Supplemental Material 2

Measurement invariance of three narcissism questionnaires across the US, the UK, and Germany

Supplementary analyses with data from Italy and Poland

Tables and Figures

Tables

Figures

Samples for additional analyses with Italy and Poland

Italian sample. The Italian data were collected in paper-pencil format for 193 participants and online for 71 participants (total $N = 264$, 72% female). On average, participants in the Italian sample were 27.95 years old ($SD = 7.52$). Participants did not receive any incentive for filling out the questionnaires. The order of presentation was fixed (first NPI, then NARQ).

Polish sample. The Polish sample consisted of 646 participants (51% female, $M_{age} = 33.43$, $SD_{age} = 9.57$). Participants were recruited through the Polish Ariadna online system. This system works similar to Amazon Mechanical Turk, except that participants are awarded points which they can exchange for various rewards. The order of the instruments was randomized.

Table S1

Descriptive statistics and omega reliabilities for the narcissism facets by country

Question-naire	**Facet**	**Country**			
		Italy		**Poland**	
		M (SD)	ω	M (SD)	ω
B-PNI	Exploitativeness	-	-	3.44 (0.93)	0.81
B-PNI	Self-sacrificing enhancement	-	-	3.82 (0.89)	0.81
B-PNI	Grandiose fantasy	-	-	3.31 (1.13)	0.88
B-PNI	Contingent self-esteem	-	-	3.13 (1.07)	0.87
B-PNI	Hiding the self	-	-	3.54 (0.9)	0.75
B-PNI	Devaluing	-	-	3.16 (1.02)	0.87
B-PNI	Entitlement rage	-	-	3.26 (0.98)	0.84
NPI	Leadership	0.31 (0.19)	0.81	-	-
NPI	Vanity	0.25 (0.22)	0.80	-	-
NPI	Entitlement	0.28 (0.2)	0.67	-	-
NARQ	Admiration	3.02 (0.81)	0.83	3.46 (0.83)	0.88
NARQ	Rivalry	2.06 (0.76)	0.82	3.02 (0.9)	0.90

Note. B-PNI = Brief Pathological Narcissism Inventory, NPI = Narcissistic Personality Inventory, NARQ = Narcissistic Admiration and Rivalry Questionnaire.

B-PNI analyses with US, UK, Germany, and Poland

The fit of the configural model was good according to the RMSEA (0.040, 90% CI = [0.039, 0.042]) and acceptable according to the CFI (0.943). All items showed moderate to strong loadings on their respective facet (see Table S2).

The measurement invariance analyses indicated that 15 (13.4%) factor loadings were noninvariant, seven of them in Germany and eight in Poland (see Table S3). Of the 560 thresholds, 85 (15.2%) were noninvariant, most of them (61) for Poland compared to the combined other three countries. For the Polish sample, 14 out of 28 items had three or four noninvariant thresholds (see Table S3). Due to the large amount of noninvariance in the Polish sample, we refrain from reporting latent mean differences between all four countries. Please refer to the main text and SOM 1 for results on the mean differences between the US, UK, and Germany.

Table S2

Standardized factor loadings from the configural invariance model for the B-PNI analysis of US, UK, Germany, and Poland

		Standardized factor loading			
Facet	**Item**	**US**	**UK**	**Germany**	**Poland**
Exploitativeness	BPNI1	0.78	0.80	0.67	0.66
	BPNI4	0.90	0.89	0.81	0.74
	BPNI6	0.90	0.70	0.90	0.85
	BPNI11	0.50	0.63	0.59	0.71
Self-sacrificing self-enhancement	BPNI10	0.72	0.75	0.80	0.78
	BPNI12	0.52	0.50	0.53	0.51
	BPNI19	0.75	0.69	0.78	0.74
	BPNI24	0.64	0.58	0.68	0.89
Grandiose fantasy	BPNI13	0.71	0.67	0.67	0.82
	BPNI17	0.86	0.90	0.87	0.83
	BPNI25	0.68	0.59	0.78	0.83
	BPNI26	0.86	0.91	0.81	0.87
Contingent self-esteem	BPNI2	0.78	0.78	0.72	0.80
	BPNI16	0.85	0.85	0.83	0.85
	BPNI18	0.70	0.60	0.82	0.85
	BPNI21	0.71	0.69	0.72	0.78
Hiding the self	BPNI3	0.73	0.72	0.83	0.67

	BPNI15	0.70	0.68	0.61	0.70
	BPNI27	0.68	0.74	0.67	0.56
	BPNI28	0.75	0.82	0.87	0.78
Devaluing	BPNI7	0.62	0.62	0.68	0.74
	BPNI9	0.48	0.53	0.66	0.82
	BPNI14	0.75	0.75	0.84	0.85
	BPNI20	0.81	0.77	0.86	0.82
Entitlement rage	BPNI5	0.70	0.68	0.70	0.70
	BPNI8	0.70	0.65	0.71	0.82
	BPNI22	0.77	0.75	0.82	0.79
	BPNI23	0.73	0.76	0.67	0.80

Table S3

Noninvariant parameters for the B-PNI analysis with US, UK, Germany, and Poland

Model	**Parameter**	**Country**	**Modification index**	**Expected parameter change**
strict	[BPNI7$4]	P	104.67	0.63
partial 1	[BPNI7$5]	P	102.20	0.62
partial 2	[BPNI9$4]	P	94.19	0.61
partial 3	[BPNI19$2]	P	93.13	-0.66
partial 4	[BPNI11$4]	P	92.76	0.55
partial 5	[BPNI4$2]	P	85.04	-0.76
partial 6	[BPNI10$4]	P	77.49	0.56
partial 7	HIDE BY BPNI15	D	70.21	-0.43
partial 8	[BPNI4$5]	UK	63.81	0.86
partial 9	[BPNI9$5]	P	65.04	0.50
partial 10	DEVA BY BPNI9	P	88.24	0.32
partial 11	[BPNI9$3]	P	67.09	0.68
partial 12	[BPNI10$5]	P	61.03	0.52
partial 13	[BPNI7$3]	P	60.11	0.48
partial 14	[BPNI19$1]	P	59.86	-0.53
partial 15	[BPNI12$2]	P	64.31	-0.45
partial 16	[BPNI19$3]	P	55.58	-0.54
partial 17	[BPNI5$4]	P	54.48	0.43

partial 18	[BPNI4$3]	P	54.10	-0.57
partial 19	[BPNI4$1]	P	55.36	-0.53
partial 20	[BPNI21$4]	P	52.17	0.45
partial 21	[BPNI15$5]	D	49.71	-0.43
partial 22	DEVA BY BPNI7	P	48.98	0.29
partial 23	[BPNI11$5]	P	43.96	0.38
partial 24	EXPL BY BPNI11	P	60.94	0.40
partial 25	[BPNI12$1]	P	42.99	-0.36
partial 26	[BPNI15$4]	P	42.08	0.39
partial 27	[BPNI11$3]	P	40.07	0.47
partial 28	[BPNI3$4]	P	36.83	0.35
partial 29	[BPNI24$2]	P	35.80	-0.41
partial 30	[BPNI25$2]	P	34.33	-0.37
partial 31	[BPNI16$2]	P	32.62	-0.44
partial 32	[BPNI13$4]	P	31.52	0.36
partial 33	[BPNI2$4]	D	30.69	-0.42
partial 34	[BPNI18$2]	P	29.07	-0.37
partial 35	[BPNI20$2]	P	28.57	-0.44
partial 36	[BPNI27$1]	P	28.07	-0.27
partial 37	[BPNI27$2]	P	32.90	-0.30
partial 38	[BPNI2$3]	D	27.35	-0.40
partial 39	[BPNI11$2]	D	27.19	0.29
partial 40	[BPNI25$1]	P	26.58	-0.33

partial 41	[BPNI17$2]	P	27.86	-0.42
partial 42	GRFA BY BPNI25	P	27.23	0.27
partial 43	[BPNI22$5]	D	26.37	0.39
partial 44	[BPNI21$5]	P	25.74	0.31
partial 45	[BPNI8$2]	P	25.61	-0.33
partial 46	EXPL BY BPNI4	P	23.56	0.29
partial 47	[BPNI11$1]	D	23.57	0.27
partial 48	[BPNI9$2]	UK	21.42	-0.27
partial 49	[BPNI28$2]	P	21.36	-0.29
partial 50	[BPNI15$2]	P	19.90	-0.27
partial 51	[BPNI24$1]	P	19.60	-0.30
partial 52	[BPNI12$3]	P	25.76	-0.29
partial 53	[BPNI14$1]	D	18.88	-0.45
partial 54	[BPNI7$1]	D	18.61	-0.29
partial 55	[BPNI19$4]	P	18.19	-0.33
partial 56	SSSE BY BPNI24	P	24.72	0.27
partial 57	[BPNI24$5]	P	27.94	0.54
partial 58	[BPNI24$4]	P	49.73	0.80
partial 59	[BPNI2$2]	UK	18.07	0.38
partial 60	DEVA BY BPNI20	D	17.78	-0.27
partial 61	[BPNI7$2]	D	18.63	-0.30
partial 62	[BPNI1$2]	P	17.50	-0.26
partial 63	[BPNI15$1]	P	17.07	-0.26

partial 64	[BPNI26$2]	D	16.70	0.39
partial 65	[BPNI23$2]	P	16.27	-0.26
partial 66	[BPNI1$1]	US	15.48	0.39
partial 67	[BPNI16$1]	P	15.27	-0.31
partial 68	[BPNI18$1]	P	17.47	-0.30
partial 69	[BPNI22$2]	P	15.13	-0.26
partial 70	[BPNI23$1]	P	16.33	-0.27
partial 71	[BPNI8$1]	P	22.73	-0.33
partial 72	[BPNI8$3]	P	16.61	-0.27
partial 73	[BPNI28$1]	P	14.96	-0.26
partial 74	[BPNI14$3]	D	14.08	-0.42
partial 75	[BPNI26$1]	D	13.69	0.37
partial 76	[BPNI17$1]	P	15.38	-0.31
partial 77	[BPNI13$2]	P	16.67	-0.27
partial 78	[BPNI25$3]	P	16.58	-0.31
partial 79	[BPNI14$2]	UK	13.62	0.37
partial 80	[BPNI16$5]	UK	13.41	-0.42
partial 81	[BPNI16$3]	P	12.63	-0.29
partial 82	[BPNI14$4]	D	12.48	-0.43
partial 83	[BPNI28$3]	D	12.24	0.33
partial 84	HIDE BY BPNI3	D	21.18	0.27
partial 85	[BPNI6$2]	D	11.95	0.33
partial 86	[BPNI6$1]	UK	11.03	-0.41

partial 87	[BPNI3$1]	US	10.75	0.28
partial 88	[BPNI17$3]	P	9.70	-0.26
partial 89	[BPNI26$3]	D	9.21	0.27
partial 90	[BPNI13$1]	P	14.79	-0.28
partial 91	GRFA BY BPNI13	P	28.52	0.32
partial 92	[BPNI13$5]	P	30.66	0.47
partial 93	GRFA BY BPNI26	D	7.88	-0.30
partial 94	GRFA BY BPNI17	D	7.94	-0.29
partial 95	EXPL BY BPNI6	D	6.75	-0.25
partial 96	HIDE BY BPNI28	D	6.35	0.26
partial 97	[BPNI27$3]	P	20.64	-0.27
partial 98	[BPNI3$2]	P	16.92	-0.27
partial 99	GRFA BY BPNI26	P	4.58	-0.30

Note. EXPL = exploitativeness, SSSE = self-sacrificing self-enhancement, GRFA = grandiose fantasy, COSE = contingent self-esteem, HIDE = hiding the self, DEVA = devaluing, ENTI = entitlement rage. Facet name BY … indicates a noninvariant factor loading. Items in brackets are noninvariant thresholds with $1 = threshold 1, $ = threshold 2 etc. The expected parameter change (EPC) given by Mplus for individual thresholds reflects the difference between the (constrained) estimate of the parameter in the current model and the estimate of the parameter for this group if it were freed. Thus, it does not directly reflect the difference in parameter estimates between one group and the combined other groups. This group difference (column effect size) was calculated from the EPC values for all groups by subtracting the mean of the EPCs for the

other groups from the EPC for the group of interest. This effect size was compared to the cut-off criterion of 0.375 for thresholds.

NPI analysis with US, UK, Germany, and Italy

For the NPI, the configural invariance model showed a good fit according to the RMSEA (0.019, 90% CI = [0.017, 0.021]) and a below acceptable fit according to the CFI (0.906). The pattern of factor loadings indicated that there were some items that showed poor factor loadings for all countries and that some factor loadings differed strongly across countries (see Table S10). For example, the standardized factor loading on the vanity item 20 (I try not to be a show-off. – I am apt to show off if I get the chance.) was 0.43 in the US sample, 0.14 in the UK sample, 0.22 in the German sample, and 0.93 in the Italian sample. This indicates that there might be differences in the factor structure across countries. Nevertheless, since the model overall fit well and the factor structure of the NPI has been a disputed topic even in homogenous samples(Ackerman et al., 2011; Emmons, 1984), we proceeded with the measurement invariance analyses.

The measurement invariance analyses indicated that 39 parameters were noninvariant (18 loadings and 21 [11%] thresholds). With respect to the loadings, Italy required its own estimate for 11 items and Germany for 5 items, while the US and the UK only accounted for one noninvariant loading each. For example, item 4 on *vanity* (When people compliment me I sometimes get embarrassed. – I know that I am good because everybody keeps telling me so.) had an unstandardized loading of 1.37 in the combined US and UK group and lower loadings in Germany (0.85) and Italy (0.54). Thus, for a substantial number of items in the NPI, the relationship between the items and the underlying trait was different for the Italian sample compared with the combined US, UK, and, in most cases, German samples. With respect to the thresholds, it was the German sample that was noninvariant from the other countries in the most cases: the thresholds of 12 items had to be freed for Germany, while for Italy 7 thresholds had to

be freed and for the US and the UK one each. For example, item 1 on leadership (I have a natural talent for influencing people. – I am not good at influencing people) had a threshold of –0.29 in the combined US, UK, and Italian samples, but a threshold of –0.99 in the German sample. This indicates that – conditional on the trait level – German participants were more likely to choose the narcissistic option (I have a natural talent for influencing people.) compared to US, UK, and Italian participants. In fact, 73% of the German participants selected the narcissistic option compared to 59% in the US, 52% in the UK, and 51% in Italy. Table S11 contains a list of the noninvariant NPI items for each country. In sum, for the US and the UK, the NPI functioned largely equivalently. For Italy and Germany there were some violations of measurement invariance, which pertained mostly to loadings for Italy and mostly to thresholds for Germany.

In the final partial invariance model, mean differences relative to the US as the reference group were found for the UK on leadership and vanity, with UK participants on average scoring lower than US participants (d = –0.38, 95% CI = [–0.50, –0.26] for leadership and (d = –0.26, 95% CI = [–0.38, –0.14] for vanity; see Figure S12 and Table S12). German participants showed small to moderately lower levels on leadership (d = –0.34, 95% CI = [–0.42, –0.26]) and slightly higher levels on vanity (d = 0.25, 95% CI = [0.17, 0.33]) and entitlement (d = 0.25, 95% CI = [0.17, 0.33]) compared to US participants. Finally, Italy showed negligible to small differences to the US on leadership and vanity (d = –0.19, 95% CI = [–0.32, –0.07] for leadership and (d = –0.17, 95% CI = [–0.30, –0.05] for vanity). The mean estimate on entitlement indicated a moderate to large difference with Italians on average scoring higher on entitlement than Americans. However, due to the low variance and large standard error of the mean estimate, this should be interpreted cautiously. In sum, the UK, Germany, and Italy showed lower leadership means than the US and the UK and Italy also showed lower vanity means than the US. In

contrast, German participants on average scored higher than US participants on vanity and entitlement.

Table S4

Standardized factor loadings from the configural invariance model for the NPI analysis with US, UK, Germany, and Italy

		Standardized factor loading			
Facet	**Item**	**US**	**UK**	**Germany**	**Italy**
Leadership	NPI1	0.65	0.63	0.65	0.62
	NPI5	0.64	0.59	0.48	0.55
	NPI6	0.27	0.43	-0.06	1.20
	NPI8	0.53	0.56	0.47	0.57
	NPI9	0.45	0.53	0.32	0.56
	NPI10	0.61	0.56	0.78	0.80
	NPI11	0.52	0.50	0.56	0.25
	NPI12	0.48	0.50	0.33	0.10
	NPI13	0.42	0.62	0.38	0.31
	NPI16	0.45	0.34	0.34	0.27
	NPI17	0.31	0.33	0.45	0.43
	NPI21	0.57	0.53	0.37	0.51
	NPI23	0.57	0.63	0.56	0.52
	NPI27	0.70	0.72	0.75	0.64
	NPI31	0.46	0.56	0.39	0.29
	NPI32	0.70	0.58	0.79	0.62
	NPI33	0.65	0.56	0.70	0.84
	NPI34	0.46	0.42	0.42	0.00

	NPI35	0.68	0.61	0.49	0.33
	NPI36	0.75	0.71	0.63	0.76
	NPI39	0.57	0.59	0.35	0.56
	NPI40	0.44	0.55	0.35	0.59
Vanity	NPI4	0.79	0.87	0.66	0.51
	NPI7	0.66	0.41	0.51	0.60
	NPI9	0.25	0.22	0.20	0.13
	NPI15	0.65	0.63	0.72	0.77
	NPI19	0.58	0.53	0.68	0.61
	NPI20	0.43	0.14	0.22	0.93
	NPI26	0.56	0.60	0.67	0.64
	NPI28	0.50	0.59	0.46	0.49
	NPI29	0.55	0.69	0.63	0.66
	NPI30	0.65	0.38	0.52	0.76
	NPI37	0.50	0.47	0.44	0.43
	NPI38	0.53	0.44	0.43	0.45
	NPI40	0.27	0.24	0.17	0.16
Entitlement	NPI2	0.71	0.53	0.69	0.26
	NPI6	0.40	0.17	0.47	-0.83
	NPI7	0.18	0.46	0.50	0.31
	NPI12	0.25	0.18	0.45	0.74
	NPI13	0.34	0.13	0.31	0.19
	NPI14	0.60	0.65	0.23	0.24

	NPI20	0.26	0.48	0.34	-0.05
	NPI24	0.43	0.50	0.45	0.31
	NPI25	0.72	0.59	0.56	0.59
	NPI30	0.16	0.56	0.47	0.19
	NPI38	0.18	0.24	0.24	0.23

Table S5

Noninvariant parameters for the NPI analysis with US, UK, Germany, and Italy

Model	**Parameter**	**Country**	**Modification index**	**Expected parameter change**
strict	Lead BY npi34	I	51.86	-0.42
partial 1	[npi35]	D	37.38	1.18
partial 2	Ent BY npi13	I	31.19	-0.65
partial 3	[npi21]	I	28.49	1.01
partial 4	[npi8]	D	25.82	0.98
partial 5	Lead BY npi11	I	23.87	-0.32
partial 6	Van BY npi20	I	24.56	0.43
partial 7	Lead BY npi35	I	24.23	-0.37
partial 8	[npi5]	I	18.19	0.86
partial 9	Van BY npi4	I	17.70	-0.52
partial 10	Lead BY npi6	D	15.91	-0.31
partial 11	Ent BY npi14	D	17.76	-0.44
partial 12	Ent BY npi25	I	18.40	0.50
partial 13	[npi21]	D	14.55	0.75
partial 14	Lead BY npi33	I	11.27	0.41
partial 15	Ent BY npi20	I	10.13	-0.93
partial 16	Lead BY npi32	D	9.54	0.35
partial 17	Lead BY npi10	UK	9.65	-0.33

partial 18	Lead BY npi10	US	13.65	-0.44
partial 19	[NPI23]	D	9.76	0.60
partial 20	[NPI8]	I	8.73	-0.60
partial 21	[NPI38]	I	8.13	-0.60
partial 22	[NPI5]	US	7.73	-0.59
partial 23	[NPI39]	I	7.72	-0.53
partial 24	[NPI1]	D	7.34	0.56
partial 25	[NPI33]	I	7.76	-0.82
partial 26	Van BY npi4	D	7.14	-0.43
partial 27	[NPI13]	D	7.46	0.64
partial 28	Lead BY npi33	D	7.30	0.28
partial 29	[NPI11]	D	6.93	0.48
partial 30	[NPI36]	D	6.39	0.58
partial 31	[NPI31]	D	6.74	0.45
partial 32	Ent BY npi6	I	5.55	0.41
partial 33	[NPI14]	UK	5.04	-0.48
partial 34	Lead BY npi27	I	4.90	-0.27
partial 35	[NPI25]	D	4.90	0.56
partial 36	[NPI30]	D	3.66	0.57
partial 37	[NPI26]	D	3.66	0.40
partial 38	[NPI23]	I	3.25	0.39

Note. Lead = leadership, Van = vanity, Ent = entitlement. Facet name BY … indicates noninvariant factor loadings. Items in brackets are noninvariant thresholds. For the NPI the

expected parameter change of the item intercept is reported. This directly reflects the difference in parameter estimates between the group of interest and the other groups and can therefore be compared to the cut-off criterion of 0.375.

Table S6

Latent mean differences and effect sizes for the NPI analysis with US, UK, Germany, and Italy

	US – UK			US – D			US – I		
Trait	**M**	**SD**	**Cohen's *d***	**M**	**SD**	**Cohen's *d***	**M**	**SD**	**Cohen's *d***
Leadership	–0.38 [–0.51, –0.24]	0.98	–0.38 [–0.5, –0.26]	–0.27 [–0.35, –0.19]	0.79	–0.34 [–0.42, –0.26]	–0.18 [–0.33, –0.03]	0.94	–0.19 [–0.32, –0.07]
Vanity	–0.26 [–0.43, –0.1]	1.03	–0.26 [–0.38, –0.14]	0.25 [0.13, 0.36]	0.98	0.25 [0.17, 0.33]	–0.19 [–0.37, 0]	1.08	–0.17 [–0.3, –0.05]
Entitlement	0.17 [–0.04, 0.38]	0.95	0.18 [0.06, 0.3]	0.27 [0.1, 0.44]	1.08	0.25 [0.17, 0.33]	0.75 [0.53, 0.98]	0.34	–

Note. D = Germany, I = Italy. Cohen's d is not reported for the mean difference between the US and Italy on entitlement because the variance of the estimate was very low.

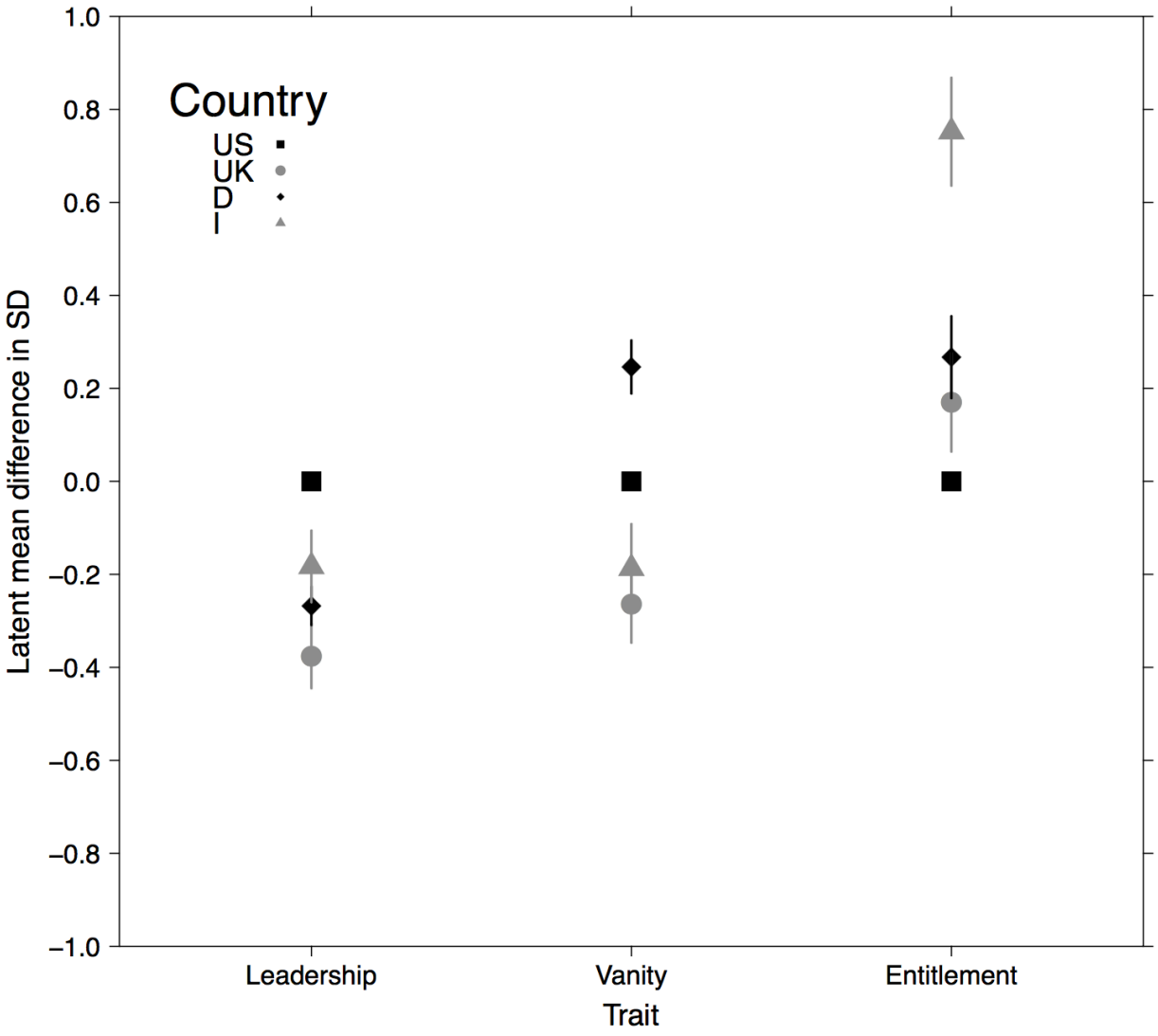

Figure S1. Latent mean differences on the NPI facets leadership, vanity, and entitlement between the US, the UK, Germany (D), and Italy (I). The means in the US were fixed to 0 for identification and are included here only as a reference point. The mean estimates of the other countries indicate the difference to the US. Error bars show +/– 1 SE of the estimated mean difference.

NARQ analysis with US, UK, Germany, Italy, and Poland

One NARQ item (item 14: Other people are worth nothing.) had to be removed because no participants in the Italian sample endorsed the highest response category on this item and the multi-group graded response model in Mplus requires all groups to have the same number of distinct values on each item. The fit of the configual invariance model with the factor structure from Back et al. (2013) was good (RMSEA = 0.040, 90% CI = [0.037, 0.042], CFI = 0.945). All items showed substantial factor loadings on their respective facet in all countries (see Table S15).

The measurement invariance analyses revealed numerous occasions of noninvariant factor loadings and thresholds, most of them thresholds in the Italian and Polish samples (see Table S16). In total, five loadings were noninvariant (3 for Italy, 1 for the US, and 1 for the UK). For example, item 8 (I deserve to be seen as a great personality.) was more strongly related to the trait admiration for US and UK participants (unstandardized loadings 1.98 and 2.10, respectively) than for participants from Germany, Italy, and Poland (unstandardized loading 1.28). Of the 425 thresholds (5 thresholds for each of the 17 remaining items times 5 countries), 25% were noninvariant. Nine thresholds were noninvariant for the US, seven for the UK, 23 for Germany, 29 for Italy, and 38 for Poland. For the German sample, 11 items in total were affected (six on admiration and five on rivalry), though only for three of these items three thresholds or more were noninvariant. For example, all five thresholds of item 18 on admiration (Mostly, I am very adept at dealing with other people.) were noninvariant for the German sample. All thresholds had higher values in the German sample compared with the other samples, indicating that Germans needed a higher trait level to have the same probability of endorsing a certain response category as people from the other countries. Thresholds on 13 items (eight on

admiration and five on rivalry) were noninvariant for the Italian sample with three items on admiration and two items on rivalry having three or more noninvariant thresholds. For the Polish sample, six items on admiration and all eight items on rivalry had noninvariant thresholds. On admiration, only item 5 had three noninvariant thresholds while the other items had two noninvariant thresholds. On rivalry, five items had three noninvariant thresholds and two items had four noninvariant thresholds. The thresholds corresponding to the lower response categories of item 16 on admiration (I manage to be the center of attention with my outstanding contributions.) were noninvariant between all countries, indicating that all countries differed in their endorsement probabilities of these categories conditional on the trait level.

Note that due to the iterative procedure, it is possible that some noninvariant parameters that were freed because one country was noninvariant from the combined other countries could have been constrained to equality between pairs of countries in a later model. For instance, the loading on item 8 was freed first for the UK because it was noninvariant between the UK and the combined US, German, Italian, and Polish samples. Next, it was freed for the US because the loading was noninvariant between the US and the combined German, Italian, and Polish samples. However, when estimated freely, the loading was 2.10 for the UK and 1.98 for the US, indicating that it might have been justified to constrain it between the UK and the US, just not with the other countries. Thus, the number of noninvariant parameters when using an iterative procedure with more than two (in this case five) groups can be an overestimation. To test this, we additionally constructed a model in which we used the estimates from the final partial invariance model to inform which parameters could be constrained between pairs of countries[1]. In this

[1] We constrained the parameters for which the difference in parameter estimates between countries was below the cut–offs for small noninvariance (0.15 for loadings and 0.25 for thresholds).

model, 10 constraints were added to the final partial invariance model: the loading of item 8 on admiration for the US and the UK and nine thresholds (four between Germany and Poland, two between the US and the UK, two between Italy and Poland, and one between the US, the UK, and Germany).

In sum, the NARQ was mostly equivalent between the US and UK samples. The German sample differed in their endorsement probabilities of some response categories on some items, but partial invariance with the US and UK samples existed. For Italy and Poland, partial invariance with the other countries was questionable. Using a rather lenient criterion – as in the description above – of counting an item as fully noninvariant when more than half of its thresholds (three or more) were noninvariant, one could argue for partial invariance for Italy on both admiration and rivalry and for Poland on admiration. For rivalry, even partial invariance could not be established for the Polish sample.

Figure S15 and Table S17 show latent mean differences on admiration and rivalry from the final partial invariance model. We do not report latent mean differences on rivalry for Poland because partial invariance could not be established. Latent mean differences from the partial invariance model in which the 10 post-hoc constraints were reintroduced are depicted in Table S18. Because they do not differ notably from those in the final partial invariance model, we focus our discussion on the final partial invariance model. The UK and German participants had lower average trait levels than US participants on admiration (d = –0.32, 95% CI = [–0.44, –0.20] for the UK and d = –0.31, 95% CI = [–0.38, –0.23] for Germany), whereas Italy did not differ from the US on admiration. In contrast, Polish participants on average were slightly higher than US participants on admiration (d = 0.25, 95% CI = [0.17, 0.34]), though partial invariance is questionable for this estimate. Mean trait levels on rivalry did not differ between the US and the

UK. The mean difference between the US and Germany was negligible (d = –0.11, 95% CI = [–0.19, –0.04]). Italy showed a moderate to large mean difference to the US (d = –0.59, 95% CI = [–0.72, –0.46]), with Italians on average scoring lower on rivalry than Americans, though this should be interpreted cautiously because partial invariance was questionable. In sum, the UK and Germany showed lower admiration levels than the US. The UK and Germany did not differ notably from the US on rivalry.

Table S7

Standardized factor loadings from the configural invariance model for the NARQ analysis with US, UK, Germany, Italy, and Poland

		Standardized factor loading				
Facet	**Item**	**US**	**UK**	**Germany**	**Italy**	**Poland**
Admiration	NARQ1	0.61	0.62	0.64	0.61	0.64
	NARQ2	0.62	0.64	0.62	0.55	0.72
	NARQ3	0.79	0.81	0.80	0.66	0.84
	NARQ5	0.56	0.58	0.62	0.70	0.43
	NARQ7	0.64	0.66	0.64	0.53	0.65
	NARQ8	0.79	0.81	0.77	0.75	0.89
	NARQ15	0.74	0.76	0.73	0.66	0.75
	NARQ16	0.78	0.80	0.80	0.82	0.85
	NARQ18	0.34	0.36	0.53	0.34	0.44
Rivalry	NARQ4	0.73	0.73	0.79	0.67	0.84
	NARQ6	0.67	0.66	0.73	0.70	0.77
	NARQ9	0.68	0.67	0.68	0.70	0.74
	NARQ10	0.83	0.82	0.69	0.85	0.82
	NARQ11	0.60	0.58	0.34	0.38	0.58
	NARQ12	0.71	0.70	0.66	0.77	0.85
	NARQ13	0.50	0.49	0.53	0.53	0.57
	NARQ17	0.61	0.60	0.61	0.56	0.59

Table S8

Noninvariant parameters for the NARQ analysis with US, UK, Germany, Italy, and Poland

Model	**Parameter**	**Country**	**Modification index**	**Expected parameter change**	**Effect size**
strict	[NARQ16$2]	I	72.12	1.05	1.33
partial001	[NARQ16$3]	I	75.86	1.03	1.35
partial002	[NARQ17$1]	P	67.16	-0.74	-0.95
partial003	[NARQ17$2]	P	64.27	-0.72	-0.91
partial004	[NARQ4$5]	D	64.53	0.85	1.15
partial005	[NARQ11$4]	P	65.88	0.63	0.80
partial006	[NARQ6$5]	P	63.19	0.72	0.94
partial007	[NARQ6$4]	P	67.91	0.77	0.99
partial008	[NARQ16$1]	I	54.10	0.87	1.10
partial009	RIV BY NARQ11	I	53.72	-0.33	NA
partial010	[NARQ13$1]	P	51.41	-0.59	-0.76
partial011	ADM BY NARQ5	I	49.15	0.43	NA
partial012	[NARQ5$5]	I	65.48	0.94	1.08
partial013	[NARQ5$4]	I	60.86	0.99	1.12
partial014	[NARQ11$5]	P	44.74	0.55	0.68
partial015	[NARQ12$1]	UK	43.59	0.78	0.96
partial016	[NARQ12$1]	US	56.27	0.81	1.08
partial017	[NARQ12$2]	P	46.05	-0.71	-0.90

partial018	[NARQ13$2]	P	46.17	-0.56	-0.71
partial019	[NARQ2$2]	P	43.08	-0.58	-0.73
partial020	[NARQ2$3]	I	43.02	0.55	0.72
partial021	[NARQ2$4]	I	42.67	0.54	0.71
partial022	[NARQ2$1]	P	40.90	-0.54	-0.69
partial023	[NARQ5$3]	I	38.44	0.89	0.98
partial024	[NARQ9$5]	P	38.39	0.60	0.76
partial025	[NARQ11$5]	D	35.41	0.48	0.62
partial026	[NARQ5$5]	P	34.72	0.45	0.61
partial027	[NARQ9$4]	P	32.22	0.56	0.71
partial028	[NARQ10$5]	P	33.79	0.71	0.90
partial029	[NARQ18$2]	D	31.10	0.44	0.55
partial030	[NARQ18$4]	P	29.54	0.41	0.51
partial031	[NARQ18$4]	D	41.60	0.49	0.65
partial032	[NARQ18$5]	D	29.51	0.42	0.53
partial033	[NARQ18$5]	P	31.14	0.40	0.55
partial034	[NARQ15$4]	I	30.12	-0.51	-0.66
partial035	[NARQ11$2]	I	28.73	-0.39	-0.51
partial036	[NARQ11$3]	P	27.68	0.44	0.53
partial037	[NARQ10$4]	P	28.67	0.68	0.82
partial038	[NARQ17$5]	P	29.25	0.49	0.61
partial039	[NARQ6$3]	P	28.99	0.54	0.66
partial040	[NARQ4$5]	P	31.39	0.62	0.83

partial041	[NARQ13$5]	P	31.64	0.49	0.60
partial042	[NARQ18$3]	D	27.91	0.41	0.51
partial043	[NARQ17$4]	I	27.45	-0.48	-0.59
partial044	[NARQ5$4]	P	25.38	0.38	0.52
partial045	[NARQ4$4]	P	22.22	0.56	0.70
partial046	[NARQ11$4]	D	21.25	0.37	0.47
partial047	[NARQ17$3]	D	20.93	0.38	0.49
partial048	ADM BY NARQ8	UK	19.45	0.32	NA
partial049	ADM BY NARQ8	US	30.09	0.27	NA
partial050	[NARQ16$4]	I	19.74	0.46	0.63
partial051	[NARQ17$2]	D	19.66	0.36	0.49
partial052	[NARQ4$2]	D	20.57	0.45	0.59
partial053	[NARQ2$1]	D	19.10	-0.40	-0.51
partial054	[NARQ11$3]	D	18.49	0.34	0.44
partial055	[NARQ17$1]	I	18.36	-0.38	-0.49
partial056	[NARQ4$1]	D	17.63	0.43	0.56
partial057	[NARQ1$5]	US	17.28	-0.37	-0.44
partial058	[NARQ7$4]	P	16.45	0.35	0.45
partial059	[NARQ10$1]	P	16.33	-0.53	-0.68
partial060	[NARQ10$2]	P	17.75	-0.56	-0.70
partial061	[NARQ10$1]	D	17.04	-0.44	-0.62
partial062	[NARQ1$1]	I	15.84	0.32	0.42
partial063	[NARQ16$2]	US	15.62	0.48	0.61

partial064	[NARQ16$1]	US	16.30	0.49	0.64
partial065	[NARQ12$5]	I	15.15	-0.43	-0.54
partial066	[NARQ18$1]	D	15.11	0.30	0.38
partial067	[NARQ12$2]	I	15.06	-0.40	-0.52
partial068	[NARQ4$4]	I	15.53	-0.43	-0.54
partial069	[NARQ7$2]	P	14.94	-0.33	-0.42
partial070	[NARQ9$1]	P	14.77	-0.40	-0.50
partial071	[NARQ8$2]	D	14.66	0.47	0.62
partial072	[NARQ7$1]	US	14.46	0.34	0.40
partial073	[NARQ15$1]	US	15.26	0.41	0.47
partial074	[NARQ15$1]	UK	19.31	0.51	0.63
partial075	[NARQ15$2]	I	15.73	-0.37	-0.50
partial076	[NARQ15$2]	P	22.34	-0.43	-0.60
partial077	[NARQ16$2]	UK	14.94	0.47	0.66
partial078	[NARQ9$2]	P	14.35	-0.40	-0.50
partial079	[NARQ3$2]	P	14.30	-0.40	-0.52
partial080	[NARQ15$3]	I	13.58	-0.34	-0.44
partial081	[NARQ7$1]	UK	13.79	0.35	0.43
partial082	[NARQ16$1]	UK	13.56	0.46	0.64
partial083	[NARQ3$1]	P	13.27	-0.38	-0.49
partial084	[NARQ7$1]	D	13.22	0.34	0.47
partial085	[NARQ8$1]	D	13.82	0.48	0.60
partial086	[NARQ7$5]	UK	12.46	-0.32	-0.39

partial087	[NARQ12$1]	D	12.51	0.30	0.48
partial088	[NARQ17$4]	UK	12.24	-0.28	-0.38
partial089	[NARQ4$5]	I	11.76	-0.35	-0.50
partial090	[NARQ4$3]	I	12.63	-0.37	-0.45
partial091	RIV BY NARQ4	I	18.89	-0.56	NA
partial092	[NARQ4$1]	P	14.19	-0.45	-0.57
partial093	[NARQ15$5]	I	12.01	-0.30	-0.39
partial094	[NARQ8$5]	I	12.91	-0.31	-0.47
partial095	[NARQ16$3]	US	11.26	0.36	0.48
partial096	[NARQ15$3]	P	11.11	-0.31	-0.41
partial097	[NARQ3$2]	I	10.93	-0.30	-0.42
partial098	[NARQ7$2]	I	14.09	-0.29	-0.39
partial099	[NARQ17$2]	I	10.82	-0.26	-0.38
partial100	[NARQ10$3]	I	8.82	0.36	0.42
partial101	[NARQ10$4]	I	8.86	0.36	0.44
partial102	[NARQ15$2]	D	8.43	-0.27	-0.40
partial103	[NARQ12$5]	P	6.53	0.30	0.38
partial104	[NARQ4$3]	US	8.49	-0.29	-0.38
partial105	[NARQ4$4]	US	7.29	-0.27	-0.38
partial106	[NARQ16$2]	D	5.15	0.23	0.42
partial107	[NARQ5$2]	P	12.60	-0.26	-0.38
partial108	[NARQ15$1]	D	7.44	0.28	0.38
partial109	[NARQ16$1]	D	6.02	0.26	0.46

partial110	[NARQ3$1]	I	8.96	-0.28	-0.38

Note. ADM = admiration, RIV = rivalry. Facet name BY … indicates a noninvariant factor loading. Items in brackets are noninvariant thresholds with $1 = threshold 1, $ = threshold 2 etc. The expected parameter change (EPC) given by Mplus for individual thresholds reflects the difference between the (constrained) estimate of the parameter in the current model and the estimate of the parameter for this group if it were freed. Thus, it does not directly reflect the difference in parameter estimates between one group and the combined other groups. This group difference (column effect size) was calculated from the EPC values for all groups by subtracting the mean of the EPCs for the other groups from the EPC for the group of interest. This effect size was compared to the cut-off criterion of 0.375 for thresholds.

Table S9

Latent mean differences and effect sizes for the NARQ analysis of US, UK, Germany, Italy, and Poland

	Admiration			Rivalry		
Country difference	**M**	**SD**	**Cohen's *d***	**M**	**SD**	**Cohen's *d***
US – UK	–0.34 [–0.47, –0.21]	1.05	–0.32 [–0.44, –0.2]	–0.01 [–0.14, 0.13]	0.99	–0.01 [–0.13, 0.11]
US – D	–0.33 [–0.42, –0.23]	1.07	–0.31 [–0.38, –0.23]	–0.1 [–0.19, –0.01]	0.9	–0.11 [–0.19, –0.04]
US – I	–0.03 [–0.17, 0.11]	0.89	–0.04 [–0.17, 0.09]	–0.7 [–0.89, –0.51]	1.19	–0.59 [–0.72, –0.46]
US – P	0.25 [0.14, 0.36]	0.99	0.25 [0.17, 0.34]	–	–	–

Note. D = Germany, I = Italy, P = Poland. For Poland, the estimate for rivalry is not shown because partial invariance could not be established.

Table S10

Latent mean differences and effect sizes for the NARQ final partial invariance model with added constraints

	Admiration			**Rivalry**		
Country difference	**M**	**SD**	**Cohen's *d***	**M**	**SD**	**Cohen's *d***
US – UK	-0.33 [-0.47, -0.2]	1.05	-0.32 [-0.44, -0.2]	-0.01 [-0.15, 0.12]	0.99	-0.01 [-0.13, 0.11]
US – D	-0.32 [-0.41, -0.22]	1.06	-0.3 [-0.37, -0.22]	-0.1 [-0.19, -0.01]	0.89	-0.11 [-0.19, -0.04]
US – I	-0.02 [-0.16, 0.11]	0.88	-0.03 [-0.15, 0.1]	-0.71 [-0.9, -0.51]	1.19	-0.59 [-0.72, -0.46]
US – P	0.25 [0.15, 0.36]	0.99	0.26 [0.17, 0.34]	-	-	-

Note. D = Germany, I = Italy, P = Poland. For Poland, the estimate for rivalry is not shown because partial invariance could not be established.

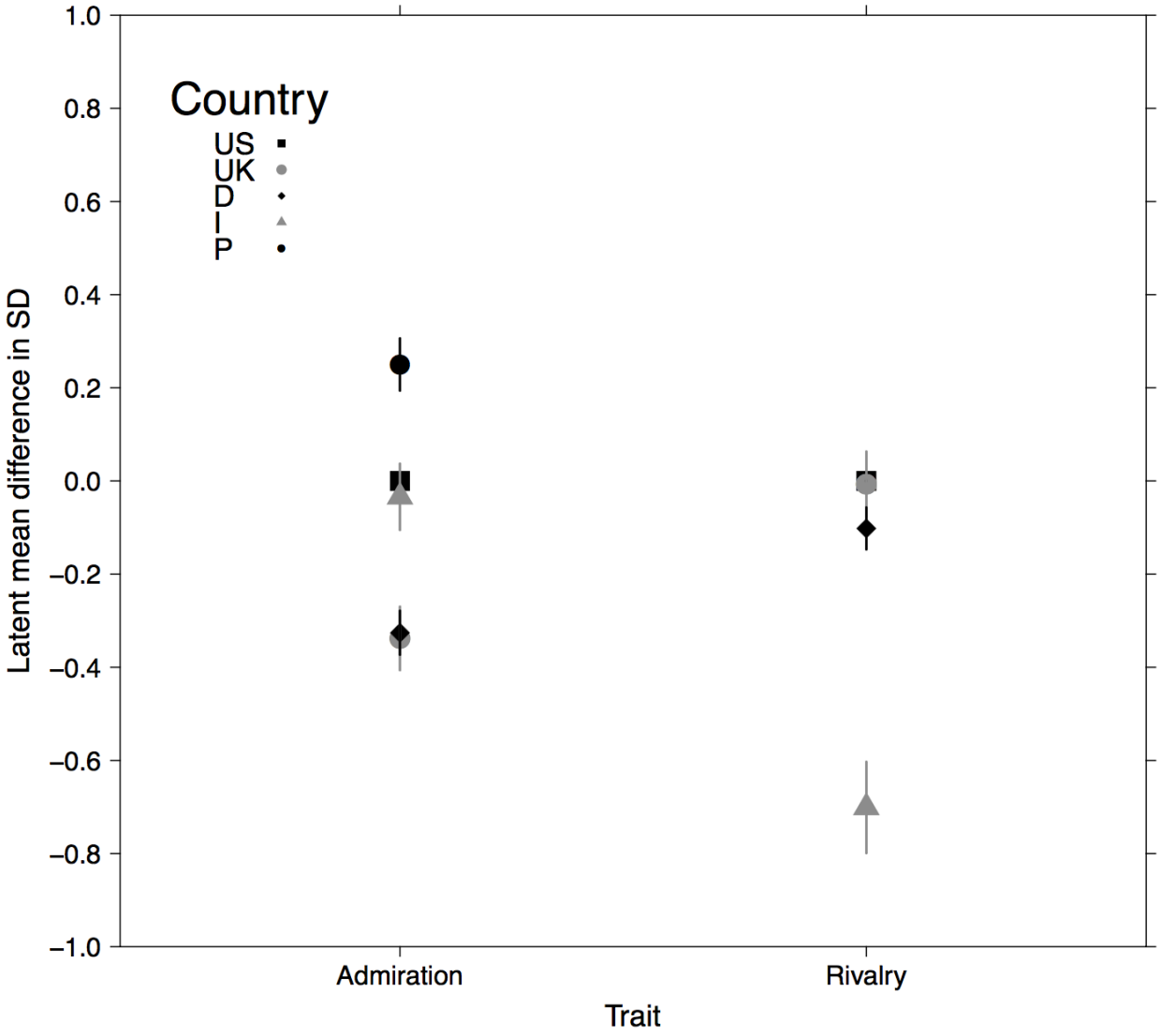

Figure S2. Latent mean differences on the NARQ traits admiration and rivalry between the US, the UK, Germany (D), Italy (I), and Poland (P). The means in the US were fixed to 0 for identification and are included here only as a reference point. The mean estimates of the other countries indicate the difference to the US. For Poland, the estimate for rivalry is not shown because partial invariance could not be established. Error bars show +/– 1 SE of the estimated mean difference.

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