Supplementary Information for Media content and political behavior in observational research: A critical assessment*

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Supplementary Information A

Replication of Schuck, Vliegenthart, and Vreese (2014)

The results reported by SVdV are based on data from twenty countries instead of the intended twenty-one. Most likely due to between-wave merging problems, all entries from Bulgaria appeared as duplicates, in which the data rows were shifted. Ultimately, this generated a data file that – published along the original article, for Bulgaria, contained no single observation for which all of the covariates and the response variable were *complete cases*. Given the default listwise deletion employed by many statistical software packages, this means that all results reported by SVdV in the multivariate section are based on data from twenty, instead of the intended twenty-one countries, Bulgaria being completely excluded from the analysis.

The N of 21,776 reported by SVdV does not include a single respondent from Bulgaria. After the necessary corrections, we have 22,792 valid observations, in twenty-one countries now. This sample size is also in line with what Schuck, Boomgaarden, and Vreese (2013) report (22,791) when they analyze a different dependent variable – cynicism – using data from the same study with a very similar methodological approach. Thus, we re-specified the models reported by SVdV using the originally intended sample of twenty-one countries. We re-estimated the models using multiple statistical softwares (results from R reported here). Table SI.A1 displays results from all four models reported by SVdV (pages 11-12) tagged as *Published* and, in parallel, the results from the models on the complete data, tagged as *Revised*.

The results reported in the *Published* columns are identical to the ones originally reported by the authors. When comparing the revised model outputs on the full data, few, but important results change. SVdV report statistical significance based one-tailed tests, so we note that $\star$ in our tables ($p < 0.1$, two-tailed) is identical to the $\star$ ($p < 0.05$, one-tailed significance levels) reported by SVdV. Independent of the threshold chosen, when Bulgaria is included, the cross-level interaction supporting SVdV's second hypothesis fails to reach statistical significance. While we do not necessarily contest the idea that the same media content can have different effects in different contexts, we do argue that there is no empirical support for contextual effects as proposed by SVdV.

The authors themselves point out that the amount of between-country variation of the *news conflict* slope is rather small, but they also emphasize that the variation is statistically significant. Beside the point that just because something is statistically significant it does not mean that it is substantively relevant, we investigate the "proclaimed significance" of the slope variation. Naturally, variation is bound to be ≥ 0, so if the decision to consider it statistically significant was based on the fact that the lower bound of the 95% confidence interval for the slope variation was above zero, there might be an issue. Also, just by looking at the log-likelihoods reported by SVdV

Table SI.A1: Model results

	Table 1 model		Fixed-effects model		Random-effects model		Cross-level interaction	
	Published	Revised	Published	Revised	Published	Revised	Published	Revised
Turnout intention (t-1)	0.514***	0.512***	0.514***	0.511***	0.514***	0.511***	0.514***	0.511***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Education	0.139***	0.145***	0.140***	0.146***	0.140***	0.146***	0.140***	0.146***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Female	−0.186***	−0.171***	−0.187***	−0.172***	−0.187***	−0.172***	−0.188***	−0.174***
	(0.034)	(0.033)	(0.034)	(0.033)	(0.034)	(0.033)	(0.034)	(0.033)
Age	0.016***	0.017***	0.016***	0.017***	0.016***	0.017***	0.016***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Direct campaign contact	0.162***	0.195***	0.159***	0.191***	0.159***	0.191***	0.159***	0.191***
	(0.051)	(0.050)	(0.051)	(0.050)	(0.051)	(0.050)	(0.051)	(0.050)
Mediated campaign contact	0.180***	0.180***	0.180***	0.179***	0.180***	0.180***	0.179***	0.179***
	(0.025)	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
News exposure	−0.014*	−0.016**						
	(0.008)	(0.007)						
News conflict	0.073***	0.078***	0.030***	0.027***	0.030***	0.027***	0.037***	0.033***
	(0.025)	(0.025)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
News conflict × Polity evaluations							0.151*	0.133
							(0.086)	(0.085)
Polity evaluations	0.312	0.382	0.181	0.215	0.146	0.187	−0.204	−0.123
	(1.168)	(1.128)	(1.181)	(1.141)	(1.187)	(1.147)	(1.198)	(1.158)
Compulsory voting	0.817**	0.821**	0.801*	0.801**	0.799*	0.800**	0.788*	0.789**
	(0.406)	(0.396)	(0.411)	(0.402)	(0.413)	(0.404)	(0.410)	(0.401)
Simultaneous elections	0.657**	0.643**	0.636**	0.619**	0.640**	0.623**	0.631**	0.615**
	(0.274)	(0.267)	(0.277)	(0.270)	(0.279)	(0.272)	(0.277)	(0.270)
Constant	−3.274***	−3.288***	−3.276***	−3.292***	−3.279***	−3.294***	−3.292***	−3.304***
	(0.157)	(0.149)	(0.159)	(0.150)	(0.159)	(0.151)	(0.159)	(0.150)
N	21,776	22,792	21,776	22,792	21,776	22,792	21,776	22,792
Countries	20	21	20	21	20	21	20	21
σ^2 country level	0.252	0.240	0.259	0.247	0.260	0.249	0.257	0.246
σ^2 News conflict					0.0002	0.0002	< 0.0001	< 0.0001
Log Likelihood	-11,013.380	-11,566.840	-11,015.070	-11,569.260	-11,015.030	-11,569.240	-11,013.530	-11,568.050

Note: *p<0.1; **p<0.05; ***p<0.01. In line with SVdV, unstandardized coefficients reported.

in Table 2 (original piece), we are hard-pressed to believe that letting the slope of *news conflict* vary across countries yields significantly better fitting models compared to the "fixed-effects" model. We use quotation marks here, because we consider this to be better described as a varying-intercept model, but for the ease of comparability, we follow the names employed by SVdV. There are many ways to assess whether this variation is significant, and here we choose to look at comparative model fit (χ^2 difference test) for nested models: the "fixed-effects" model is nested within the random-effects model, which is nested within the cross-level interaction model (and subsequently the "fixed-effects model" is nested in the cross-level interaction model).

Table SI.A2: Model fit comparison

Compared to	Model	Df	AIC	BIC	logLik	χ^2	Diff. Df	Pr(> χ^2)
Published								
-	Fixed-effects	12	22054.13	22149.99	-11015.07			
Fixed-effects	Random-effects	13	22056.06	22159.91	-11015.03	0.07	1	0.7945
Fixed-effects	Cross-level int.	14	22055.06	22166.90	-11013.53	3.07	2	0.2153
Random-effects	Cross-level int.	14	22055.06	22166.90	-11013.53	3.00	1	0.0831
Revised								
-	Fixed-effects	12	23162.53	23258.94	-11569.27			
Fixed-effects	Random-effects	13	23164.47	23268.91	-11569.23	0.06	1	0.8058
Fixed-effects	Cross-level int.	14	23164.10	23276.58	-11568.05	2.43	2	0.2964
Random-effects	Cross-level int.	14	23164.10	23276.58	-11568.05	2.37	1	0.1235

Model fit comparisons for both *Published* and *Revised* models are reported in Table SI.A2. These results indicate that estimating an extra parameter for the between-country variance of the *news conflict* slope brings no added value to the model. While one could argue that including the cross-level interaction and fitting that model to the original (20 country) data results in a better fit compared to the random-effects model, it still does not fit significantly better than the "fixed-effects" model. And in-between, the random-effects model does not fit better than the "fixed-effects" model. Both the Akaike Information Criterion and the Bayesian Information Criterion point to the same substantive conclusion. It should be noted that with each step between the models we are losing only one degree of freedom. This is due to the fact that the models employed by SVdV assumed that the random effects for the intercept and the slope are uncorrelated.

We re-specified the last two models including the estimation of a covariance parameter between the random effects. The results do not change substantively, and the correlation between the intercept and slope random effects is -0.80 for the random effects model. This correlation is substantially reduced, when we employed the necessary centering of the predictors (an issue discussed in the next section). Model fit comparisons are even less friendly towards the original claims, if we estimate the random effects covariance parameter.

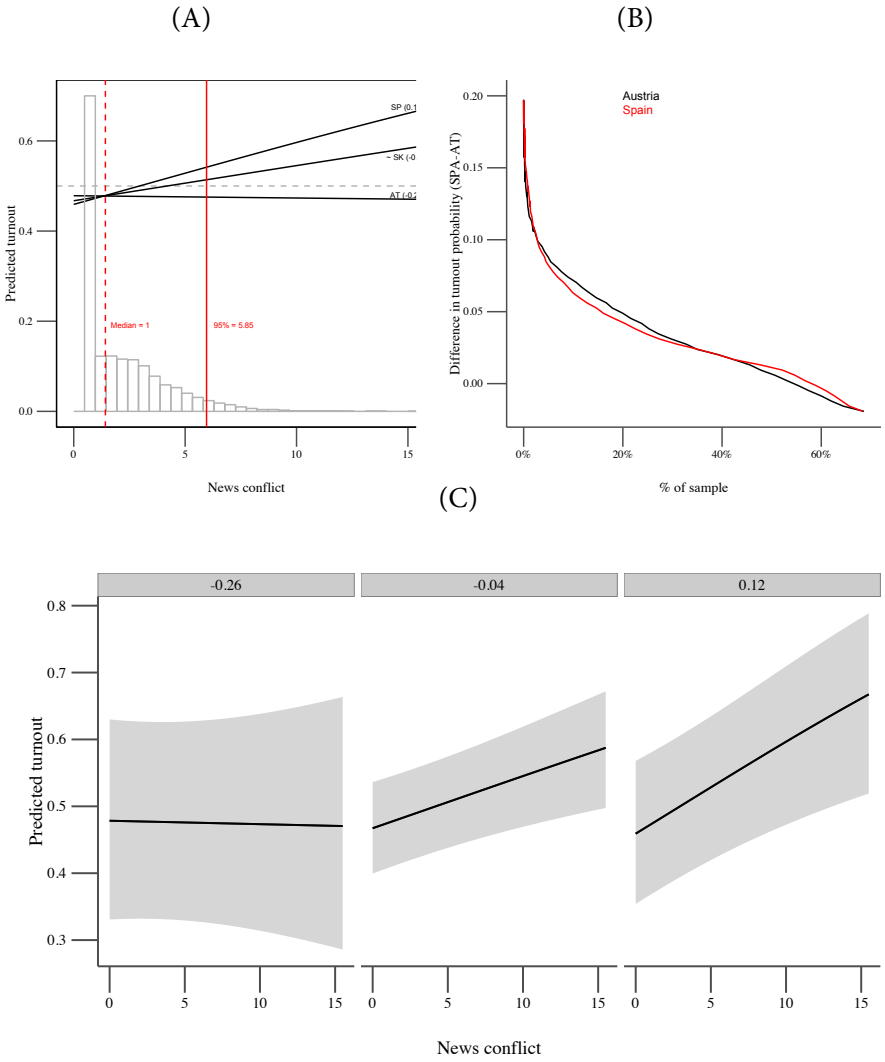
Figure 2 of the original piece offers a visual display of the different *news conflict* slopes, depending on polity evaluation (negative, neutral, positive). This figure is intended to convey the substantive importance of the information environment. The figure is based only on the "fixed part of the analysis" (SVdV, 12) and does not display any uncertainty measures. Accordingly, when reproducing this figure, no substantial differences should be expected compared to those reported in the original paper. We have followed the description by SVdV of Figure 2. It was not perfectly clear what SVdV mean by "fixed part of the analysis", so we used the fixed-effects from the cross-level interaction. All continuous variables were set to closest existing value of their mean, and as the mean polity evaluations (−0.04) are closest to Slovakia, the country level predictors were fixed to the values found for each country – Austria, Slovakia, and Spain – and in all cases these country predictors had the value of 0.

However, confidence intervals and the distribution of the key variable help us to understand the conditions under which *news conflict* has a statistically and substantially significant effect on turnout (Brambor, Clark, and Golder 2006; Kam and Franzese 2007). As the point we are making does not necessarily depend on whether the cross-level interaction is significant or not, we decided to reproduce Figure 2 using the original data (20 countries), displayed in Panel A of Figure SI.A1.

The distribution of the predictor (full sample, 20 countries) and sample moments of interest indicate that sizable between-country differences in predicted turnout appear only at unlikely values of the *news conflict*. Panel B in Figure SI.A1 substantiates this claim. Again, we see that substantive between-country differences in predicted turnout appear at very small proportions of the samples. While we do not deem the chosen method of presentation or discussion used by SVdV as an issue, these further details help in better grasping the substantial role between-system differences can play.

However, we can also see that in some countries, given the same level of *news conflict*, the predicted probability of turnout is above 0.5, whereas in others is below 0.5. This can also be regarded as a substantively important effect, as it differentiates between individuals for whom the predicted behavior would be turnout vs. those below 0.5 are expected to stay home. Panel C in Figure 1 includes 95% confidence bounds calculated using only the fixed effects from the cross-level interaction model (original data), with all other covariates fixed at values discussed above. We note that bounds do not take the distribution of the predictor in the data into consideration. When uncertainty is factored in, we see that even with the selection of the minimum and maximum (positive) polity evaluation country values, these slopes are not significantly different from each other, or the 0.5 probability value. Using the full sample, we find no statistical or substantial cross-level interaction between the information

Figure SI.A1: Polity evaluation and news conflict



Panel (A): predicted turnout as a function of news conflict for different polity evaluation levels (reproducing Figure 2 by SVdV). All other variables fixed at values described in the text and by SVdV, predictions based on fixed-effects only. Distribution of news conflict on the 20 country original sample. Panel (B): difference in predicted turnout between most positive and most negative polity evaluation countries plotted against the % of the sample in a country with news conflict values for which the δ turnout probability was calculated. Panel (C): identical to Panel (A) with 95% confidence intervals calculated based on fixed-effects (and their standard errors) only. Random effects are averaged over, news conflict values range from its minimum (0) to its maximum (15.5), with increments of 0.25 for the prediction.

environment and *news conflict*.

Table SI.A3: Conflicted, but not exposed

Country	Miscoded	% of valid	% of no exposure
AT	59	6.03	11.64
BE	167	8.59	16.23
BG	46	2.30	4.34
CZ	24	2.38	4.75
DE	57	5.77	11.95
DK	40	3.98	8.75
FI	40	3.98	8.44
FR	77	7.79	15.19
GRE	56	5.76	11.16
HU	57	5.75	11.88
IRE	53	5.35	11.04
IT	25	2.52	5.54
LAT	92	7.22	8.53
LIT	25	2.30	7.55
NL	53	5.33	11.35
PL	26	2.59	6.05
PT	27	2.70	6.01
SPA	40	4.01	8.00
SVK	50	4.25	9.96
SWE	62	6.33	12.16
UK	132	13.40	23.24

Further non-influential coding issues in Schuck, Vliegenthart, and Vreese (2014)

Another issue with the data material is the discrepancy with the operationalization. The operationalization of news conflict implies that for an individual who reports not following at all any of the media outlets, both news exposure (a simple summation) and *news conflict* should take the value 0: people with no media exposure could not have been exposed to any *news conflict*. However, in the replication data 1208 respondents were not exposed to any medium but have scores above zero on the *news conflict* variable. The country level breakdown of the 1208 observations is reported in Table SI.A3.

The *news conflict* scores were very low for all these cases, and accordingly it does not change any of the previously reported results. Nevertheless, being the most important predictor, such mis-alignment between intended coding and data is worrisome. For the analyses reported in the article, we followed the operationalization coding, and we re-coded all cases with 0 exposure to 0 *news conflict* value. We also note that Appendix A SVdV indicates that for newspapers the range of exposure variable was

0-6, however, in the data, given the maximum values found, we believe that this range also 0-7, as for the TV news shows.

A final concern with the data is the fact that the medium specific conflict frame index feeds into this composite score. As per page 6 or the original article, four features of the news item indicate conflict, and each of them can either present (1) or not (0). These "presence" scores were averaged ("summed and divided by the number of items to build an additive index scale" [SVdV, p. 6]), and then averaged across all news items in each media outlet. The four items are described in Appendix B (SVdV), and we note some concern related to the first item, that is not listed as a limitation by SVdV:

> **Appendix B, SVdV**: "Explicitly (only if the story or somebody in the story says depicts so): Does the story (or somebody in the story) mention two or more sides of (i.e., not two separate arguments of but two or more distinct perspectives on) a problem or issue?"
>
> **Schuck et al. (2010, 54)**: "**V33** Explicitly (only if the story or somebody in the story says depicts so): Does the story (or somebody in the story) mention two or more sides of (i.e., not two separate arguments of but two or more distinct perspectives on) a problem or issue? **Note: These 'sides' do not necessarily indicate a conflict or disagreement.** Example: The tax increase might look good on the budget but it might slow down demand as citizens will be left with less money to spend. Coding: 1 = no 2 = yes" (emphasis added)

We found that including this problematic item in the index **does not** influence the substantive findings at the individual level. We still find this discrepancy crucial as, yet again, it is related to the most important predictor in the analyses reported, and it undoubtedly paints a more conflictual news environment at both outlet and country level. As the removal of this item does not change the results substantially, we use the four items as SVdV.

Supplementary Information B

Model fit comparison

SVdV present an additional, statistical, reason behind the dismissal of news exposure in favor of *news conflict*. As the collinearity between the two variables is not perfect, the authors also report that adding *news conflict* to a model that has all other predictors (including exposure) yields a significant gain in fit. This is correct, but some other model comparisons are missing from the discussion. Table SI.B1 reports these model comparisons. The sequence of models based on SVdV's Table 1 is intuitive: the "no media" model contains all predictors used by the authors, except the two exposure predictors; the "exposure only" model includes the mere news exposure predictor; the "conflict only" model includes the *news conflict* measure; and finally, the "full model" includes the two predictors simultaneously, as the model reported by SVdV in Table 1. We use the full sample (21 countries), with the corrected *news conflict* measure (see discussion in the main text and *Supplementary Information* **A**).

Table SI.B1: Model fit comparison: exposure vs. news conflict

Compared to	Model	Df	AIC	BIC	logLik	χ^2	Diff. Df	Pr(> χ^2)
No media	Conflict only	12	23164.10	23260.51	-11570.05	6.90	1	0.0086
No media	Exposure only	12	23166.70	23263.11	-11571.35	4.29	1	0.0383
Exposure only	Full model	13	23162.36	23266.81	-11568.18	6.34	1	0.0118
Conflict only	Full model	13	23162.36	23266.81	-11568.18	3.74	1	0.0532

As Table SI.B1 shows, adding either one of the exposure related predictors produces a model with significantly better fit (first two rows). Next, adding *news conflict* to a model that already includes news exposure further enhances the fit. Adding exposure to a model with *news conflict* already present results in a better fitting model, but this difference is not statistically significant at conventional level ($p = 0.0532$). But the differences are minimal, and the the AIC and BIC fit statistics point into opposite directions.

Supplementary Information C

Data and model for "The mobilizing effect of non-conflictual news"

In the first two columns of Table SI.C1 we report the country average scores for news conflict and news non-conflict. These are based on the conflict and non-conflict scores for each outlet in the respective country. The last three columns report correlations between the individual level exposure variables, after using the operationalization proposed by SVdV.

Table SI.C1: Exposure, news conflict, new non-conflict

	News conflict	News non-conflict	ρ (conf, no-conf)	ρ (conf, exposure)	ρ (no-conf, exposure)
AT	0.456	0.544	0.992	0.998	0.998
BE-F	0.172	0.828	0.978	0.984	0.999
BE-W	0.279	0.721	0.961	0.980	0.997
BG	0.231	0.769	0.982	0.989	0.999
CYP	0.246	0.754	0.957	0.976	0.997
CZ	0.324	0.676	0.974	0.988	0.997
DE	0.146	0.854	0.984	0.988	1.000
DK	0.263	0.737	0.952	0.975	0.996
EE	0.195	0.805	0.982	0.988	0.999
FI	0.314	0.686	0.976	0.989	0.998
FR	0.438	0.562	0.986	0.995	0.998
GRE	0.286	0.714	0.975	0.988	0.998
HU	0.302	0.698	0.984	0.993	0.998
IRE	0.169	0.831	0.985	0.990	1.000
IT	0.334	0.666	0.980	0.991	0.998
LAT	0.358	0.642	0.993	0.997	0.999
LIT	0.040	0.960	0.716	0.740	0.999
LUX	0.190	0.810	0.997	0.998	1.000
MT	0.455	0.545	0.992	0.998	0.998
NL	0.329	0.671	0.955	0.980	0.995
PL	0.383	0.617	0.939	0.980	0.988
PT	0.348	0.652	0.919	0.969	0.988
RO	0.371	0.629	0.976	0.991	0.996
SLO	0.255	0.745	0.986	0.942	0.932
SPA	0.332	0.668	0.981	0.992	0.998
SVK	0.283	0.717	0.983	0.991	0.999
SWE	0.165	0.835	0.904	0.935	0.997
UK	0.214	0.786	0.960	0.977	0.998

Descriptive statistics for the variables used in this section are displayed in Table SI.C2. All models were specified to mimic those reported by SVdV, Table 1. Media predictor slopes are fixed across countries and no-cross level interaction was specified. General formula for n individuals in J countries:

$$\Pr(y_i = 1) = \text{logit}^{-1}(\alpha_{j[i]} + \beta_1 \text{age}_i + +\beta_2 \text{female}_i + \beta_3 \text{education}_i + \beta_4 \text{directContact}_i + \beta_5 \text{indirectContact}_i + \beta_6 \text{mediaVariable}_i), \text{ for i} = 1, \ldots, \text{n}$$

$$\alpha_j = \gamma_0^\alpha + \gamma_1^\alpha \text{simElect} + \gamma_2^\alpha \text{compVote} + \gamma_3^\alpha \text{polityEval} + \eta_j^\alpha, \text{ for j} = 1, \ldots \text{J}.$$

where the second level errors are normally distributed, $\eta_j^{\alpha} \sim N(0, \sigma_{\alpha}^2)$. Full model results are reported in Table SI.C3.

Table SI.C2: EES summary statistics

Statistic	N	Mean	SD	Min	Max
Turnout	26,908	0.710	0.454	0	1
Age	26,763	50.291	16.911	18	99
Sex (female = 1)	27,068	0.559	0.497	0	1
Education	26,206	0.771	0.896	0	2
Direct contact	27,069	0.161	0.432	0	2
Indirect contact	27,069	0.824	0.982	0	5
News conflict (uncentered)	27,069	2.579	2.034	0.000	16.593
News non-conflict (uncentered)	27,069	6.187	4.417	0.000	33.587
News exposure (uncentered)	27,069	8.839	6.037	0	42

Table SI.C3: The impact of mere exposure, EES 2009

	Turnout		
	Mere exposure	Conflict	No-conflict
Exposure	0.259^{***}	0.252^{***}	0.261^{***}
	(0.016)	(0.016)	(0.016)
Age	0.026^{***}	0.026^{***}	0.026^{***}
	(0.001)	(0.001)	(0.001)
Female	-0.062^{**}	-0.065^{**}	-0.061^{**}
	(0.030)	(0.030)	(0.030)
Education	0.248^{***}	0.248^{***}	0.246^{***}
	(0.018)	(0.018)	(0.018)
Direct campaign contact	0.210^{***}	0.212^{***}	0.211^{***}
	(0.046)	(0.046)	(0.046)
Mediated campaign contact	0.263^{***}	0.263^{***}	0.263^{***}
	(0.020)	(0.020)	(0.020)
Polity evaluations	0.201	0.201	0.201
	(0.932)	(0.936)	(0.937)
Compulsory voting	1.003^{***}	1.002^{***}	1.004^{***}
	(0.385)	(0.385)	(0.385)
Simultaneous elections	0.951^{***}	0.950^{***}	0.952^{***}
	(0.233)	(0.232)	(0.233)
Constant	-0.946^{***}	-0.950^{***}	-0.948^{***}
	(0.138)	(0.138)	(0.138)
N	25,841	25,841	25,841
Political systems	28	28	28
σ^2 country level	0.289	0.288	0.289
Log Likelihood	-13,502.110	-13,507.600	-13,499.410
AIC	27,026.220	27,037.190	27,020.810

Note: *p<0.1; **p<0.05; ***p<0.01

Best fitting model based on model comparison: news non-conflict.

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