Supplement to "All over the map: A worldwide comparison of risk preferences": Appendix A

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S.1. Country fixed effects

$N = 2939$, LL $= -214{,}609$	α^+	β^+	α^-	β^-	λ	σ
Australia	−0.077	0.007	−0.102*	−0.106***	−0.115	0.017
	(0.049)	(0.059)	(0.057)	(0.039)	(0.126)	(0.013)
Belgium	−0.010	−0.076*	−0.101*	−0.058	0.057	0.017*
	(0.044)	(0.041)	(0.056)	(0.039)	(0.124)	(0.010)
Brazil	−0.027	−0.174***	−0.029	−0.033	0.127	0.021**
	(0.042)	(0.043)	(0.051)	(0.037)	(0.120)	(0.009)
Cambodia	−0.236***	−0.182***	−0.424***	0.217***	0.902***	0.097***
	(0.060)	(0.047)	(0.071)	(0.057)	(0.231)	(0.009)
Chile	−0.190***	−0.082*	−0.136**	−0.088**	−0.002	0.051***
	(0.049)	(0.048)	(0.054)	(0.044)	(0.109)	(0.010)
China	−0.056	−0.088***	−0.105**	−0.045	0.102	−0.000
	(0.036)	(0.032)	(0.044)	(0.031)	(0.103)	(0.008)
Colombia	−0.095*	−0.116***	−0.075	0.043	0.517***	0.057***
	(0.054)	(0.044)	(0.058)	(0.041)	(0.144)	(0.011)
Costa Rica	−0.119**	−0.086**	−0.116**	0.047	0.254*	0.072***
	(0.055)	(0.043)	(0.054)	(0.043)	(0.137)	(0.010)
Czech	−0.017	−0.063*	0.010	−0.044	−0.086	−0.022***
	(0.040)	(0.036)	(0.046)	(0.034)	(0.106)	(0.008)
Ethiopia	−0.160***	−0.304***	−0.336***	0.049	0.850***	0.077***
	(0.046)	(0.041)	(0.051)	(0.043)	(0.160)	(0.009)
France	−0.100**	−0.092**	−0.024	−0.010	0.125	0.034***
	(0.046)	(0.045)	(0.052)	(0.043)	(0.117)	(0.009)
Germany	−0.041	0.012	−0.038	−0.015	−0.141	0.024**
	(0.043)	(0.041)	(0.050)	(0.037)	(0.103)	(0.010)

(*Continues*)

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$N = 2939$, LL $= -214{,}609$	α^+	β^+	α^-	β^-	λ	σ
Guatemala	0.049	−0.118**	0.142*	0.190***	0.071	0.088***
	(0.057)	(0.058)	(0.077)	(0.056)	(0.137)	(0.013)
India	−0.290***	−0.072	−0.306***	0.175***	0.912***	0.088***
	(0.054)	(0.051)	(0.062)	(0.052)	(0.230)	(0.010)
Japan	−0.012	−0.095**	0.022	−0.013	0.151	−0.004
	(0.046)	(0.040)	(0.049)	(0.039)	(0.122)	(0.010)
Kyrgyzstan	−0.055	−0.167***	−0.273***	0.063	0.215	0.066***
	(0.053)	(0.042)	(0.060)	(0.046)	(0.140)	(0.009)
Malaysia	−0.070	−0.181***	−0.205***	−0.063	0.599***	0.055***
	(0.055)	(0.050)	(0.068)	(0.054)	(0.218)	(0.012)
Nicaragua	−0.191***	−0.358***	−0.364***	0.052	1.269***	0.167***
	(0.061)	(0.042)	(0.057)	(0.058)	(0.277)	(0.009)
Nigeria	−0.515***	−0.355***	−0.595***	−0.010	1.146***	0.191***
	(0.045)	(0.039)	(0.049)	(0.052)	(0.244)	(0.008)
Peru	−0.222***	−0.315***	−0.275***	−0.000	0.538***	0.110***
	(0.056)	(0.046)	(0.064)	(0.053)	(0.181)	(0.012)
Poland	−0.086*	−0.063	−0.067	0.036	0.111	0.011
	(0.051)	(0.041)	(0.052)	(0.038)	(0.123)	(0.010)
Russia	−0.059	−0.091*	−0.091	0.095**	0.397**	0.021
	(0.048)	(0.047)	(0.057)	(0.047)	(0.194)	(0.013)
Saudi	−0.092*	−0.297***	−0.165***	−0.045	0.529***	0.032***
	(0.054)	(0.044)	(0.063)	(0.045)	(0.171)	(0.011)
South Africa	−0.100*	−0.060	−0.127**	0.055	0.171	0.056***
	(0.051)	(0.051)	(0.062)	(0.055)	(0.143)	(0.013)
Spain	0.023	−0.054	−0.051	−0.042	0.019	0.001
	(0.049)	(0.040)	(0.050)	(0.041)	(0.111)	(0.010)
Thailand	0.037	−0.105**	0.038	0.074	0.383**	0.047***
	(0.056)	(0.051)	(0.057)	(0.048)	(0.161)	(0.010)
Tunisia	−0.246***	−0.169***	−0.329***	0.009	0.470***	0.098***
	(0.058)	(0.050)	(0.069)	(0.058)	(0.172)	(0.011)
UK	0.082	−0.228***	−0.246***	0.101**	1.251***	0.028***
	(0.053)	(0.038)	(0.064)	(0.044)	(0.213)	(0.010)
Vietnam	−0.119**	−0.217***	−0.102*	0.030	0.212*	0.034***
	(0.049)	(0.041)	(0.053)	(0.042)	(0.123)	(0.009)
Female	−0.121***	0.041***	−0.090***	−0.043***	−0.030	0.016***
	(0.014)	(0.012)	(0.016)	(0.013)	(0.039)	(0.003)
Loss						−0.004**
						(0.002)
Constant	0.785***	1.046***	0.870***	0.945***	1.607***	0.156***
	(0.031)	(0.027)	(0.037)	(0.026)	(0.085)	(0.007)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

S.2. Cultural attitudes and religion

In this section, we look at sociocultural factors in the determination of risk preferences. As usual, we control for country dummies, as well as the physical factors described above, in all of the regressions. We start by considering the cultural attitude scales de-

TABLE S.1. Effects of cultural characteristics on risk preferences.

$N = 2939$, LL $= -214{,}015$	α^+	β^+	α^-	β^-	λ	σ
Individualism	0.002	−0.001	0.001	0.003*	0.005	−0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.000)
Uncertainty avoidance	0.003	0.004*	0.002	0.000	−0.002	0.000
	(0.003)	(0.002)	(0.003)	(0.002)	(0.007)	(0.000)
Power distance	−0.002	0.002	−0.003	−0.004**	−0.006	0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.006)	(0.000)
Masculinity	0.003	−0.006***	0.001	0.004*	0.013**	−0.001***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.006)	(0.000)
Demographics	✓	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓	✓
Constant	0.659***	1.052***	0.844***	0.896***	1.492***	0.163***
	(0.072)	(0.061)	(0.077)	(0.059)	(0.198)	(0.014)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

veloped by Hofstede (1980), measured at the individual level in the final questionnaire.[1] The effects are reported in Table S.1. Somewhat surprisingly, given discussions in the previous literature (Rieger, Wang, and Hens (2015), Weber and Hsee (1998)), effects seem to range from weak to nonexistent. The only effects that are significant at the 5% level is slightly more pessimism by subjects ranking high on power distance, and some effects for masculinity. There is, however, also a marginally significant correlation of the pessimism parameter for gains with uncertainty avoidance, going in the expected direction of more uncertainty avoidance being associated with higher pessimism.

We next discuss the effects of religion, shown in Table S.2. The usual caveat of how we can only show correlations—not causal effects—of course continues to apply. However, the religious affiliation we use here—in opposition to the intensity of religious belief often discussed in the literature—is plausibly determined by upbringing. This makes it unlikely that the choice of religious affiliation is determined by risk preferences, except perhaps for the choice of being atheist. The latter is related with marginally significantly lower levels of noise. We cannot replicate previous findings in the literature according to which Catholics are more risk tolerant than Protestants (see Barsky, Kimball, Juster, and Shapiro (1997), Noussair, Trautmann, van de Kuilen, and Vellekoop (2013), but see also Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner (2011) for evidence to the contrary).

Orthodox participants display increased sensitivity for losses relative to the reference group of Protestants, as do Buddhists. The strongest effects, however, are observed

[1] Examples of questions aimed at detecting the respondents' cultural attitudes are "It is more important for men to have a professional career than it is for women" (masculinity); "Individuals should sacrifice self-interest for the group that they belong to" (individualism); "Standardized work procedures are helpful" (uncertainty avoidance); or "People in lower positions should not disagree with decisions made by people in higher positions" (power distance); a complete list can be found in the instructions. People are asked to indicate on a 5-point scale whether they agree or disagree with the statement.

TABLE S.2. Effects of religious affiliation on risk preferences.

$N = 2937$, LL $= -213{,}922$	α^+	β^+	α^-	β^-	λ	σ
Atheist	0.033	−0.037	0.050	0.022	0.029	−0.011*
	(0.028)	(0.025)	(0.033)	(0.027)	(0.076)	(0.006)
Catholic	0.030	−0.022	0.032	0.017	0.017	−0.004
	(0.030)	(0.028)	(0.034)	(0.029)	(0.081)	(0.006)
Orthodox	0.048	0.056	−0.013	0.110**	0.255	0.012
	(0.047)	(0.042)	(0.052)	(0.050)	(0.176)	(0.009)
Muslim	0.044	0.003	−0.071	0.042	0.122	0.012
	(0.044)	(0.036)	(0.057)	(0.041)	(0.135)	(0.008)
Jewish	−0.060	−0.144**	−0.213**	−0.040	0.362*	−0.003
	(0.089)	(0.061)	(0.087)	(0.067)	(0.214)	(0.019)
Hindu	−0.081	0.037	−0.082	0.029	−0.219	−0.008
	(0.083)	(0.067)	(0.084)	(0.077)	(0.225)	(0.016)
Buddhist	0.023	−0.031	0.032	0.111**	0.109	0.004
	(0.048)	(0.042)	(0.051)	(0.046)	(0.135)	(0.010)
Religion–other	0.015	−0.044	−0.018	−0.003	0.055	0.006
	(0.035)	(0.032)	(0.040)	(0.032)	(0.092)	(0.008)
Demographics	✓	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓	✓
Constant	0.761***	1.086***	0.865***	0.922***	1.590***	0.165***
	(0.040)	(0.033)	(0.046)	(0.032)	(0.112)	(0.009)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

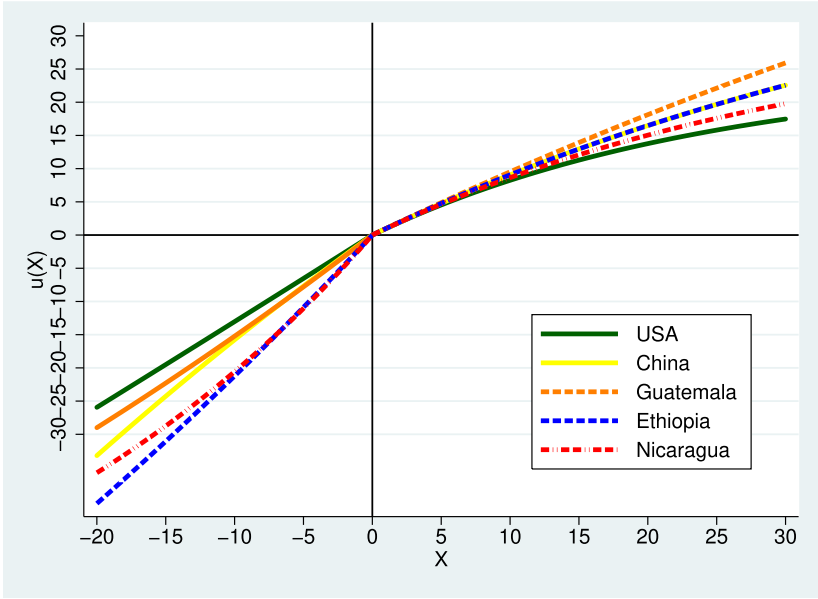
for Jews, who are less pessimistic for gains, exhibit less sensitivity for losses, and are marginally significantly more loss averse than Protestants. The finding of higher risk tolerance for gains is consistent with the finding for the US by Barsky et al. (1997). One potential explanation is that Jewish families tend on average to be more affluent than the average family, so that the effect we observe for being Jewish is really an income effect. Disentangling this relationship, however, is not possible based on our data alone.

S.3. FULL PROSPECT THEORY SPECIFICATION

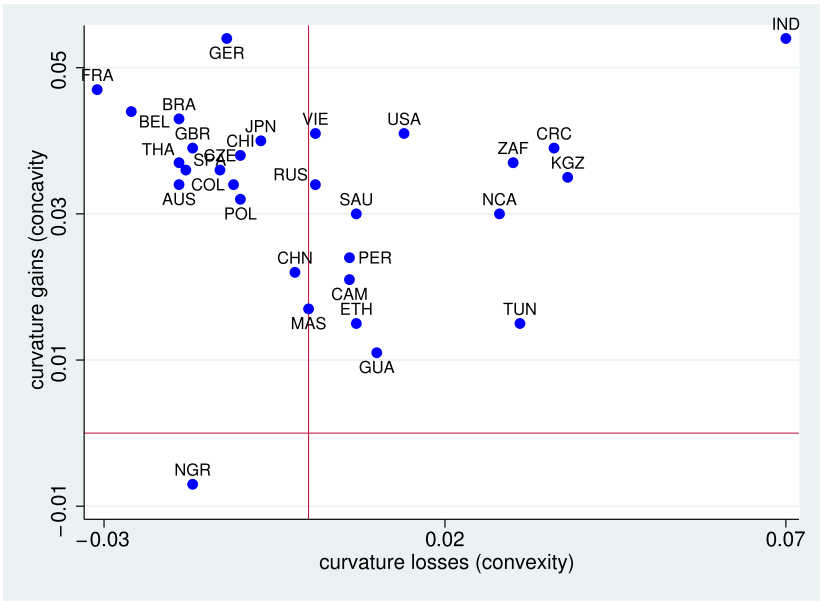
In this section, we examine the stability of our results to using a fully flexible function including domain-specific utility as well as probability weighting. We use an exponential utility function:

$$v(x) = \begin{cases} \frac{1}{\mu}\left(1 - e^{-\mu x}\right) & \text{if } x > 0, \\ -\frac{\lambda}{\nu}\left(1 - e^{-\nu|x|}\right) & \text{if } x \leq 0, \end{cases} \tag{S.1}$$

with $\mu > 0$ ($\mu < 0$) indicating concave (convex) utility for gains, and $\nu > 0$ ($\nu < 0$) indicating convex (concave) utility for losses. Exponential utility has the advantage of reducing issues of collinearity between utility and probability weighting, and it reduces issues with the identification of loss aversion using power utility (see Wakker (2010, Section 9.6)). It is thus better suited in our case than alternative functions such as the power utility (see also Choi, Fisman, Gale, and Kariv (2007)).



(a) Typical utility functions



(b) Scatter plot of parameters

FIGURE S.1. Utility functions.

S.3.1 *Country level parameters*

We start by representing utility curvature in Figure S.1. Panel S.1(a) shows some typical utility functions, while panel S.1(b) shows a scatter plot of the utility parameters for gains and losses. For gains, we almost universally find slightly concave utility, with the

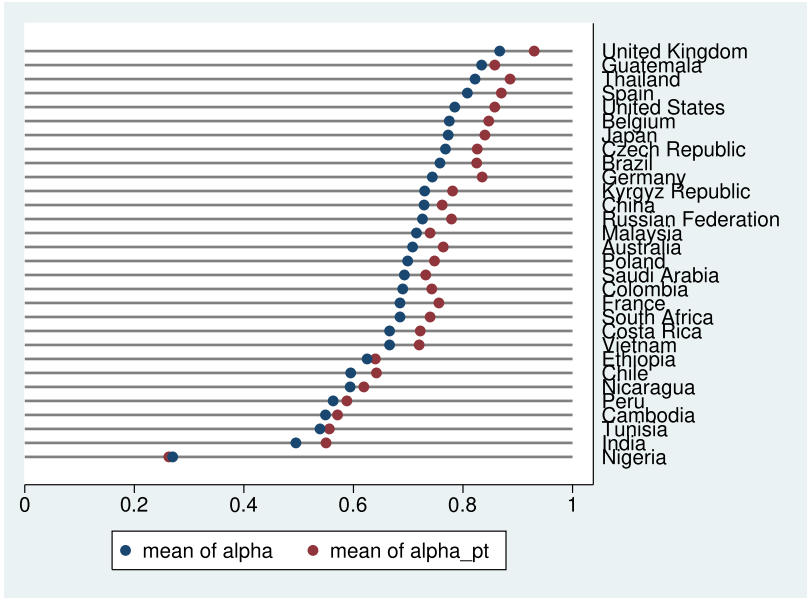
exception of Nigeria, where utility is somewhat convex (although not significantly so). There appears to be a tendency for industrialized countries to exhibit more pronounced utility curvature, with Germany, France, Belgium and the US among the countries with the most concave utility functions for gains (India is an obvious outlier in this group). At the opposite end of the spectrum, we find countries such as Guatemala, Malaysia, Ethiopia, and Tunisia in addition to the already mentioned Nigeria, all of which are low or middle income countries. For losses, the patterns are more varied, with convex, linear, and concave utility all occurring in the data.

Figure S.2 plots the parameters of the probability weighting function for gains under the full prospect theory model against those obtained assuming linear utility. This is reflected in very regular changes in the weighting function parameters relative to those shown above. Panel S.2(a) shows the changes undergone by the sensitivity parameter α^+. The sensitivity parameter becomes slightly larger for all countries but Nigeria once we allow for utility curvature. Furthermore, the two values of the sensitivity parameter we observe for the prospect theory model and the piecewise linear utility model are highly correlated at $r = 0.993$, $p < 0.001$.

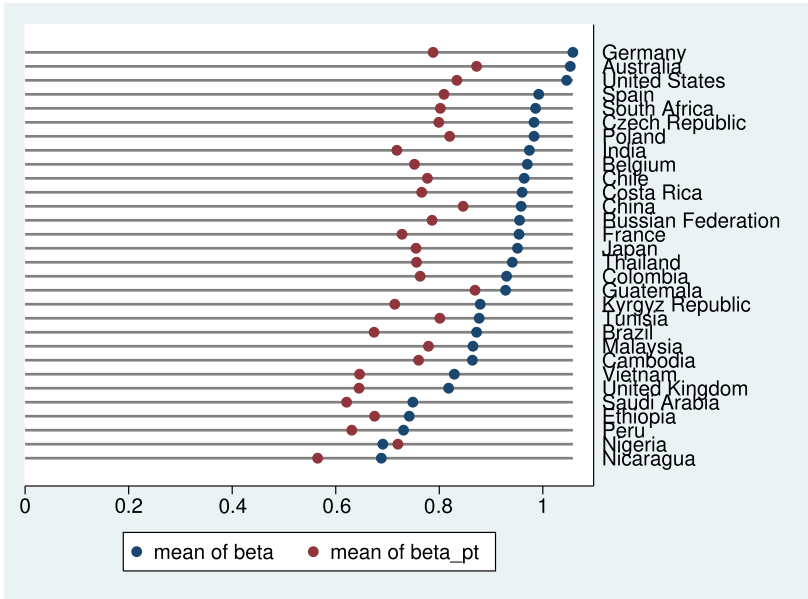
We observe similarly regular changes for the pessimism parameter β^+, shown in panel S.2(b). Allowing for utility curvature reduces the value of β^+ in all cases (again with the exception of Nigeria). This is indeed to be expected, since part of the risk tolerance is now picked up in utility curvature. This is shown clearly when one correlates the difference between the two pessimism parameters obtained under the two models and the utility curvature parameter. The resulting correlation is $r = 0.988$, $p < 0.001$, showing a direct relationship between the risk tolerance picked up by the utility function and the amount of risk tolerance lost in the pessimism parameter.

The corresponding parameters for losses are shown in Figure S.3. Differences in the sensitivity parameter, shown in panel S.3(a), are small. They go in both directions, reflecting the less regular patterns seen for the utility functions. A similar conclusion holds for the optimism parameter for losses, shown in panel S.3(b). Once again, we find these deviations to be highly correlated with the utility parameter for losses at $r = 0.999$, $p < 0.001$. We also observe high degrees of collinearity between the utility parameter and the optimism parameter even for this relatively simple model, with a correlation of $r = -0.699$, $p < 0.001$. This is likely due to the higher levels of noise we observe for losses, which makes the separation of these parameters more difficult.

The main issue when estimating the full PT model relative to estimating the simplified version in the main text derive from collinearity in the estimation of utility curvature and the pessimism/optimism parameters. This issue derives from noise in the responses, and increases in $\frac{1}{N}$. This means that the issue is confounded the smaller the groups become in regression analysis. If we estimate the model at the country level, we do not find major collinearity issues for gains, as shown by the insignificant correlation between the utility curvature and pessimism parameters ($r = 0.017$, $p = 0.928$). The problem is, however, severe for losses, where the correlation between utility curvature and optimism is very large and highly significant ($r = -0.747$, $p < 0.001$). The fact that we observe this issue mainly for losses may well be driven by the higher noise levels in this decision domain. Table S.3 shows the regression on country dummies of the full prospect theory model.



(a) Parameter comparison alpha

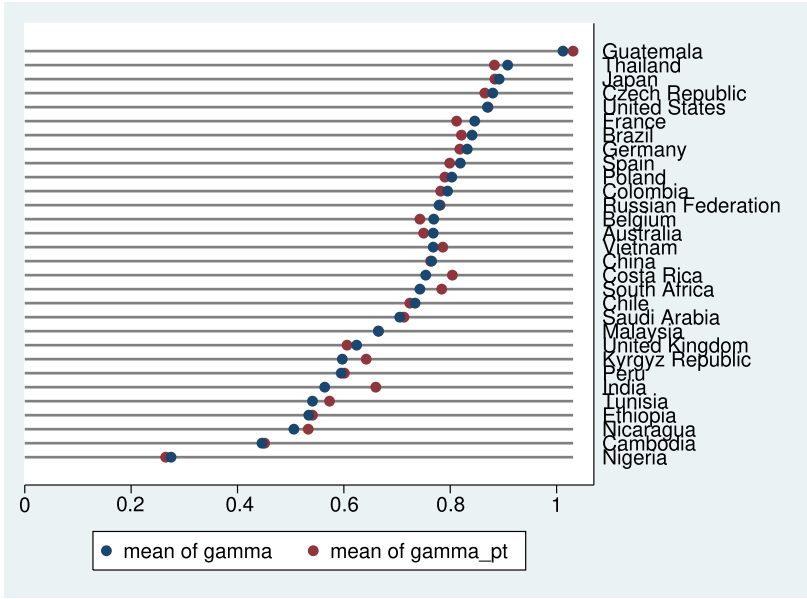


(b) Parameter comparison beta

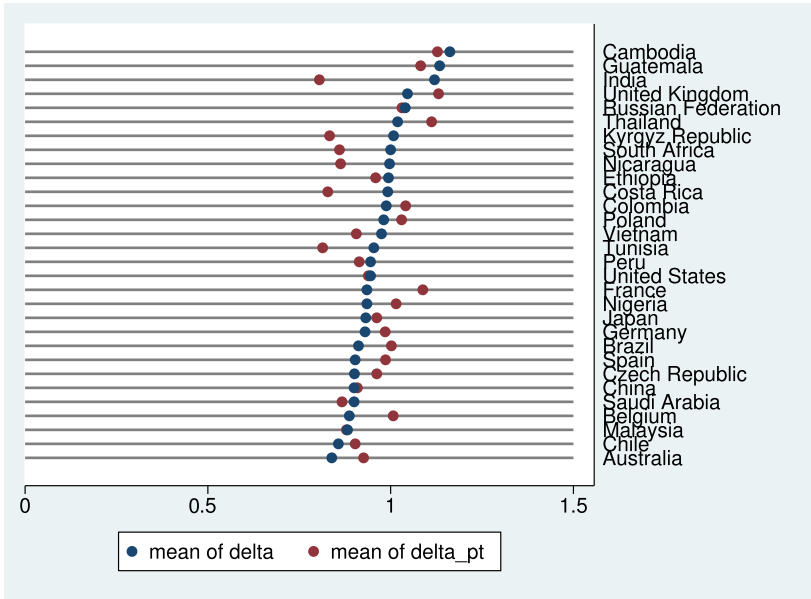
FIGURE S.2. Probability weighting functions for gains, parameter comparison.

S.3.2 *Descriptive country comparison*

In this section we provide some graphs completing the evidence regarding utility curvature. We start by showing the probability weighting functions estimated when utility is potentially nonlinear. The weighting functions for gains are shown in Figure S.4.



(a) Typical utility functions



(b) Scatter plot of parameters

FIGURE S.3. Probability weighting functions for losses, parameter comparison.

Panel S.4(a) shows some typical probability weighting functions (corresponding to the same countries as those shown in the main text). The functions are now generally more elevated, due to the concave utility function capturing part of the overall risk tolerance. Some rankings are also change relative to the main text, for instance, Vietnam

TABLE S.3. Country effects, prospect theory.

	Utility Function			Weighting Gains		Weighting Losses	
	μ	ν	λ	α^+	β^+	α^-	β^-
Australia	−0.007	−0.020*	−0.099	−0.094*	0.038	−0.121**	−0.013
	(0.010)	(0.011)	(0.111)	(0.053)	(0.068)	(0.058)	(0.067)
Belgium	0.003	−0.027**	−0.054	−0.011	−0.082	−0.128**	0.068
	(0.009)	(0.010)	(0.107)	(0.050)	(0.050)	(0.057)	(0.069)
Brazil	0.002	−0.020*	0.001	−0.033	−0.160***	−0.050	0.063
	(0.010)	(0.012)	(0.108)	(0.045)	(0.056)	(0.052)	(0.068)
Cambodia	−0.020*	0.005	0.887***	−0.287***	−0.074	−0.420***	0.189**
	(0.010)	(0.016)	(0.220)	(0.066)	(0.055)	(0.071)	(0.095)
Chile	−0.003	−0.011	−0.009	−0.216***	−0.057	−0.147***	−0.036
	(0.009)	(0.011)	(0.098)	(0.054)	(0.058)	(0.054)	(0.067)
China	−0.019***	−0.003	0.194**	−0.096**	0.012	−0.108**	−0.030
	(0.007)	(0.009)	(0.090)	(0.040)	(0.042)	(0.045)	(0.052)
Colombia	−0.007	−0.012	0.443***	−0.115*	−0.071	−0.089	0.102
	(0.009)	(0.012)	(0.143)	(0.063)	(0.050)	(0.061)	(0.070)
Costa Rica	−0.002	0.035***	0.277**	−0.136**	−0.068	−0.067	−0.111*
	(0.009)	(0.011)	(0.117)	(0.061)	(0.057)	(0.057)	(0.062)
Czech	−0.005	−0.014	−0.089	−0.032	−0.035	−0.006	0.023
	(0.008)	(0.009)	(0.092)	(0.044)	(0.044)	(0.047)	(0.055)
Ethiopia	−0.026***	0.006	0.921***	−0.218***	−0.159***	−0.330***	0.020
	(0.008)	(0.010)	(0.151)	(0.050)	(0.048)	(0.051)	(0.065)
France	0.006	−0.032***	−0.017	−0.102**	−0.106**	−0.059	0.149**
	(0.010)	(0.012)	(0.108)	(0.052)	(0.052)	(0.052)	(0.073)
Germany	0.013	−0.013	−0.205**	−0.023	−0.046	−0.053	0.046
	(0.009)	(0.010)	(0.085)	(0.049)	(0.051)	(0.050)	(0.060)
Guatemala	−0.030***	0.009	0.286**	0.000	0.035	0.160**	0.143
	(0.010)	(0.013)	(0.146)	(0.061)	(0.072)	(0.077)	(0.089)
India	0.013	0.069***	0.614***	−0.308***	−0.116**	−0.211***	−0.134*
	(0.012)	(0.015)	(0.166)	(0.061)	(0.055)	(0.067)	(0.073)
Japan	−0.001	−0.008	0.088	−0.018	−0.079*	0.013	0.023
	(0.009)	(0.011)	(0.110)	(0.049)	(0.048)	(0.051)	(0.066)
Kyrgyzstan	−0.006	0.037**	0.296***	−0.077	−0.120**	−0.229***	−0.106
	(0.009)	(0.015)	(0.115)	(0.059)	(0.055)	(0.064)	(0.076)
Malaysia	−0.024***	−0.001	0.661***	−0.118**	−0.055	−0.206***	−0.060
	(0.009)	(0.013)	(0.198)	(0.059)	(0.062)	(0.068)	(0.093)
Nicaragua	−0.011	0.027*	1.065***	−0.239***	−0.269***	−0.338***	−0.076
	(0.010)	(0.014)	(0.235)	(0.066)	(0.056)	(0.061)	(0.084)
Nigeria	−0.048***	−0.018	1.500***	−0.595***	−0.114**	−0.606***	0.076
	(0.009)	(0.013)	(0.276)	(0.047)	(0.055)	(0.049)	(0.081)
Peru	−0.017*	0.005	0.543***	−0.270***	−0.203***	−0.270***	−0.025
	(0.010)	(0.013)	(0.161)	(0.062)	(0.056)	(0.066)	(0.080)
Poland	−0.009	−0.011	0.119	−0.110**	−0.014	−0.081	0.091
	(0.009)	(0.010)	(0.106)	(0.053)	(0.052)	(0.053)	(0.064)
Russia	−0.007	0.000	0.353**	−0.079	−0.048	−0.090	0.092
	(0.009)	(0.012)	(0.155)	(0.052)	(0.057)	(0.059)	(0.073)
Saudi	−0.011	0.006	0.493***	−0.126**	−0.213***	−0.158**	−0.072
	(0.009)	(0.013)	(0.169)	(0.060)	(0.053)	(0.064)	(0.067)

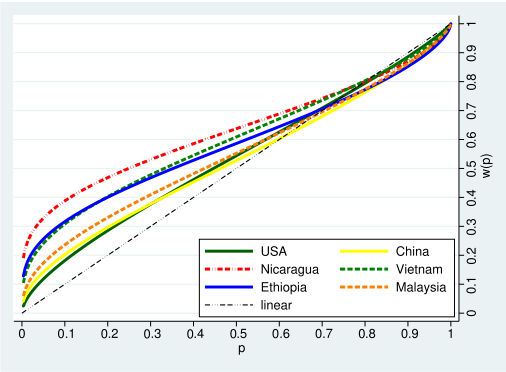
(*Continues*)

TABLE S.3. *Continued.*

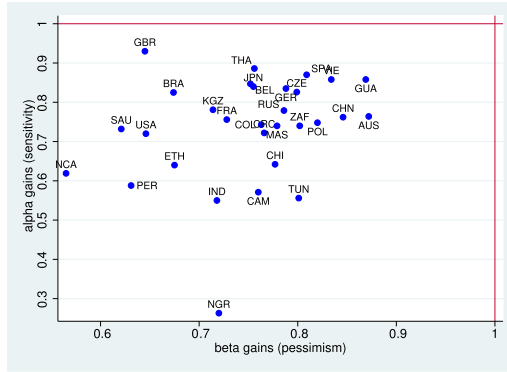
	Utility Function			Weighting Gains		Weighting Losses	
	μ	ν	λ	α^+	β^+	α^-	β^-
South Africa	−0.004	0.029**	0.224*	−0.118**	−0.032	−0.087	−0.079
	(0.010)	(0.014)	(0.122)	(0.057)	(0.065)	(0.064)	(0.082)
Spain	−0.005	−0.019*	−0.006	0.012	−0.025	−0.072	0.047
	(0.008)	(0.011)	(0.099)	(0.053)	(0.049)	(0.050)	(0.062)
Thailand	−0.004	−0.020	0.273*	0.028	−0.078	0.012	0.173**
	(0.011)	(0.013)	(0.151)	(0.064)	(0.061)	(0.059)	(0.087)
Tunisia	−0.026**	0.030**	0.633***	−0.302***	−0.033	−0.298***	−0.125
	(0.010)	(0.014)	(0.170)	(0.062)	(0.063)	(0.073)	(0.080)
UK	−0.002	−0.018	0.943***	0.072	−0.189***	−0.265***	0.192***
	(0.009)	(0.011)	(0.179)	(0.060)	(0.047)	(0.063)	(0.072)
Vietnam	0.000	0.013	0.171	−0.138**	−0.188***	−0.085	−0.033
	(0.010)	(0.012)	(0.118)	(0.054)	(0.054)	(0.056)	(0.073)
Female	0.011***	0.003	−0.074*	−0.112***	−0.011	−0.085***	−0.054**
	(0.003)	(0.004)	(0.040)	(0.015)	(0.017)	(0.016)	(0.025)
Constant (USA)	0.041***	0.001	1.310***	0.858***	0.834***	0.871***	0.939***
	(0.006)	(0.007)	(0.066)	(0.035)	(0.036)	(0.038)	(0.044)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

now sports a less pessimistic function than Ethiopia. This is obviously due to the higher concavity of the utility function in Vietnam, and illustrates the difficulties in assessing overall risk preferences from the complete PT specification. Panel S.4(b) shows a scatter plot of the parameter values. This confirms first of all that the pessimism parameters have moved considerably to the left relative to the graph shown in the main text, due the concave utility functions. The overall trends between countries appear to remain similar, but are now somewhat more difficult to detect (regression analysis below will tell us more).

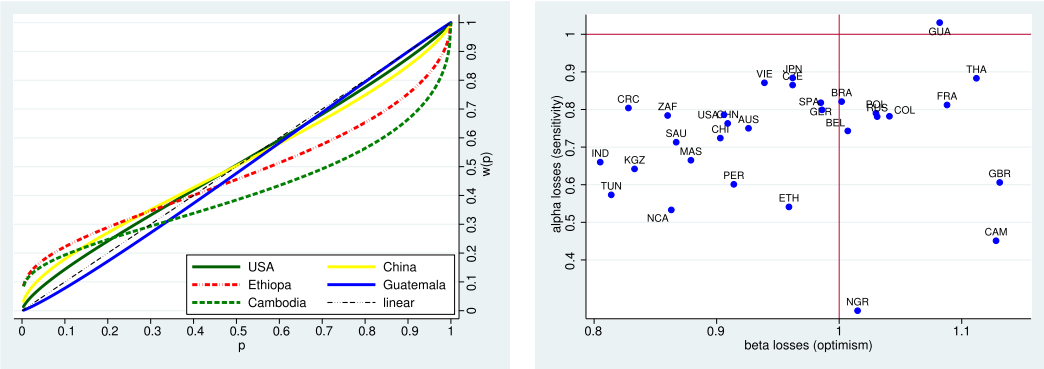


(a) Typical weighting functions



(b) Scatter plot of parameters

FIGURE S.4. Probability weighting functions for gains, full PT specification.



(a) Typical weighting functions (b) Scatter plot of parameters

FIGURE S.5. Probability weighting functions for losses, full PT specification.

This leaves the weighting functions for losses to be discussed, which are shown in Figure S.5, with panel S.5(a) showing the same functions as in the man text, and panel S.5(b) providing a scatter plot of the parameters. The patterns appear quite similar to those shown in the main text, if perhaps somewhat accentuated. This is because the utility functions do not move preferences in a uniform direction for losses, as some are concave and some are convex.

S.3.3 *Regression analysis using full PT model*

Let us now move on to the regression analysis using the full PT model. Table S.4 shows the income regression. The effects from the main text emerge intact from this exercise. Countries with a lower GDP per capita tend to exhibit lower sensitivity and less pes-

TABLE S.4. Income effects, prospect theory.

	Utility Function			Weighting Gains		Weighting Losses		
	μ	ν	λ	α	β	γ	δ	σ
GDP difference	−0.006***	0.011***	0.221***	−0.072***	−0.030***	−0.083***	−0.022*	0.033***
	(0.001)	(0.002)	(0.022)	(0.008)	(0.008)	(0.008)	(0.011)	(0.002)
Foreigner	−0.002	0.009	0.028	0.025	0.008	0.003	−0.017	0.019*
	(0.006)	(0.008)	(0.077)	(0.037)	(0.037)	(0.039)	(0.045)	(0.007)
Gini coeff.	−0.002	0.003	0.008	0.010	0.015*	0.043***	−0.006	0.001
	(0.001)	(0.002)	(0.021)	(0.008)	(0.007)	(0.009)	(0.011)	(0.002)
Private university	−0.003	0.008	0.104	0.007	−0.039	−0.038	−0.076	−0.000
	(0.004)	(0.007)	(0.077)	(0.029)	(0.026)	(0.033)	(0.039)	(0.005)
OPEC	−0.024***	−0.023**	0.633***	−0.300***	−0.030	−0.293***	0.055	0.065***
	(0.006)	(0.009)	(0.168)	(0.032)	(0.035)	(0.032)	(0.051)	(0.006)
Female	✓	✓	✓	✓	✓	✓	✓	✓
Constant	0.044***	−0.015***	1.250***	0.849***	0.793***	0.861***	0.986***	0.155***
	(0.002)	(0.003)	(0.039)	(0.015)	(0.016)	(0.016)	(0.020)	(0.004)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

TABLE S.5. Individual effects, prospect theory.

	Utility Function			Weighting Gains		Weighting Losses		
	μ	ν	λ	α	β	γ	δ	σ
Female	0.013***	0.007	−0.092*	−0.079***	−0.024	−0.063***	−0.053*	0.011***
	(0.004)	(0.005)	(0.051)	(0.019)	(0.021)	(0.021)	(0.031)	(0.004)
Age (z-score)	−0.001	0.002	0.028	−0.010	0.009	0.012	0.006	0.009***
	(0.002)	(0.002)	(0.021)	(0.009)	(0.010)	(0.010)	(0.013)	(0.002)
Height (z-score)	0.002	0.004	−0.021	0.030***	−0.015	0.020*	0.003	−0.005**
	(0.002)	(0.003)	(0.029)	(0.011)	(0.013)	(0.011)	(0.014)	(0.002)
Constant	0.039***	−0.002	1.328***	0.836***	0.849***	0.861***	0.940***	0.159***
	(0.007)	(0.007)	(0.070)	(0.036)	(0.038)	(0.039)	(0.044)	(0.007)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

simism for gains. This effect is now reinforced by less concave utility for gains. They also tend to be more loss averse. The one difference emerges for losses, where we find the greatest collinearity issues. Here, we now find a marginally significant *decrease* in optimism. This is, however, compensated by a much more convex utility function in poorer countries. Other effects fare similarly, and are not discussed in detail.

Table S.5 shows the effects of physical characteristics using the full PT model. Women are again found to display less sensitivity than men for both gains and losses. We also replicate the finding of women being more noisy. The increased utility curvature for

TABLE S.6. Study characteristics, prospect theory.

	Utility Function			Weighting Gains		Weighting Losses		
	μ	ν	λ	α	β	γ	δ	σ
GPA (z-score)	0.003**	0.001	−0.065***	0.036***	−0.002	0.043***	−0.013	−0.007***
	(0.002)	(0.003)	(0.023)	(0.009)	(0.010)	(0.009)	(0.015)	(0.002)
Mathemathics and	−0.001	0.011*	−0.024	0.003	−0.003	0.045*	−0.025	−0.004
engineering	(0.004)	(0.006)	(0.066)	(0.024)	(0.027)	(0.026)	(0.033)	(0.005)
Natural sciences	0.007	0.002	−0.124	−0.031	−0.022	−0.066*	−0.038	0.007
	(0.007)	(0.008)	(0.084)	(0.032)	(0.040)	(0.035)	(0.044)	(0.006)
Medicine	−0.001	0.021**	−0.036	0.030	0.007	0.010	−0.149***	−0.002
	(0.008)	(0.010)	(0.090)	(0.048)	(0.049)	(0.049)	(0.055)	(0.008)
Social sciences	0.003	−0.001	−0.027	−0.094***	0.010	−0.096***	−0.012	0.017***
(not econ)	(0.006)	(0.008)	(0.067)	(0.030)	(0.035)	(0.030)	(0.045)	(0.005)
Humanities	0.005	0.008	0.009	−0.076**	−0.020	−0.013	−0.028	0.017***
	(0.007)	(0.008)	(0.091)	(0.034)	(0.041)	(0.038)	(0.043)	(0.007)
Arts	−0.007	0.022	0.236	−0.058	−0.022	−0.106**	−0.098	0.021**
	(0.010)	(0.017)	(0.147)	(0.053)	(0.060)	(0.050)	(0.101)	(0.009)
Study other	−0.005	0.009	0.020	−0.079***	0.034	−0.039	−0.058	0.017***
	(0.006)	(0.007)	(0.067)	(0.026)	(0.034)	(0.028)	(0.040)	(0.005)
Constant	0.034***	−0.010	1.423***	0.837***	0.862***	0.846***	0.995***	0.158***
	(0.008)	(0.009)	(0.089)	(0.040)	(0.047)	(0.042)	(0.053)	(0.008)

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

gains indicates that women are indeed also less risk tolerant than men—an effect that now emerges more strongly than in the reduced model in the main text. There is a much smaller effect going in the same direction for losses, which is marginally significant and captured by the optimism parameter. We also replicate the same effects for hight already discussed in the main text.

Table S.6 shows the effects of study characteristics in the full PT model. Once again, the effects we observe are very similar to those presented in the main text. In terms of GPA, we find the same effects in terms of sensitivity as before. The effect on pessimism again goes in the direction of an increased GPA correlating with higher levels of pessimism (and thus against the effect pointed out in the early literature). This effect is now captured in utility curvature, and significant at the 5% level. We further replicate the effects of study major reported in the main text.

References

Barsky, R. B., M. S. Kimball, F. T. Juster, and M. D. Shapiro (1997), "Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement survey." *Quarterly Journal of Economics*, 112 (2), 537–579. [3, 4]

Choi, S., R. Fisman, D. Gale, and S. Kariv (2007), "Consistency and heterogeneity of individual behavior under uncertainty." *The American Economic Review*, 97 (5), 1921–1938. [4]

Dohmen, T., A. Falk, D. Huffman, U. Sunde, J. Schupp, and G. G. Wagner (2011), "Individual risk attitudes: Measurement, determinants, and behavioral consequences." *Journal of the European Economic Association*, 9 (3), 522–550. [3]

Hofstede, G. H. (1980), *Culture's Consequences: International Differences in Work-Related Values*. Sage Publications, Thousand Oaks, CA. [3]

Noussair, C. N., S. T. Trautmann, G. van de Kuilen, and N. Vellekoop (2013), "Risk aversion and religion." *Journal of Risk and Uncertainty*, 47 (2), 165–183. [3]

Rieger, M. O., M. Wang, and T. Hens (2015), "Risk preferences around the world." *Management Science*, 61 (3), 637–648. [3]

Wakker, P. P. (2010), *Prospect Theory for Risk and Ambiguity*. Cambridge University Press, Cambridge. [4]

Weber, E. U. and C. Hsee (1998), "Cross-cultural differences in risk perception, but cross-cultural similarities in attitudes towards perceived risk." *Management Science*, 44 (9), 1205–1217. [3]

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