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A Comment on Identity Effects in Social Media - Taylor et al. (2023)

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A comment on Identity effects in social media

Taylor et al. (2023)

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Abstract

Taylor et al. (2023) explored the impact of identity cues on online behavior, employing a large-scale field experiment on a social news aggregation website. Findings reveal that identity cues significantly influence how individuals form opinions and engage with online content, accounting for 28% to 61% of variation in voting associated with commenters' production, reputation, and reciprocity. The results highlight the role of identity cues in perpetuating social content evaluation disparities and suggest anonymized content votes could enhance overall content quality on social platforms. In the replication analysis of this study, we utilized the provided script on the same data, which was provided by the paper's author following non-disclosure agreements. Further the robustness of the results was also tested after applying a mixed effects model instead of the linear probability model. Our replication confirmed the overall reproducibility of the results using the provided script, but there were notable changes in the estimates. In our analysis, the variation in individuals forming opinions and engaging with online content, as measured by voting associated with commenters' production, reputation, and reciprocity, ranged from 15% to 60% due to identity cues. This indicates that a few effects are somewhat smaller than in the original study. Moreover, when using our alternative analytic approach, the results remained generally robust, but there were exceptions. Specifically, the model assessing the impact of identity cues on individuals in voting associated with commenters' production yielded different results: We generally found stronger evidence in form of higher statistical significance for the claims of the authors.

1. Introduction

Taylor et al. (2023), conducted an extensive longitudinal field experiment to assess the impact of identity cues on online content consumption and feedback. Over an 89-week period on a social news aggregation website akin to Reddit.com, the team observed the responses of more than 6,400 viewers to nearly 350,000 comments from 3,725 commenters. Each piece of content was randomly assigned to either an “anonymous” condition, where the viewer couldn’t see the commenter’s username, or an “identified” condition, allowing the viewer to view and click on the commenter’s username directly above the comment.

The findings illuminated the profound influence of identity cues on the perception and engagement with online content. Identity effects explained as much as 61 percent of the variation in voting, indicating that over half of the differences in users’ decisions to up-vote or down-vote content could be attributed to the presence or absence of identity cues.

In our re-analysis, we investigated whether their analytical results are reproducible and robust. To check the reproducibility, we utilized the same dataset, obtained the encrypted data from the authors, and applied the provided script that was used for the analysis in the paper. To test the robustness, we implemented an alternative model using a mixed-effect approach on the dataset. The fixed effects used by Taylor and colleagues (2023) treat group/entity-specific attributes as nuisance parameters (i.e., author and user identity) and remove their influence, as seen in (1) and (2), while in a mixed model, the random effect part models this variability by allowing the intercept to vary over the user and the comment author, as seen in (3). Thus, while the authors of the original paper controlled for these effects, we specifically modelled them. Therefore, our robustness check involved a different perception of author and user identity.

Model specifications

Taylor et al. (2023) used a fixed effect linear probability model of the form:

$$Y_{ijk} = \beta X_{ijk} + \delta D_{jk} + \gamma D_{jk} X_{ijk} + \lambda_j + \mu_i + \varepsilon_{ijk} \quad (1)$$

- Y_{ijk} be a binary variable indicating whether commenter i ’s comment k was interacted with (e.g. upvoted, down-voted, or replied to at least once) by viewer j

- D_{jk} is a binary variable indicating that viewer j saw comment k in the identified condition
- X_{ijk} is a covariate that we hypothesize is a moderator for the treatment
- δ is the average treatment effect of displaying the identity
- γ captures the moderation of the treatment effect
- λ_j be the viewer's unobserved propensity to interact
- μ_i be the commenter's unobserved propensity to be interacted with
- ε_{ijk} represents factors that affect voting behavior that we have not modeled, such as the idiosyncratic quality of the comment

The reciprocity models were calculated for viewer commenter pair fixed effects:

$$Y_{ijk} = \beta X_{ijk} + \delta D_{jk} + \gamma D_{jk} X_{ijk} + v_{ij} + \varepsilon_{ijk} \quad (2)$$

Introducing v_{ij} , a term capturing the average interaction between viewer j and commenter i .

$$y_{ijk} = \beta_0 + \beta_1 \text{identified} + \beta_2 \text{production} + \beta_3 \text{reputation} + \beta_4 (\text{identified} \times \text{production}) + \beta_5 (\text{identified} \times \text{reputation}) + u_i + v_j + \epsilon_{ijk} \quad (3)$$

- Y_{ijk} be a binary variable indicating whether commenter i 's comment k was interacted with (e.g. upvoted, down-voted, or replied to at least once) by viewer j (analogous to the original study)
- β_0 is the intercept
- $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 are the fixed effect coefficients of identified, production, reputation, interaction between identified and production, and interaction between identified and reputation, respectively
- u_i represents the random effect of the commenter (random intercept)
- v_j represents the random effect of the viewer j

For the reciprocity models, we applied the same model to author-viewer pairs instead of single comments.

2. Reproducibility

In the original analysis, model estimates were computed based on 12,583,408 observations with non-missing data (based on 12,623,814 total observations). In our re-analysis, when applying the original script to the original dataset provided by the authors, 12,584,849 observations entered the model. This slight increase in the number of observations compared to the original analysis is attributed to the automatic removal of missing values from the dataset during the application of the model. In the reproduction of the analyses fewer cases get excluded leading to more complete observations included in the model.

In our re-analysis, the influence of identity cues on individuals forming opinions and interacting with online content, as indicated by voting linked to commenters' production, reputation, and reciprocity, exhibited a variation spanning from 15% to 60% while in original analysis it was from 28% to 61%.

In addition, we want to highlight two aspects that we would have treated differently.

- From running the models, it appears that the authors reported R^2 not the adjusted R^2 as it is claimed in the table. To compare the results, we also reported R^2 in the table and highlighted this by crossing out “adjusted”.
- In the original study authors indicated $p < .1$ as significant, which is not well justified in the paper (see e.g., results for *production x identified* for down-vote and reply where also the CIs cross 0). We therefore changed the indication of significance by applying four levels: † < 0.10, * < 0.05, ** < 0.01, *** < 0.001.

See the original study for more details on the analysis conducted. In Table 1 we summarized the results from the original paper, and our re-analyses. We highlighted values in rows that differ (slightly) regarding p-values between the original and our work.

3. Conclusion

In conclusion, our replication successfully verified the general reproducibility of the original results through the utilization of the provided script. However, noteworthy discrepancies were identified in the estimates, primarily stemming from variations in the

number of observations used for estimate computation, attributable to the automated removal of missing values. To enhance reproducibility, we recommend employing tools such as *Docker* (Merkel, 2014), *renv* (Ushey & Wickham, 2023), or *groundhog* (Simonsohn & Gruson 2023) to safeguard package versions and ensure code reproducibility. Additionally, for greater ease of reproduction, we propose the inclusion of system and package version information in the scripts, which can be easily achieved by incorporating the commands "Sys.info()" and "sessionInfo()" in the scripts.

4. References

Merkel, D. (2014). *Docker: lightweight linux containers for consistent development and deployment*. *Linux Journal*, 2014(239), 2.

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Table 1 (Original Authors Table 1). Regression results as in the paper (1-3), in a computational reproduction (4-6), and in an alternative analysis using mixed models (7-9). Values that differ are highlighted in bold.

Production and Reputation										
observations: 12,583,408					observations: 12,584,849					
Paper			Reproduction			Mixed effects model				
		Up-vote (1)	Down-vote (2)	Reply (3)	Up-vote (4)	Down-vote (5)	Reply (6)	Up-vote (7)	Down-vote (8)	Reply (9)
Identification	est.	0.196	0.054	0.066	0.200	0.055	0.066	0.200	0.055	0.066
	95CI	(0.018, 0.374)	(-0.013, 0.112)	0.041, 0.091	(0.024, 0.376)	(-0.001, 0.112)	(0.040, 0.092)	(0.151, 0.249)	(0.030, 0.081)	(0.042, 0.090)
	<i>p</i>	0.031*	0.112	<0.001***	0.026*	0.059†	< 0.001 ***	< 0.001 ***	< 0.001 ***	< 0.001 ***
Production	est.	-0.207	0.060	-0.036	-0.203	0.060	-0.031	-0.198	0.060	-0.025
	95CI	(-0.305, -0.109)	(0.005, 0.115)	(-0.06, -0.012)	(-0.314, -0.091)	(0.003, 0.116)	(-0.061, 0.000)	(-0.248, -0.150)	(0.034, 0.086)	(-0.049, -0.001)
	<i>p</i>	<0.001***	0.032*	0.002**	<0.001***	0.038	0.051†	< 0.001 ***	< 0.001 ***	0.045*
Production × Identified	est.	0.127	0.064	-0.019	0.121	0.067	-0.023	0.121	0.067	-0.024
	95CI	(0.047, 0.207)	(-0.005, 0.133)	(-0.041, 0.003)	(0.034, 0.208)	(-0.000, 0.134)	(-0.040, -0.006)	(0.071, 0.171)	(0.041, 0.093)	(-0.048, 0.001)
	<i>p</i>	<0.001***	<0.067†	<0.084†	0.051†	0.051†	0.007**	< 0.001 ***	< 0.001 ***	0.058†
% Variation by Identified		38%	52%	35%	37%	53%	43%	38%	53%	49%
Reputation	est.	0.424	-0.129	-0.036	0.454	-0.132	-0.033	0.471	-0.135	-0.031
	95CI	(0.33, 0.518)	(-0.198, -0.06)	(-0.061, -0.011)	(0.352, 0.556)	(-0.202, -0.063)	(-0.058, -0.009)	(0.422, 0.521)	(-0.161, -0.110)	(-0.056, -0.007)
	<i>p</i>	<0.001***	<0.001***	0.005**	< .001***	< .001***	0.008**	< 0.001 ***	< 0.001 ***	0.010*
Reputation × Identified	est.	0.163	-0.199	0.012	0.159	-0.200	0.006	0.158	-0.201	0.006
	95CI	(0.061, 0.265)	(-0.332, -0.066)	(-0.01, 0.034)	(0.061, 0.256)	(-0.331, -0.069)	(-0.016, 0.028)	(0.108, 0.208)	(-0.228, -0.175)	(-0.019, 0.030)
	<i>p</i>	0.001**	0.003**	0.275	0.001**	0.003**	0.582	< 0.001 ***	< 0.001 ***	0.644
% Variation by Identified		28%	61%	25%	26%	60%	15%	25%	60%	16%
Adjusted R ²		0.068	0.042	0.022	0.069	0.042	0.023	0.031	0.41	0.035

Table 1 Continued.

Reciprocity										
observations: 1,094,177					observations: 1,096,219					
Paper				Reproduction			Mixed effects model			
	Up-vote (1)	Down-vote (2)	Reply (3)	Up-vote (4)	Down-vote (5)	Reply (6)	Up-vote (7)	Down-vote (8)	Reply (9)	
Reciprocity	est.	3.055	-0.934	-0.502	3.080	-0.941	-0.553	3.151	-1.002	-0.664
	95CI	(0.456, 5.654)	(-2.051, 0.138)	(-1.335, 0.331)	(0.395, 5.765)	(-2.096, 0.215)	(-1.377, 0.271)	(2.105, 4.197)	(-1.434, -0.570)	(-1.396, 0.067)
	<i>p</i>	0.021*	0.101	0.237	0.025*	0.111	0.189	< 0.001 ***	< 0.001 ***	0.075†
Reciprocity × Identified	est.	2.495	-1.183	0.302	2.476	-1.207	0.260	2.479	-1.206	0.266
	95CI	(0.68, 4.31)	(-1.904, -0.462)	(-0.408, 1.012)	(0.583, 4.369)	(-1.940, -0.474)	(-0.463, 0.984)	(1.433, 3.526)	(-1.638, -0.774)	(-0.466, 0.998)
	<i>p</i>	0.007**	0.001**	0.404	0.010*	0.001**	0.481	< 0.001 ***	< 0.001 ***	0.476
% Variation by Identified	45%	56%	38%	45%	56%	32%	44%	55%	29%	
Adjusted-R ²	0.121	0.090	0.033	0.123	0.091	0.034	0.134	0.096	0.047	

Note. Model 9 did not converge, but we still reported its estimated values. In the original paper, the authors report “Adjusted R²”. However, we think the authors actually reported R² instead of adjusted R². For comparability, we also reported R² in the replication (4-6) and conditional R² in the mixed effects model analyses (7-9). We also changed the indication of significance. *P* values: † < 0.10, * < 0.05, ** < 0.01, *** < 0.001. Est. = parameter estimation, 95CI = 95% confidence interval

Calculation of variation accounted for by identified [%]**Identification x Production / (Identification x Production + Production)****Up-votes**

original: $0.127 / (0.127 + 0.207) = 38\%$

replication: $0.121 / (0.121 + 0.203) = 37\%$

Imer: $0.121 / (0.121 + 0.198) = 38\%$

Down-votes

original: $0.064 / (0.064 + 0.060) = 52\%$

replication: $0.067 / (0.067 + 0.060) = 53\%$

Imer: $0.067 / (0.067 + 0.060) = 53\%$

Replies

original: $0.019 / (0.019 + 0.036) = 35\%$

replication: $0.023 / (0.023 + 0.031) = 43\%$

Imer: $0.024 / (0.024 + 0.025) = 49\%$

Identification x Reputation / (Identification x Reputation + Reputation)**Up-votes**

original: $0.163 / (0.163 + 0.424) = 28\%$

replication: $0.159 / (0.159 + 0.454) = 26\%$

Imer: $0.158/(0.158 + 0.471) = 25\%$

Down-votes

original: $0.199/(0.199+0.129) = 61\%$

replication: $0.200/(0.200 + 0.132) = 60\%$

Imer: $0.201/(0.201 + 0.135) = 60\%$

Replies

original: $0.012/(0.012 + 0.036) = 25\%$

replication: $0.006/(0.006 + 0.033) = 15\%$

Imer: $0.006/(0.006 + 0.031) = 16\%$

Identification x Reciprocity/ (Identification x Reciprocity+ Reciprocity)**Up-votes**

original: $2.495/(2.495 + 3.055) = 45\%$

replication: $2.476/(2.476 + 3.080) = 45\%$

Imer: $2.479/(2.479 + 3.151) = 44\%$

Down-votes

original: $1.183/(1.183 + 0.934) = 56\%$

replication: $1.207/(1.207 + 0.941) = 56\%$

Imer: $1.206/(1.206 + 1.002) = 55\%$

Replies

original: $0.302 / (0.302 + 0.502) = 38\%$

replication: $0.260 / (0.260 + 0.553) = 32\%$

lmer: $0.266 / (0.266 + 0.664) = 29\%$