Stand.	Unstand.	Stand.
Factor loadings						
Trust in parliament	19.22 (0.10)	0.67	19.22 (0.10)	0.64	19.22 (0.10)	0.73
Trust in police	18.90 (0.10)	0.66	18.90 (0.10)	0.55	18.90 (0.10)	0.72
Trust in courts	25.64 (0.10)	0.83	25.64 (0.10)	0.82	25.64 (0.10)	0.93
Trust in parties	15.53 (0.09)	0.595	15.53 (0.09)	0.55	15.53 (0.09)	0.65
Correlation between error terms						
Trust in parliament / trust in parties	192.77 (6.86)	0.42	134.90 (5.45)	0.25	165.94 (2.22)	0.50
Model fit						
RMSEA	0.067 [0.064; 0.071]	CFI	0.990	TLI	0.984	SRMR	0.073

Notes: Results of multi-group confirmatory factor analysis (MGCFA). Unstandardized and standardized factor loadings. Standard errors in parentheses. N (individuals) = 71,813. N (groups) = 3. For RMSEA, 90% confidence intervals are reported in square brackets.
Sources: Asian Barometer 2010-2012, Latinobarómetro 2013, European Social Survey 2012-2013.

[2] As this study is interested only in covariates and not in means, scalar invariance is not required. Nonetheless, partial scalar invariance (relaxing equal intercept constraint for trust in police and trust in courts) is also present.

[3] MGCFA was performed after linearly transforming the variables to the 0-100 scale. The measurement model allows for a correlation of error terms between trust in parliament and trust in parties.

Table A-4: Baseline measurement model for multi-level SEM

	Model 0a: unconstrained baseline measurement model			
	Individual level		System level	
	Unstandardized	Standardized	Unstandardized	Standardized
Factor loadings				
Trust in parliament	1.00 (0.00)	0.65	1.00 (0.00)	1.00
Trust in police	0.88 (0.04)	0.57	0.76 (0.13)	0.62
Trust in courts	1.30 (0.03)	0.84	0.98 (0.10)	0.82
Trust in parties	0.82 (0.01)	0.57	0.69 (0.05)	0.88
Correlation between error terms				
Trust in parliament / trust in parties	128.59 (9.54)	0.35	-	-
Model fit				
RMSEA 0.012	CFI 0.991	TLI 0.972	SRMR (within) 0.001	SRMR (between) 0.088
	Model 0b: baseline measurement model, assuming metric isomorphism			
	Individual level		System level	
	Unstandardized	Standardized	Unstandardized	Standardized
Factor loadings				
Trust in parliament	1.00 (0.00)	0.65	1.00 (0.00)	0.64
Trust in police	0.88 (0.04)	0.57	0.88 (0.04)	0.75
Trust in courts	1.29 (0.03)	0.83	1.29 (0.03)	1.00
Trust in parties	0.82 (0.01)	0.57	0.82 (0.01)	0.59
Correlation between error terms				
Trust in parliament / trust in parties	127.49 (9.64)	0.35	127.49 (9.64)	0.92
Model fit				
RMSEA 0.010	CFI 0.989	TLI 0.981	SRMR (within) 0.001	SRMR (between) 0.544

Notes: Results of multi-level confirmatory factor analysis. Unrestrained model. Unstandardized and standardized factor loadings. Standard errors in parentheses. N (individuals) = 40,237*. N (countries) = 45. Model 0a: Correlation between error terms only allowed on the individual level.

* Sample size is lower for the pure measurement model than for the full SEM as FIML cannot use information from cases with missing values on all trust questions if the model includes no covariates.

Sources: Asian Barometer 2010-2012, Latinobarómetro 2013, European Social Survey 2012-2013.

Table A-5: Measurement models for the multi-level structural equation models 1-4

	Model 1	Model 2	Model 3	Model 4
	Individual level			
Factor loadings				
Trust in parliament	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
Trust in police	0.78 (0.04)	0.72 (0.04)	0.72 (0.04)	0.72 (0.04)
Trust in courts	1.07 (0.03)	0.98 (0.03)	0.98 (0.03)	0.98 (0.03)
Trust in parties	0.82 (0.01)	0.82 (0.01)	0.82 (0.01)	0.82 (0.01)
Correlation between error terms				
Trust in parliament / trust in parties	78.59 (9.65)	54.98 (8.02)	55.14 (8.03)	54.84 (8.04)
	System level			
Factor loadings				
Trust in parliament	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
Trust in police	0.66 (0.23)	0.99 (0.22)	0.99 (0.22)	1.02 (0.19)
Trust in courts	0.88 (0.16)	1.04 (0.17)	1.04 (0.17)	1.07 (0.15)
Trust in parties	0.53 (0.10)	0.47 (0.11)	0.47 (0.11)	0.50 (0.09)
Model fit[a]				
RMSEA	0.034	0.032	0.031	-
CFI	0.600	0.655	0.704	-
TLI	0.486	0.542	0.594	-
SRMR (within)	0.137	0.111	0.093	-
SRMR (between)	0.201	0.140	0.140	-

Notes: Results of multi-level structural equation model. Unstandardized factor loadings. Standard errors in parentheses. N (individuals) = 40,281. N (countries) = 45. [a] Model fit for the entire structural equation model, not just the measurement model.

Sources: Asian Barometer 2010-2012, Latinobarómetro 2013, European Social Survey 2012-2013.

Table A-6: Random-slope model without interaction on effect of political losing on perceptions of electoral fairness

		Model 4_0
Individual-level effects		
Election loser	-0.06	(0.44)
Perceived electoral fairness (b_1)	11.83***	(0.76)
Election loser on perceived electoral fairness (a_1)	-0.09***	(0.02)
Election loser via perceived electoral fairness (a_1*b_1)	-1.11***	(0.20)
Government satisfaction (b_2)	20.14***	(1.60)
Election loser on government satisfaction (a_2)	-0.22***	(0.03)
Election loser via government satisfaction (a_2*b_2)	-4.47***	(0.42)
Economic performance evaluations	20.54***	(1.46)
Political interest	9.28***	(0.72)
Social trust	7.91***	(1.04)
Subjective socioeconomic status	5.33***	(0.80)
Education (ref.: none)		
(some) primary	-1.26	(1.22)
(some) secondary	-2.86**	(1.23)
(some) tertiary	-2.20	(1.35)
Female	1.05***	(0.26)
Age	-0.04**	(0.01)
System-level effect		
Electoral integrity	12.55	(7.81)
Individuals		40,281
Countries		45
σ^2 (within)		228.81*** (16.00)
r^2 (within)		-
σ^2 (between)		40.99*** (8.29)
σ^2 (random slope)		0.01*** (0.00)
AIC		1,433,736

Notes: Multi-level structural equation modeling. Maximum likelihood estimation. Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Sources: Asian Barometer 2010-2012; European Social Survey 2012-2013; Latinobarómetro 2013; V-Dem v9.

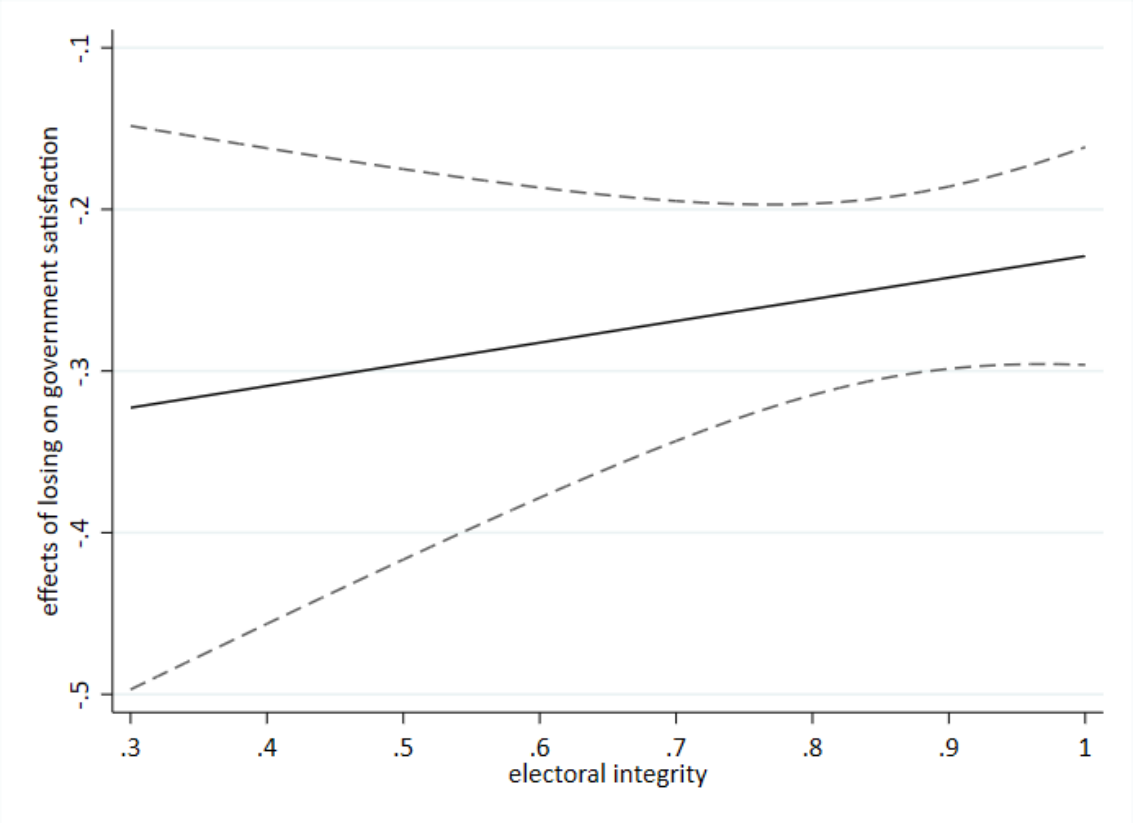
Table A-7: Cross-level moderated mediation model for political losing on political trust via satisfaction with the incumbent government

		Model 5
Individual-level effects		
Election loser	-0.07	(0.43)
Perceived electoral fairness (b_1)	11.87***	(0.75)
Election loser on perceived electoral fairness (a_1)	-0.07***	(0.02)
Election loser via perceived electoral fairness (a_1*b_1)	-0.87***	(0.22)
Government satisfaction (b_2)	20.08***	(1.60)
Election loser on government satisfaction (a_2)	-0.36***	(0.01)
Election loser via government satisfaction (a_2*b_2)	-7.30**	(2.77)
Economic performance evaluations	20.53***	(1.46)
Political interest	9.28***	(0.72)
Social trust	7.96***	(1.05)
Subjective socioeconomic status	5.41***	(0.82)
Education (ref.: none)		
(some) primary	-1.20	(1.22)
(some) secondary	-2.81*	(1.23)
(some) tertiary	-2.14	(1.35)
Female	1.05***	(0.26)
Age	-0.04**	(0.01)
System-level effect		
Electoral integrity	3.60	(6.94)
Cross-level moderated mediation effect		
Electoral integrity on government satisfaction	-0.16	(0.21)
Election loser*electoral integrity on government satisfaction (i_2)	0.14	(0.15)
Election loser*electoral integrity on political trust via government satisfaction (i_2*b_2)	2.72	(3.04)
Individuals		40,281
Countries		45
σ^2 (within)		228.55*** (15.97)
r^2 (within)		-
σ^2 (between)		46.53*** (7.03)
σ^2 (random slope)		0.04*** (0.01)
AIC		1,435,952

Notes: Multi-level structural equation modeling. Maximum likelihood estimation. Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Sources: Asian Barometer 2010-2012; European Social Survey 2012-2013; Latinobarómetro 2013; V-Dem v9.

Figure A-1: The conditional effect of political losing on satisfaction with the incumbent government



Notes: Multilevel structural equation modeling with maximum likelihood estimation. Unstandardized estimates and 95% confidence intervals of conditional effect for varying degrees of electoral integrity (0.02 scale points intervals). Model specifications according to Model 5 in Table A-7.
Sources: Asian Barometer 2010-2012; European Social Survey 2012-2013; Latinobarómetro 2013; V-Dem v9.

References

Acock, Alan C. 2013. *Discovering Structural Equation Modeling Using Stata*. College Station: Stata Press.

Byrne, Barbara M. 2012. *Structural Equation Modeling with Mplus: Basic Concepts, Applications, and Programming*. New York, Hove: Taylor & Francis.

Chen, Fang F. 2007. "Sensitivity of Goodness of Fit Indexes to Lack of Measurement Invariance." *Structural Equation Modeling: A Multidisciplinary Journal* 14 (3): 464-504.

Cheung, Gordon W., and Roger B. Rensvold. 2002. "Evaluating Goodness-of-Fit Indexes for Testing Measurement Invariance." *Structural Equation Modeling: A Multidisciplinary Journal* 9 (2): 233-55.

Davidov, Eldad, Bart Meuleman, Jan Cieciuch, Peter Schmidt, and Jaak Billiet. 2014. "Measurement Equivalence in Cross-National Research." *Annual Review of Sociology* 40: 55-75.

Jöreskog, Karl G. 1971. “Simultaneous Factor Analysis in Several Populations.” *Psychometrika* 36 (4): 409-26.

Steenkamp, Jan-Benedict E. M., and Hans Baumgartner. 1998. “Assessing Measurement Invariance in Cross-National Consumer Research.” *Journal of Consumer Research* 25 (1): 78-107.

Wang, Jichuan, and Xiaoqian Wang. 2012. *Structural Equation Modeling: Applications Using Mplus*. Chichester: Wiley.