

# Facebook Results Memo

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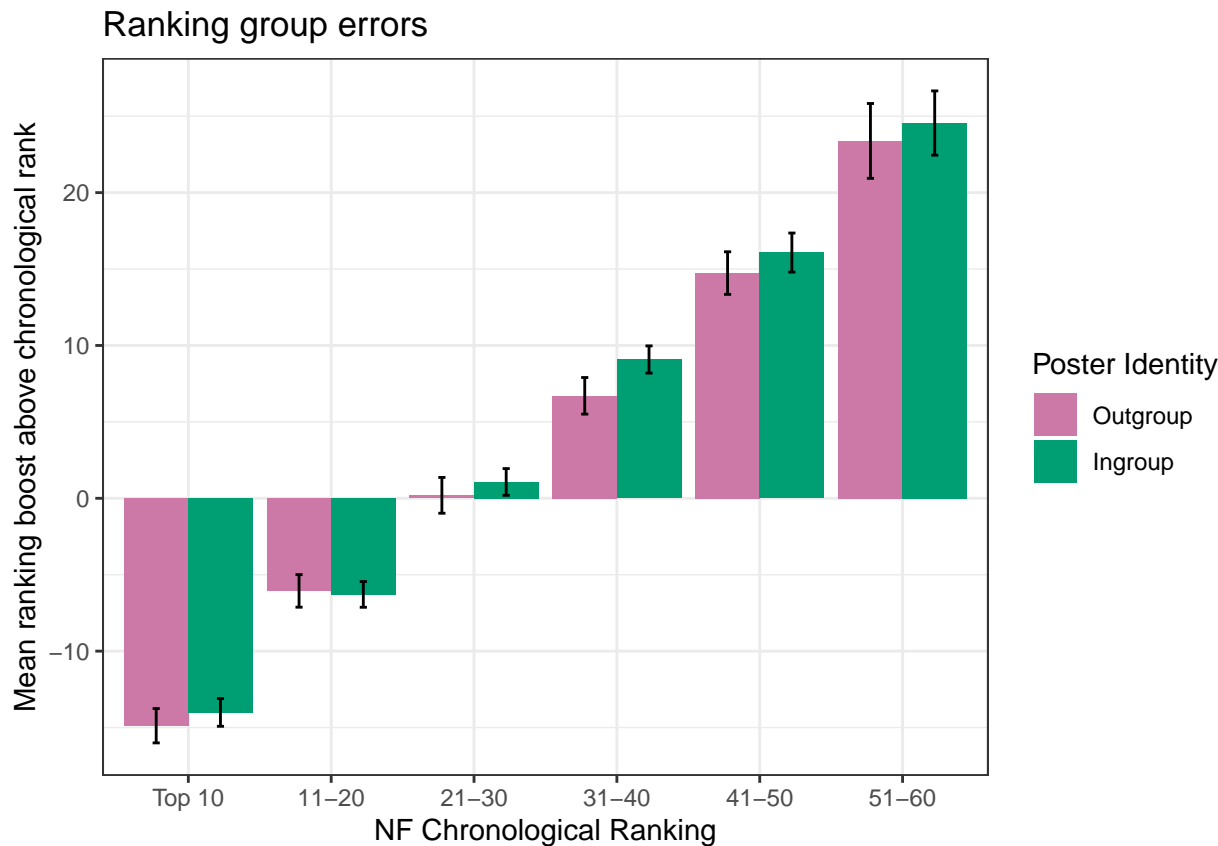
8/27/2020

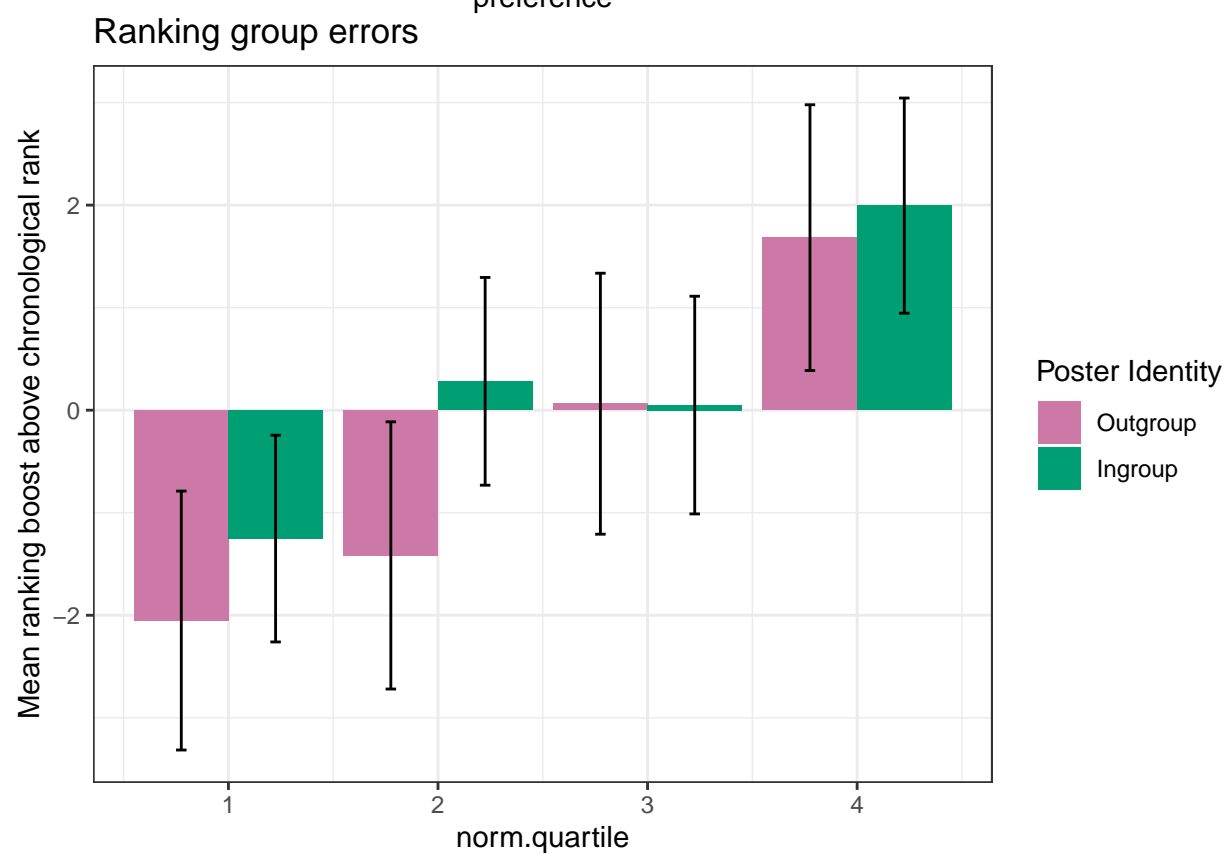
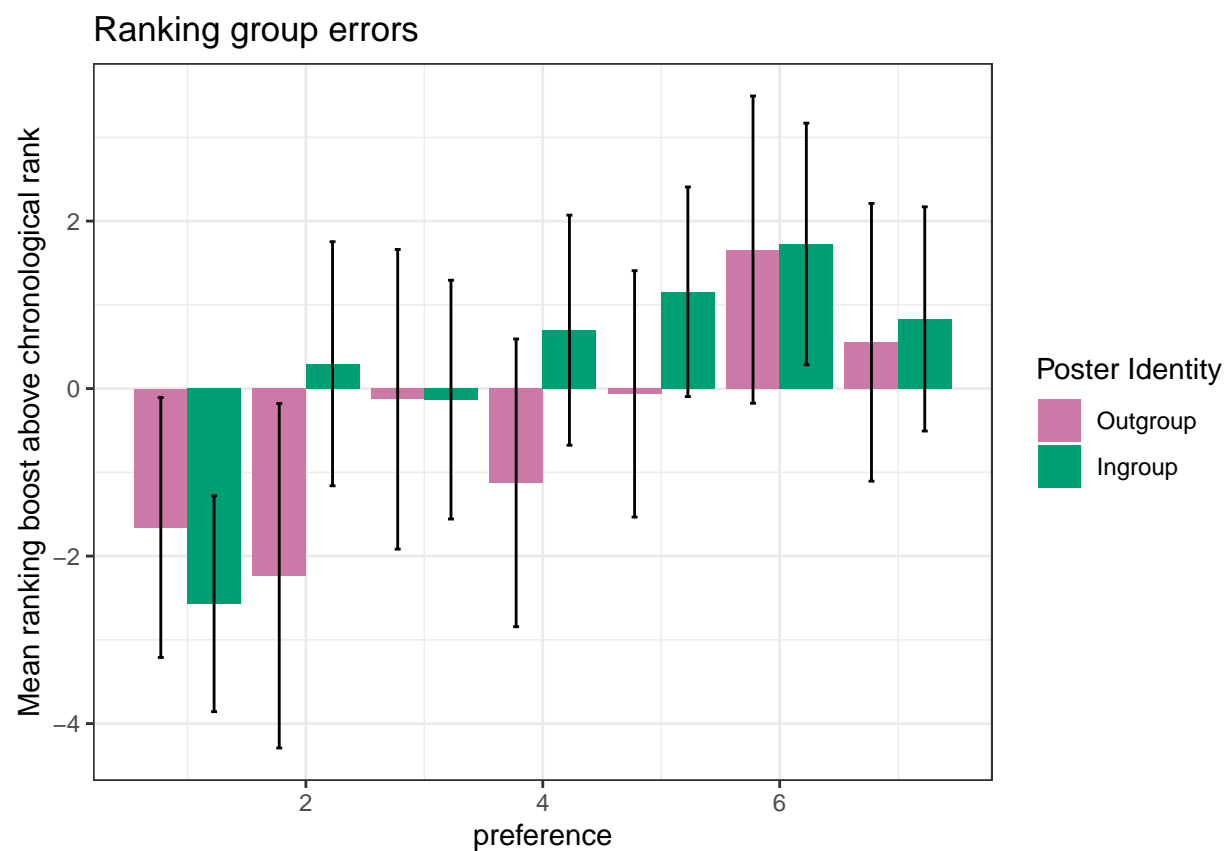
## Executive Summary

Artificial intelligence has become an important component of how social media platforms try to achieve the goal of bringing people together, by helping prioritize what we see and consume online. These algorithms have the potential to expand people’s social networks, but – given evidence of bias with algorithms in other settings – also have the risk of narrowing the breadth of those with whom we interact online, and reinforcing or potentially even exacerbating the high levels of segregation that characterize ‘normal’ (real-life) interactions. To explore this possibility, we conduct an audit study in which each subject (along with an RA) records their first 60 news feed posts (NF) and the first 60 users recommended by the ‘People You May Know’ algorithm (PYMK).

We find evidence of significant discrimination in the NF sorting. When the author and subject are of the same race, the post receives a boost equivalent to 20 percentile points of stated preference; a same-race post in the 50th percentile of stated preference is ranked the same on average as an opposite-race post in the 70th percentile. We find no evidence of discrimination in the PYMK recommendations. We reconcile these findings by distinguishing between behaviors dominated by System 1 (driven by implicit/subconscious attitudes) vs System 2 (driven by explicit/conscious attitudes).

Paper Figures





% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:34:29

Table 1:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−1.006296*** (0.339386)			−1.007704*** (0.338416)	−0.931093*** (0.330125)	
I(100 *norm.pctle)		−0.038949*** (0.005737)		−0.038960*** (0.005735)		−0.040080*** (0.005579)
time_rank			0.232724*** (0.010967)		0.232392*** (0.010963)	0.233469*** (0.010932)
Constant	23.903490*** (0.263650)	25.246370*** (0.331596)	17.874620*** (0.302280)	25.855030*** (0.389394)	18.444260*** (0.363434)	19.864020*** (0.409220)
Observations	7,866	7,866	7,866	7,866	7,866	7,866
R <sup>2</sup>	0.001117	0.005826	0.054160	0.006946	0.055116	0.060329
Adjusted R <sup>2</sup>	0.000990	0.005700	0.054040	0.006693	0.054876	0.060090

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

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% Date and time: Sun, Jan 17, 2021 - 13:34:30

Table 2:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−0.320043 (0.351422)			−0.173920 (0.348483)	−0.260766 (0.351182)	
I(100 *norm.pctle)		−0.079599*** (0.005687)		−0.079514*** (0.005690)		−0.077353*** (0.005939)
friend_rank			0.050286*** (0.009575)		0.050057*** (0.009580)	0.013012 (0.009923)
Constant	30.368040*** (0.287258)	34.141870*** (0.328728)	28.637850*** (0.332681)	34.253810*** (0.397966)	28.819020*** (0.412562)	33.636990*** (0.506265)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R <sup>2</sup>	0.000076	0.017689	0.002529	0.017711	0.002579	0.017844
Adjusted R <sup>2</sup>	−0.000016	0.017599	0.002437	0.017531	0.002396	0.017664

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:34:30

Table 3:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−0.320043 (0.351422)			−0.173920 (0.348483)	−0.251979 (0.350972)	
I(100 *norm.pctle)		−0.079599*** (0.005687)		−0.079514*** (0.005690)		−0.075465*** (0.005937)
pct_friend_rank			0.060297*** (0.009570)		0.060085*** (0.009574)	0.023990** (0.009920)
Constant	30.368040*** (0.287258)	34.141870*** (0.328728)	28.335990*** (0.332496)	34.253810*** (0.397966)	28.510760*** (0.412088)	33.211360*** (0.506023)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R <sup>2</sup>	0.000076	0.017689	0.003636	0.017711	0.003683	0.018217
Adjusted R <sup>2</sup>	−0.000016	0.017599	0.003544	0.017531	0.003500	0.018036

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

### control correlations

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Table 4: Correlations 1

	Pearson	Spearman	Kendall
NF Rank, Time	0.233	0.238	0.165
PYMK Rank, Pct Friends	0.060	0.060	0.041

Correlation matrix for benchmarks

### preference correlations

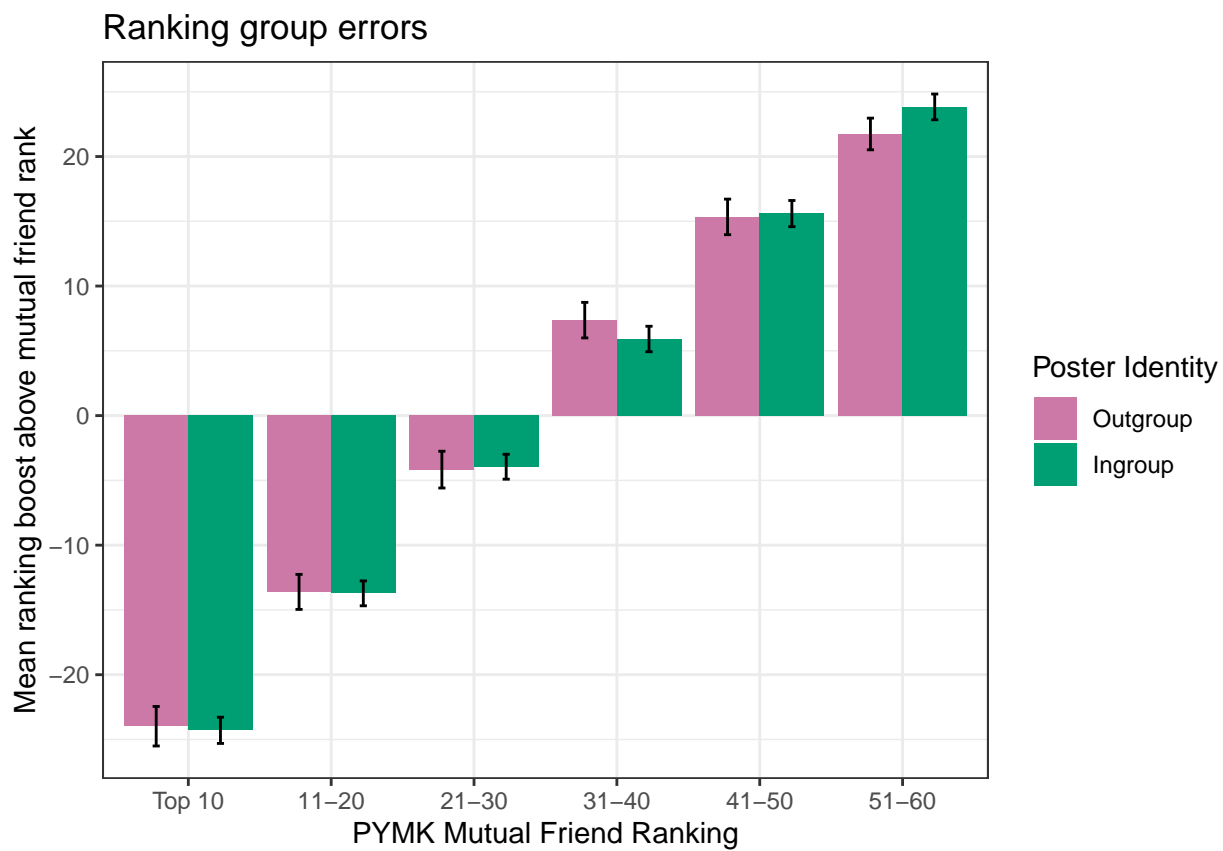
% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

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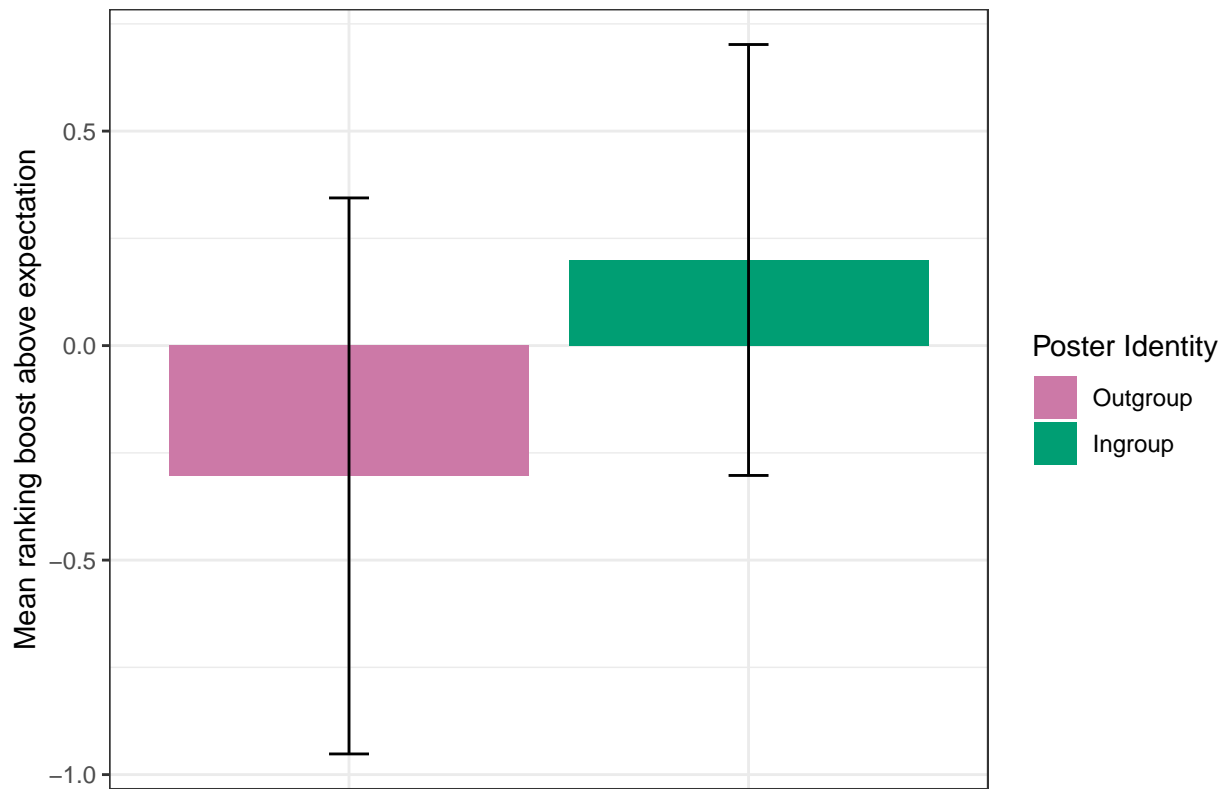
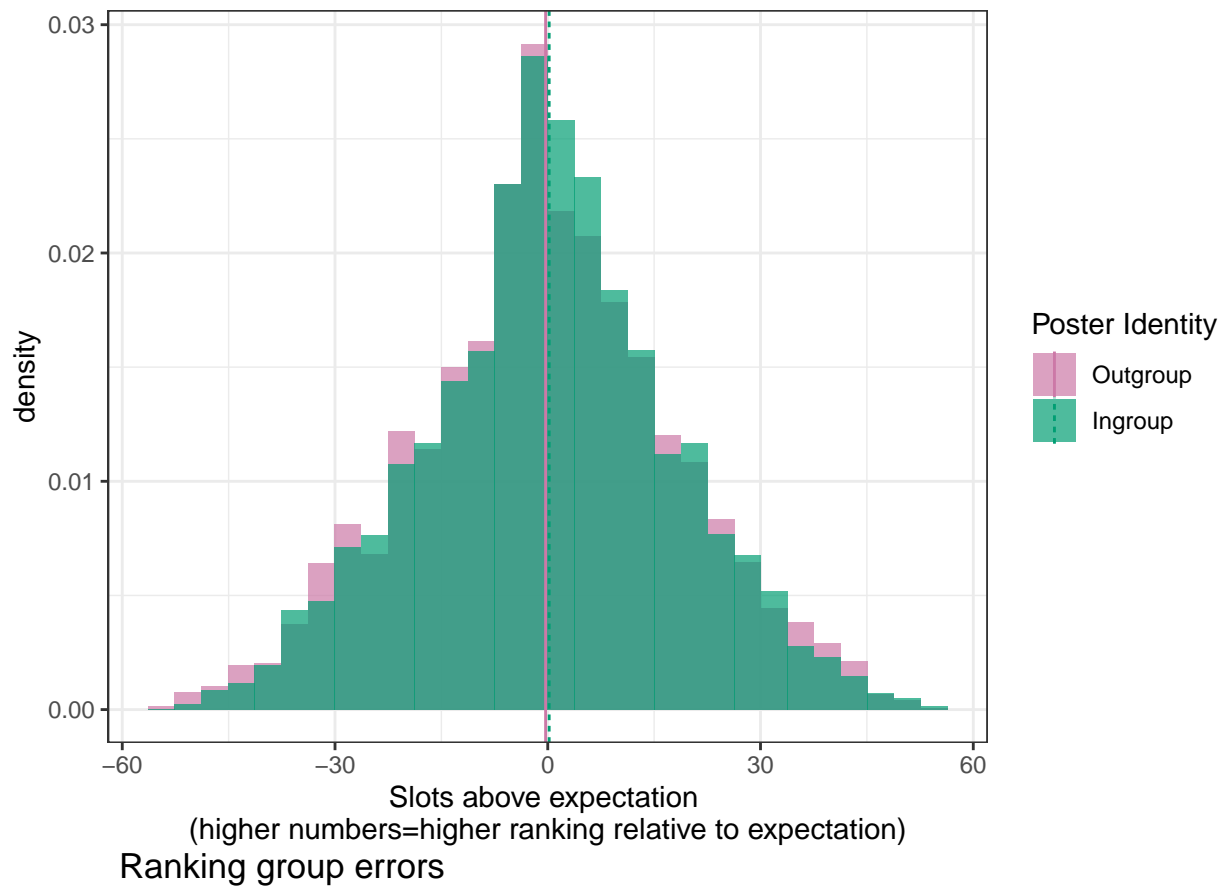
Table 5: Correlations 2

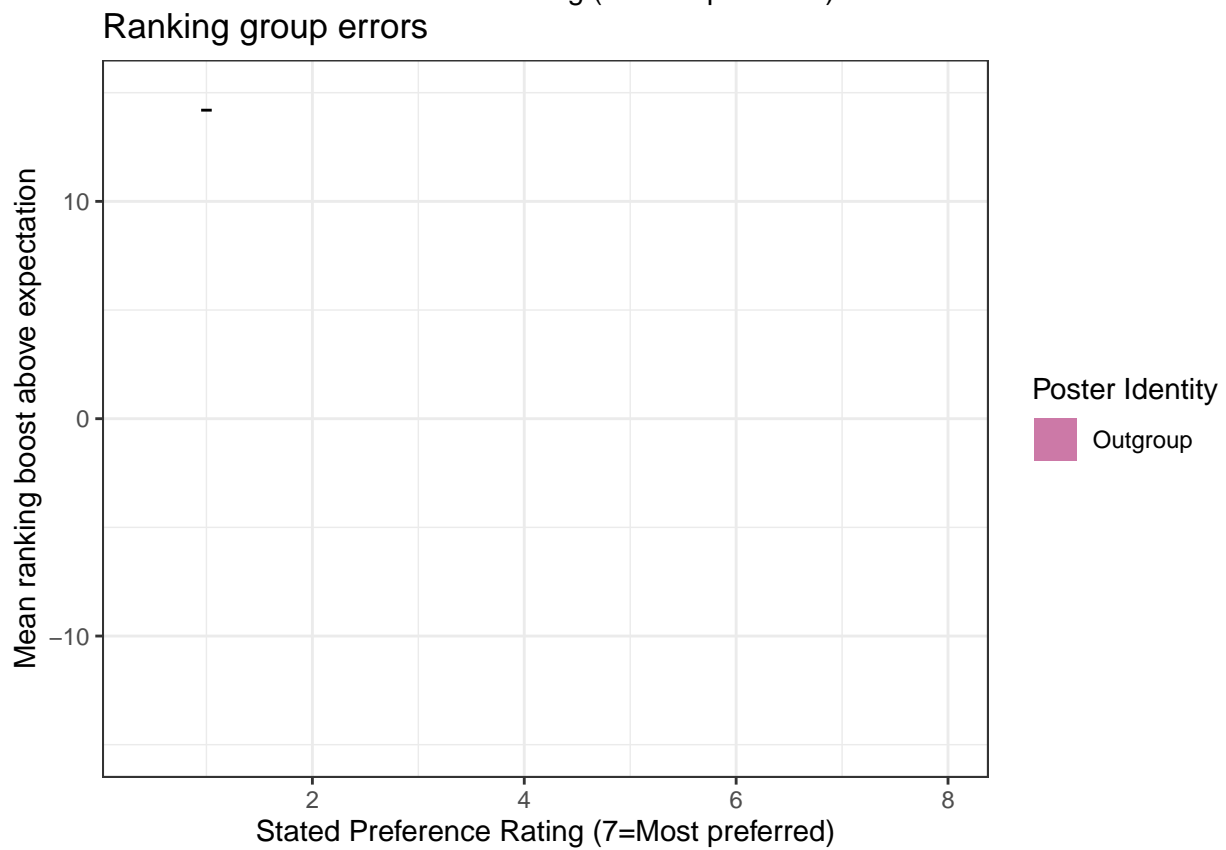
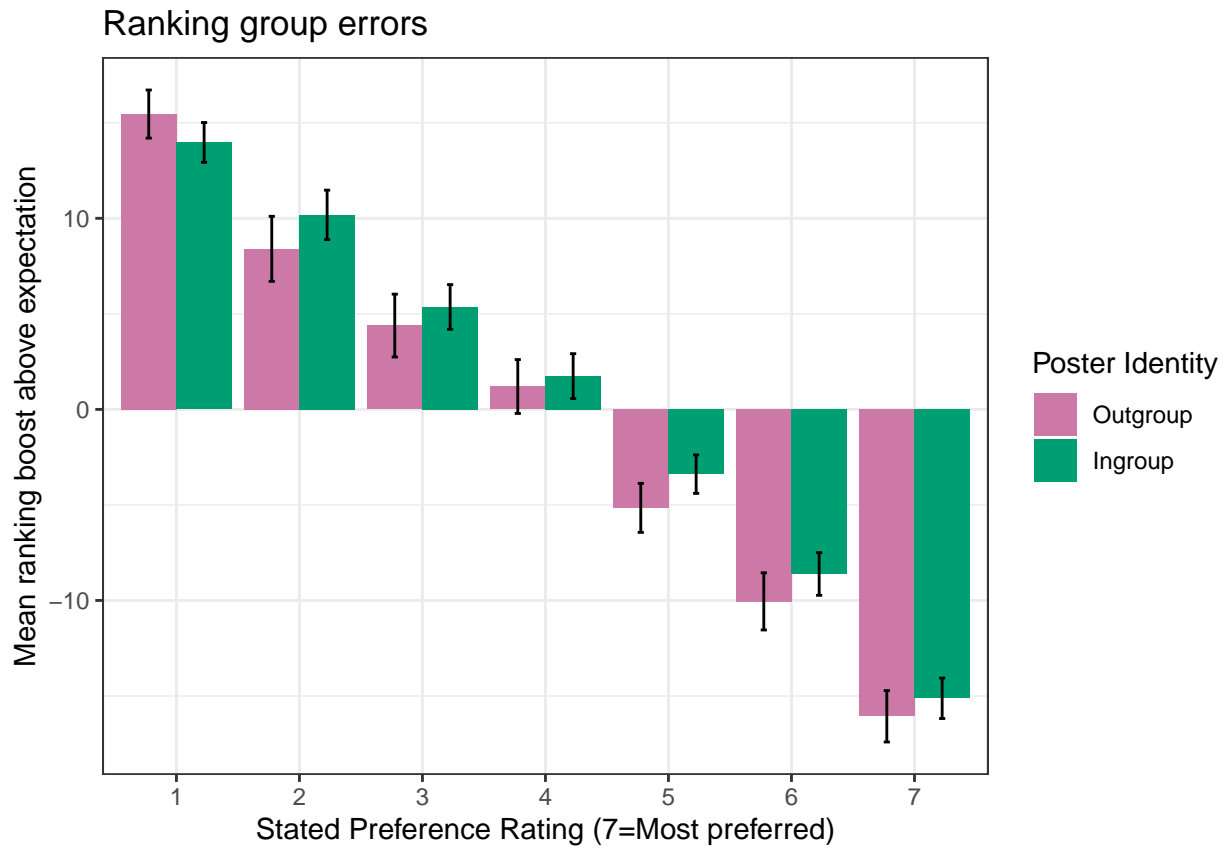
	Pearson	Spearman	Kendall
NF Rank, Preference	-0.078	-0.079	-0.053
PYMK Rank, Familiarity	-0.140	-0.134	-0.090

Correlation matrix for preferences

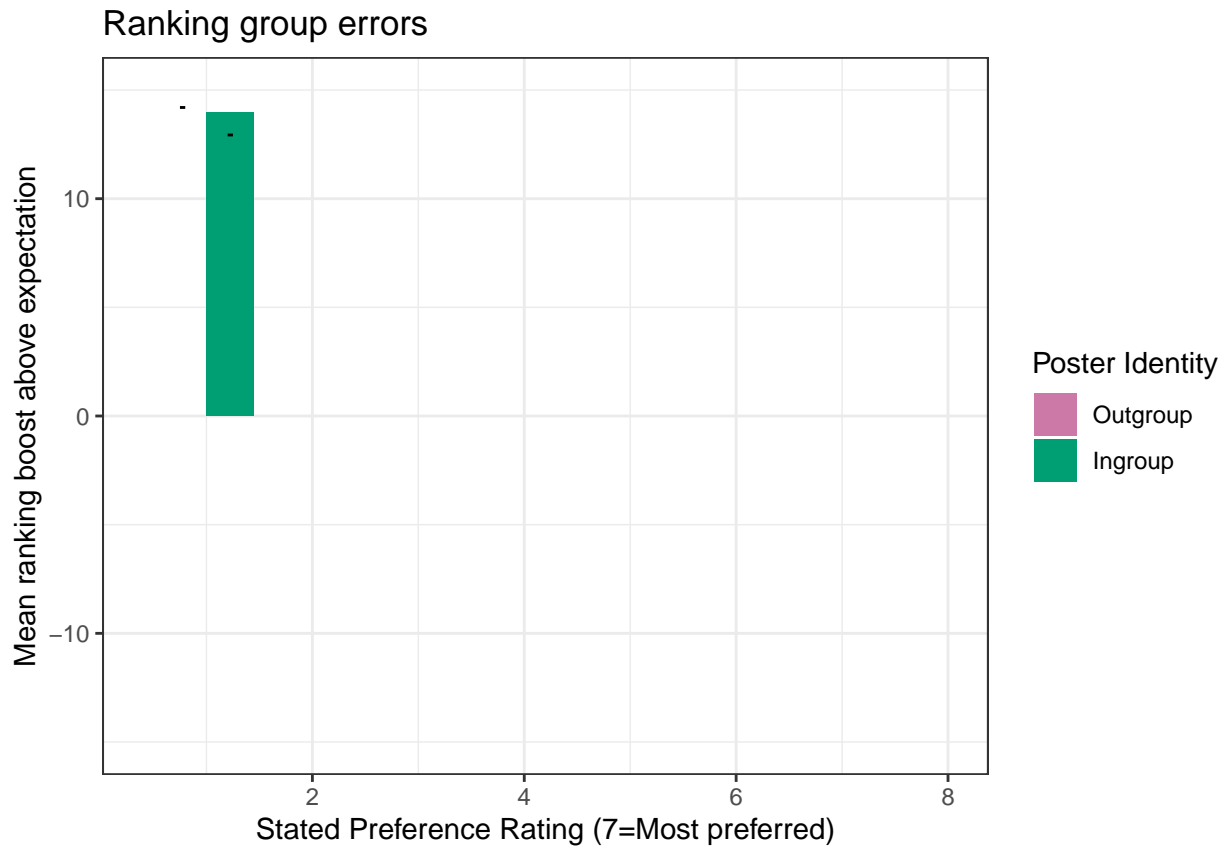


## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

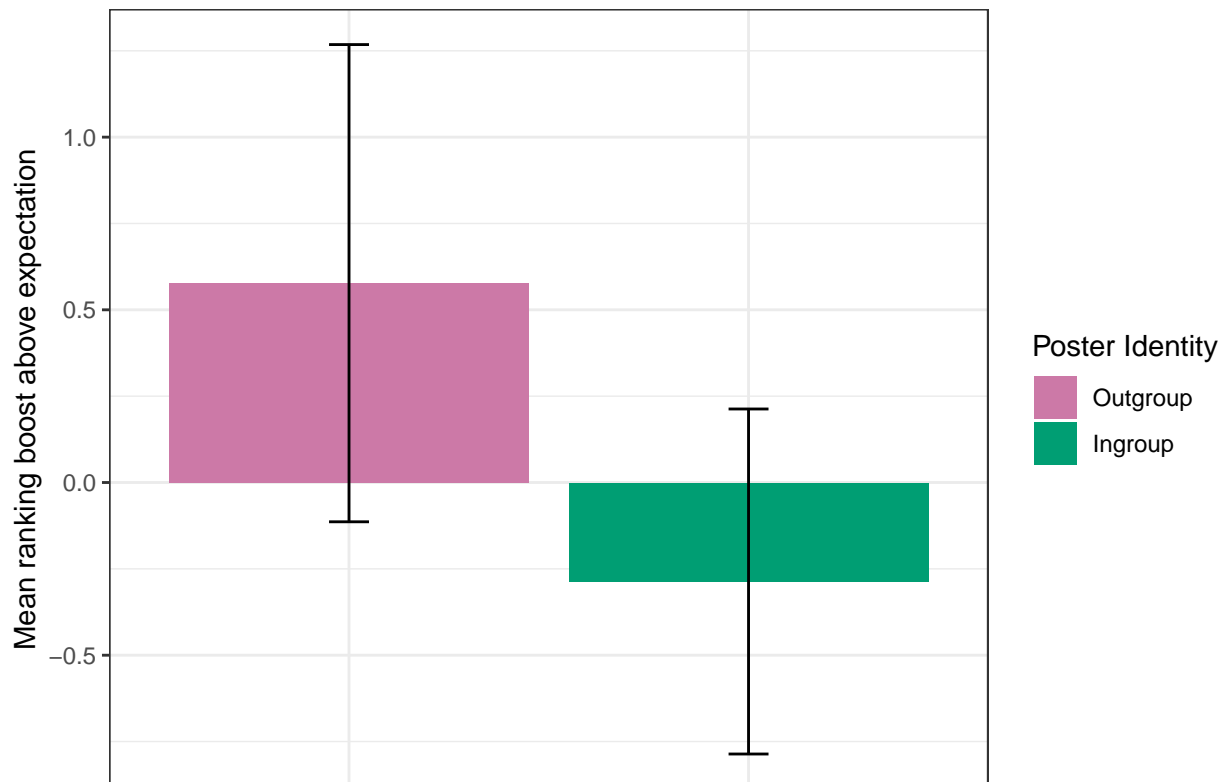
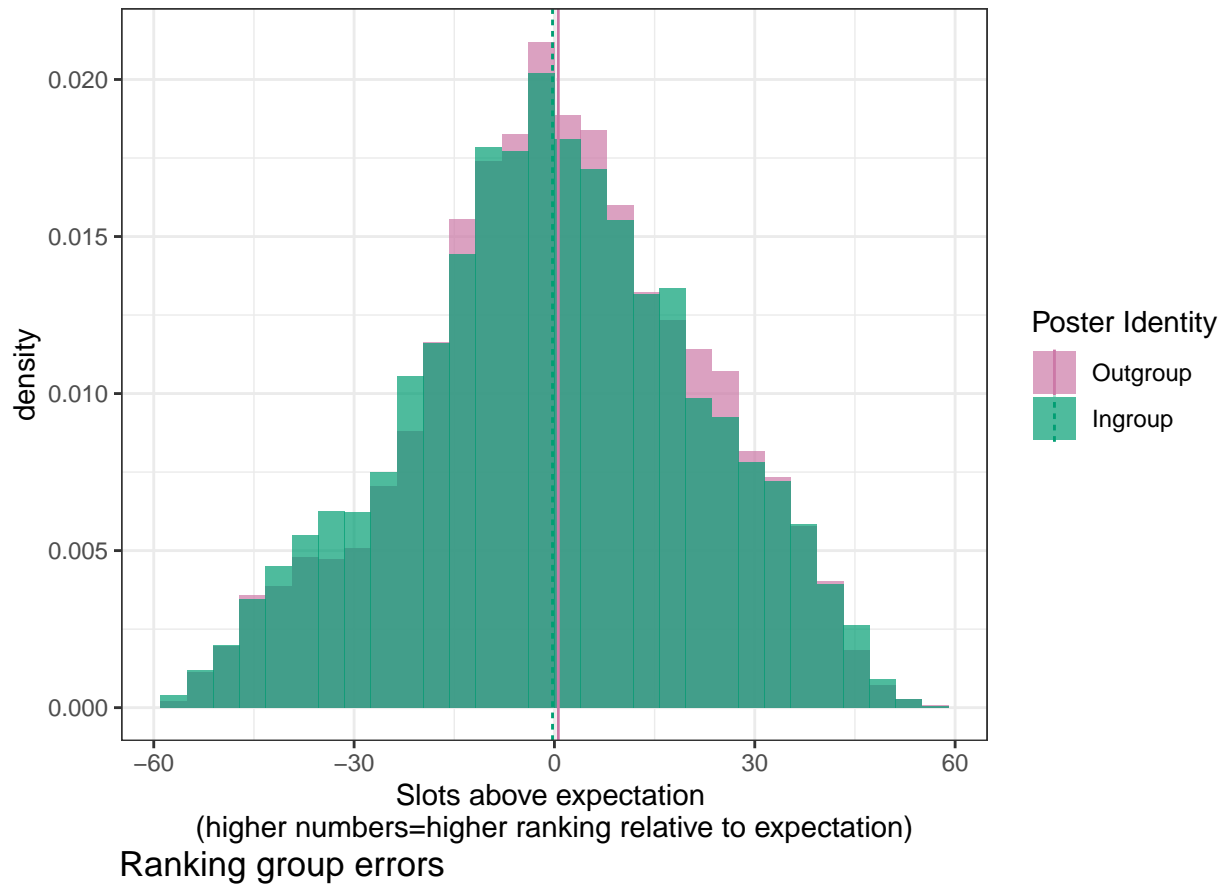


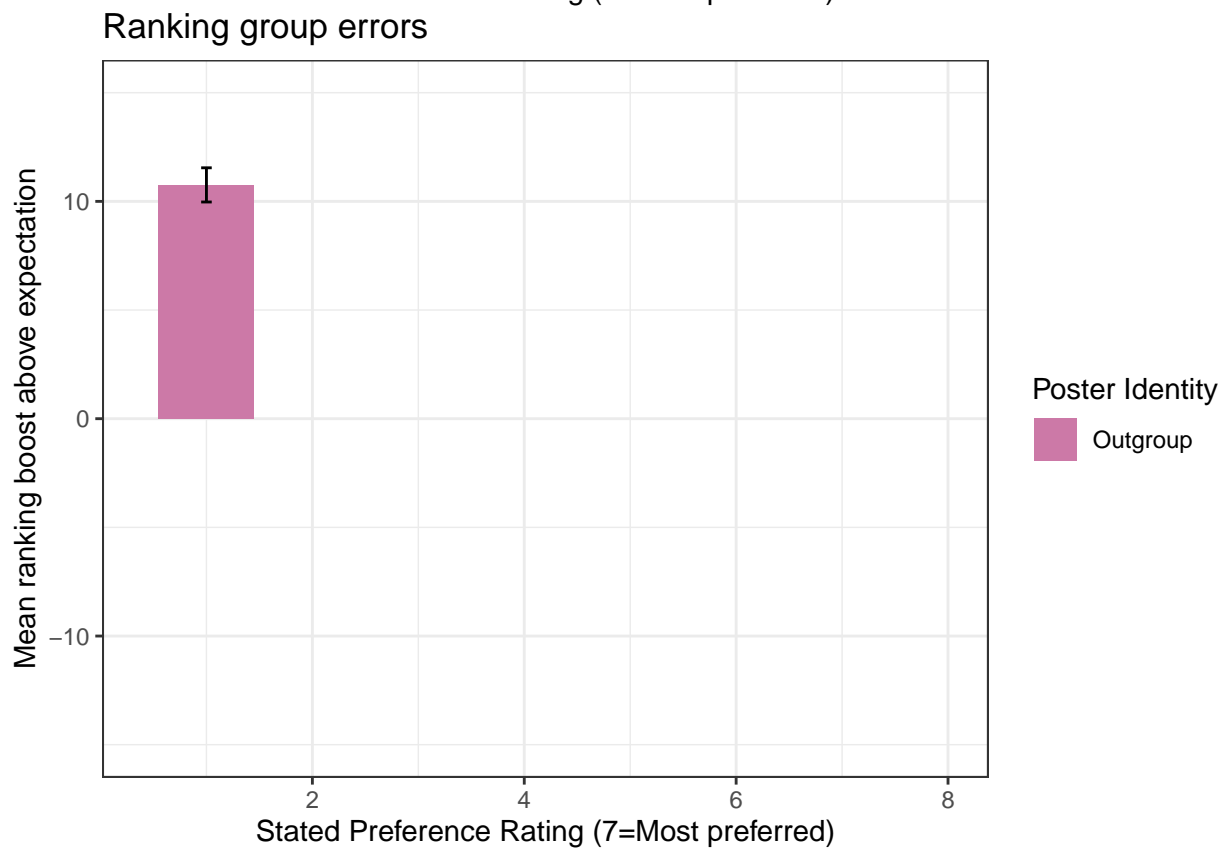
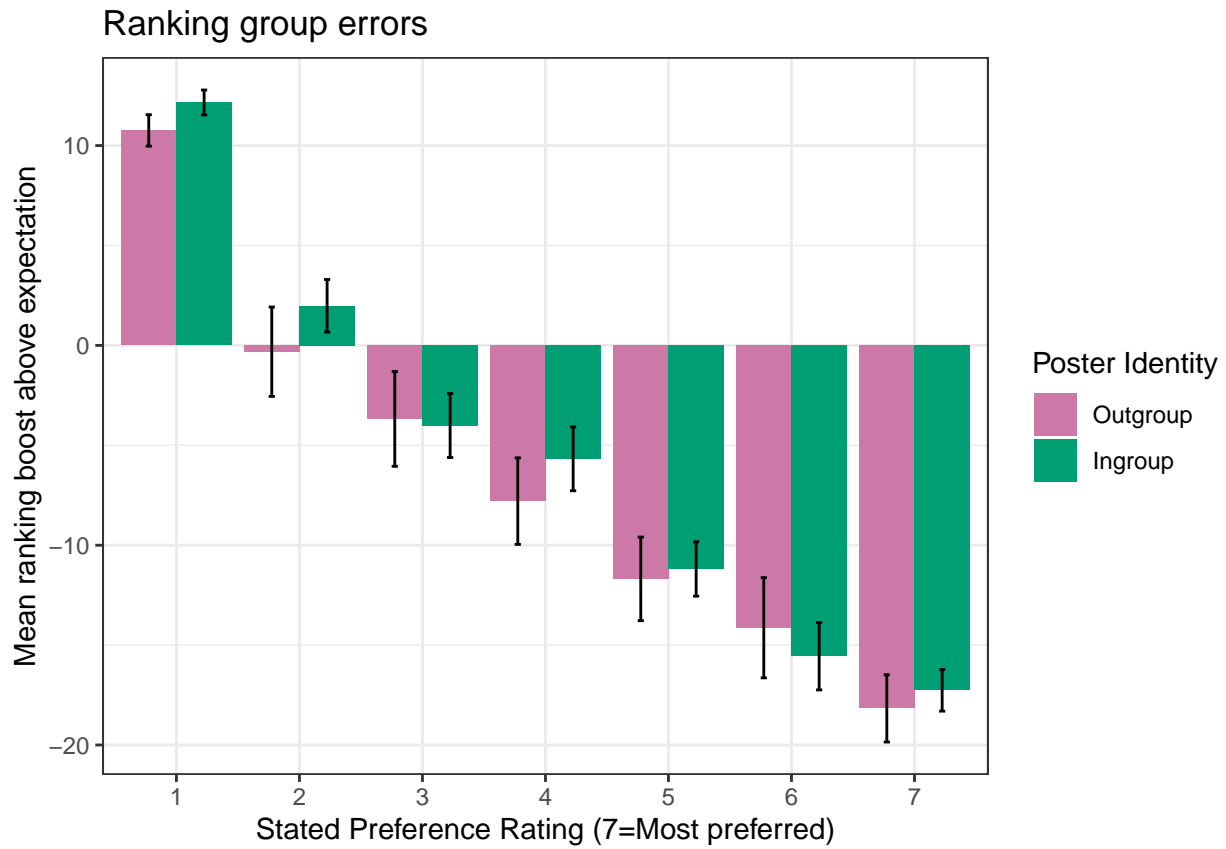


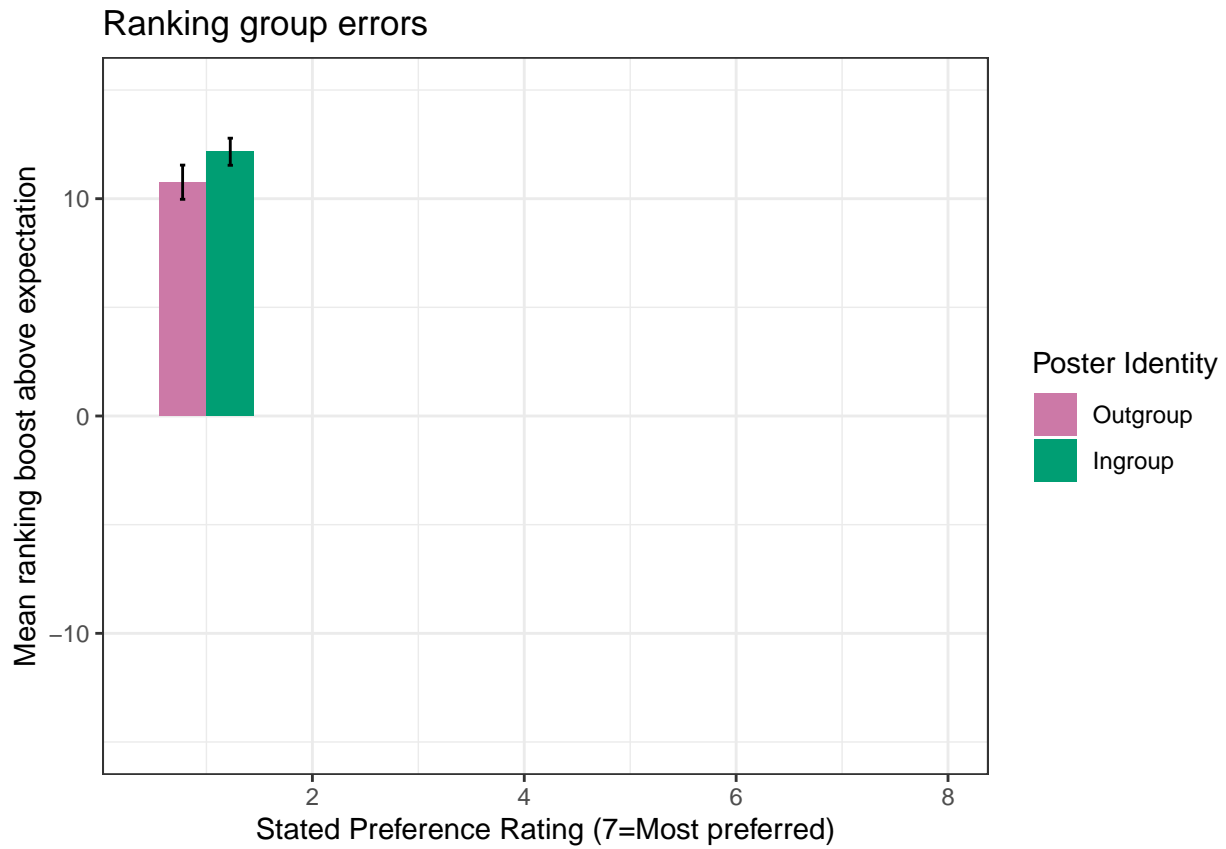




```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



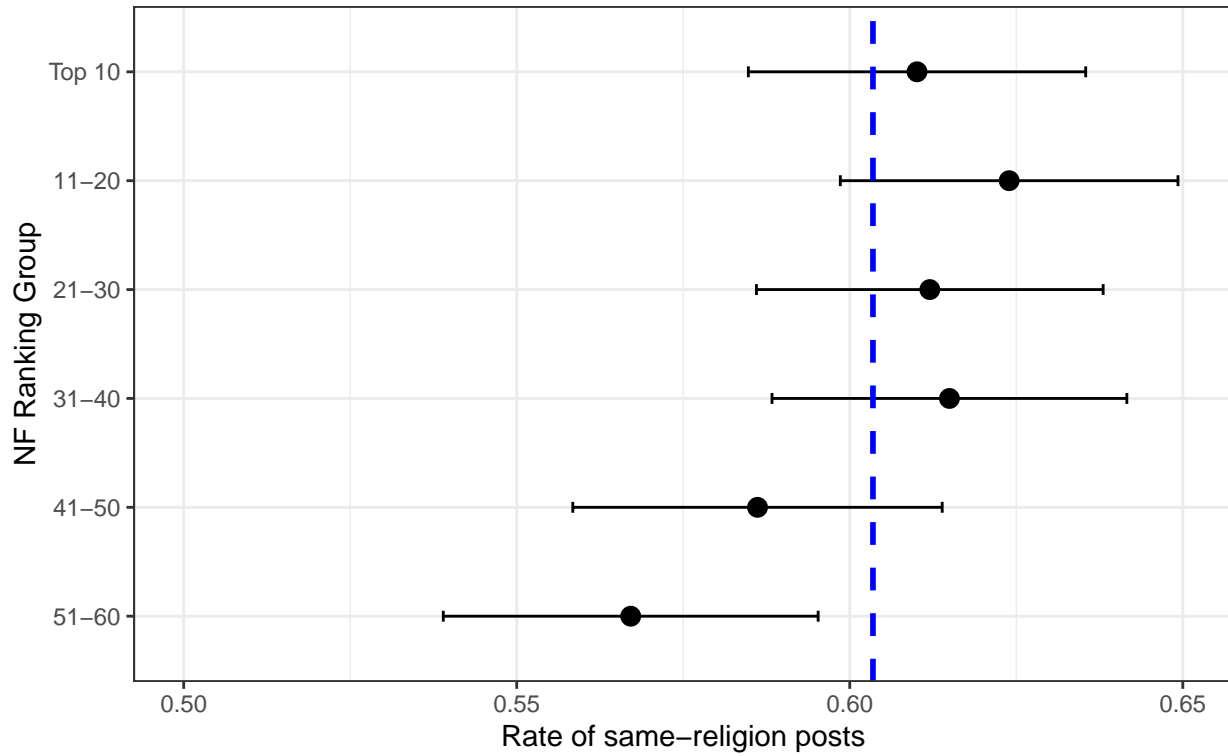




```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

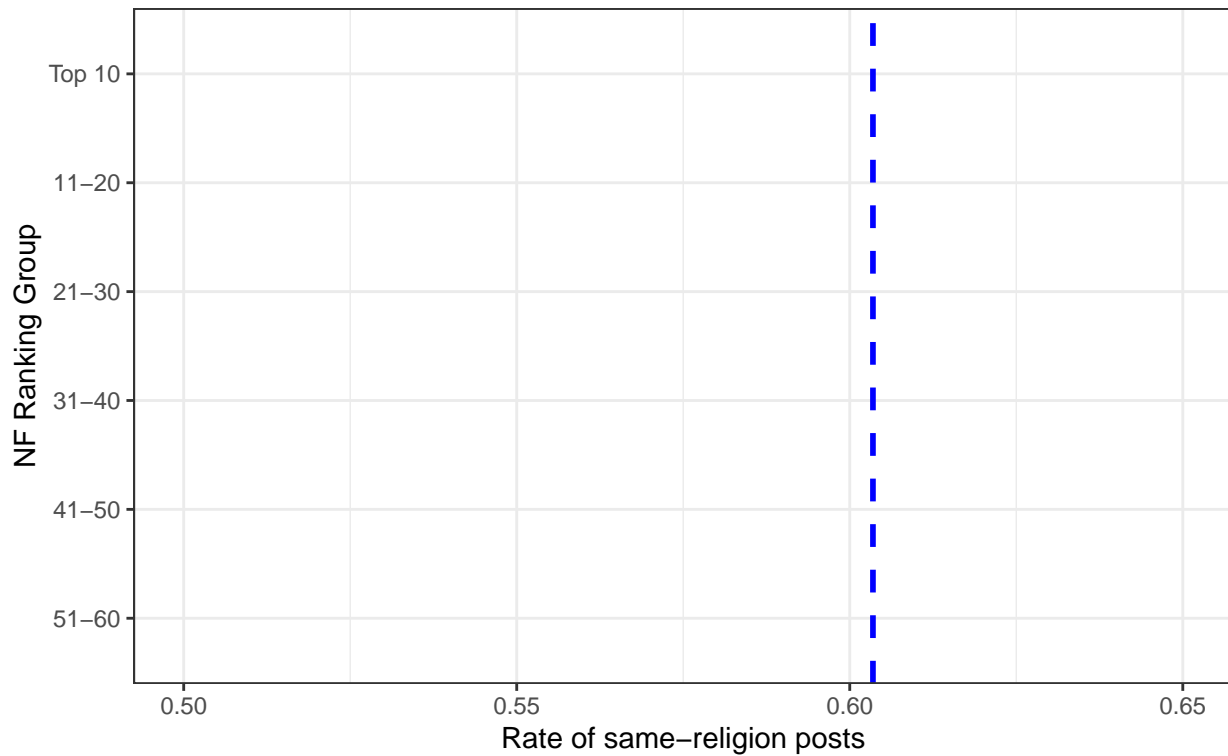
### Newsfeed preference for user's religion (India)

Same-religion posts get sorted closer to the top



## Newsfeed preference for user's religion (India)

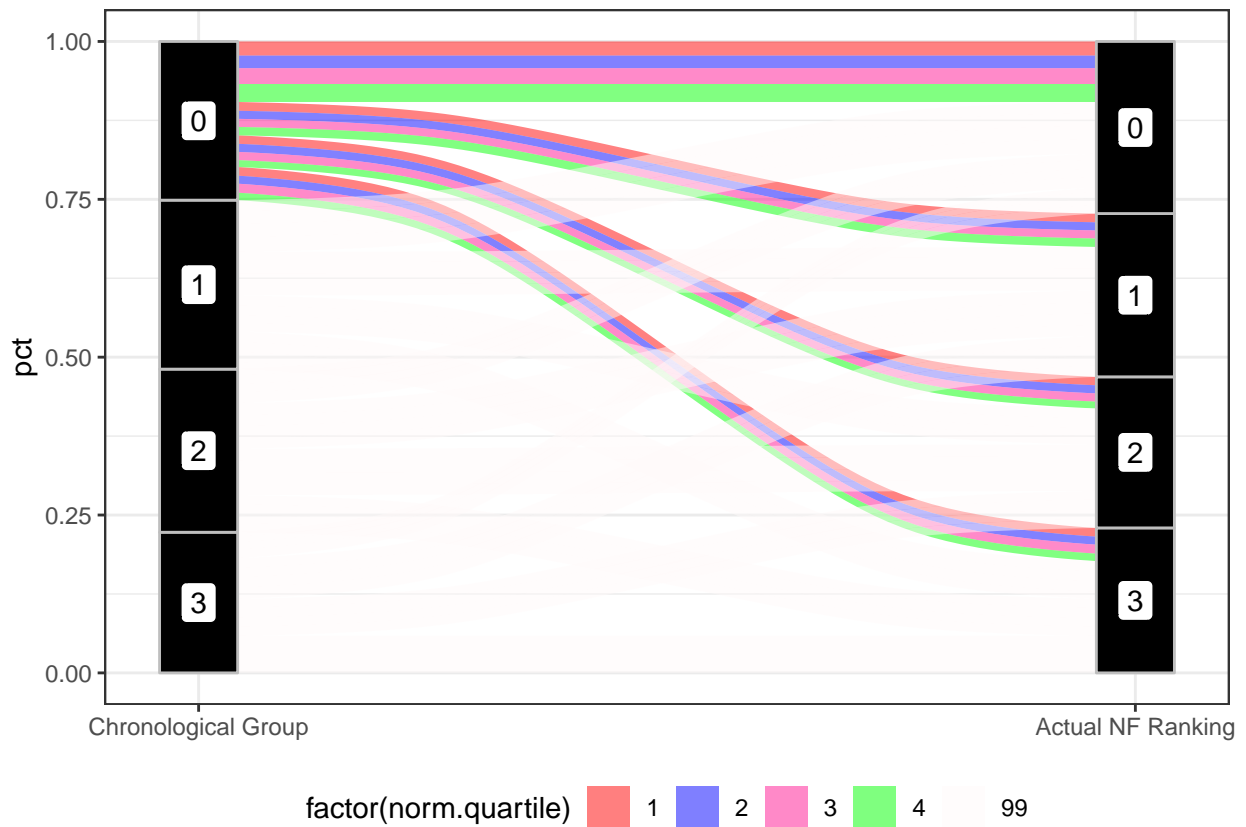
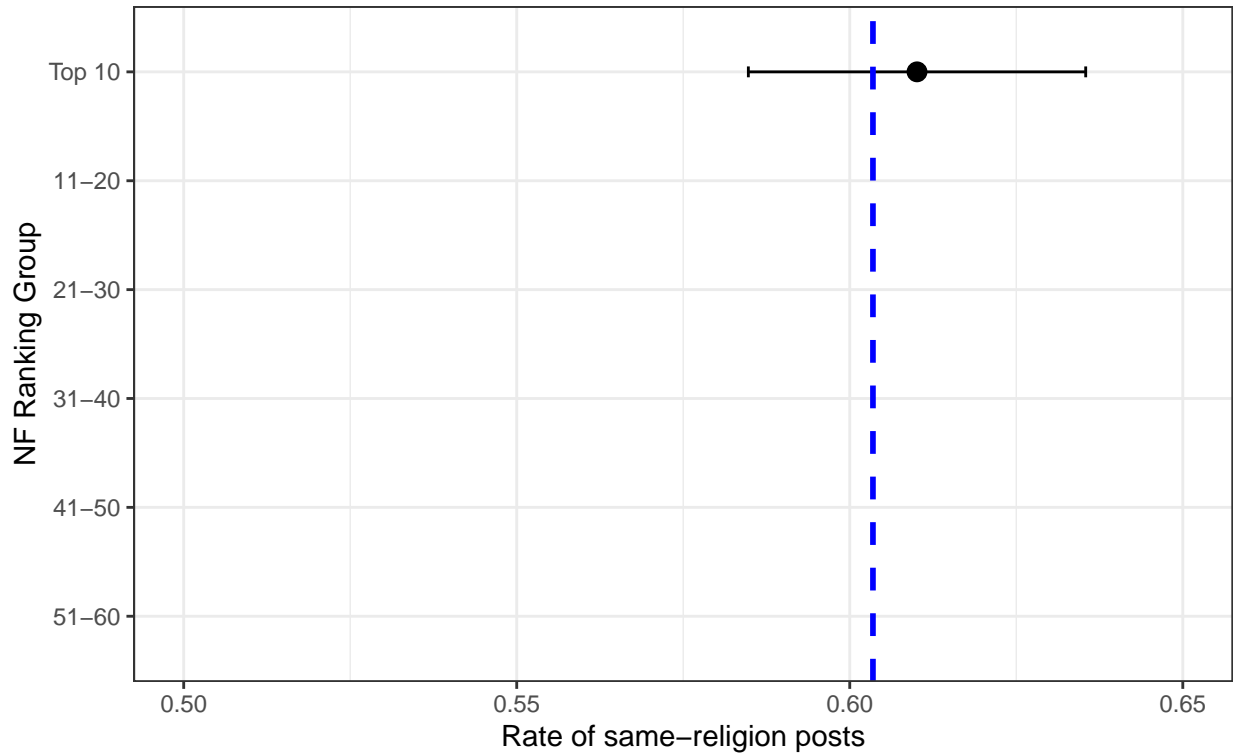
Same-religion posts get sorted closer to the top

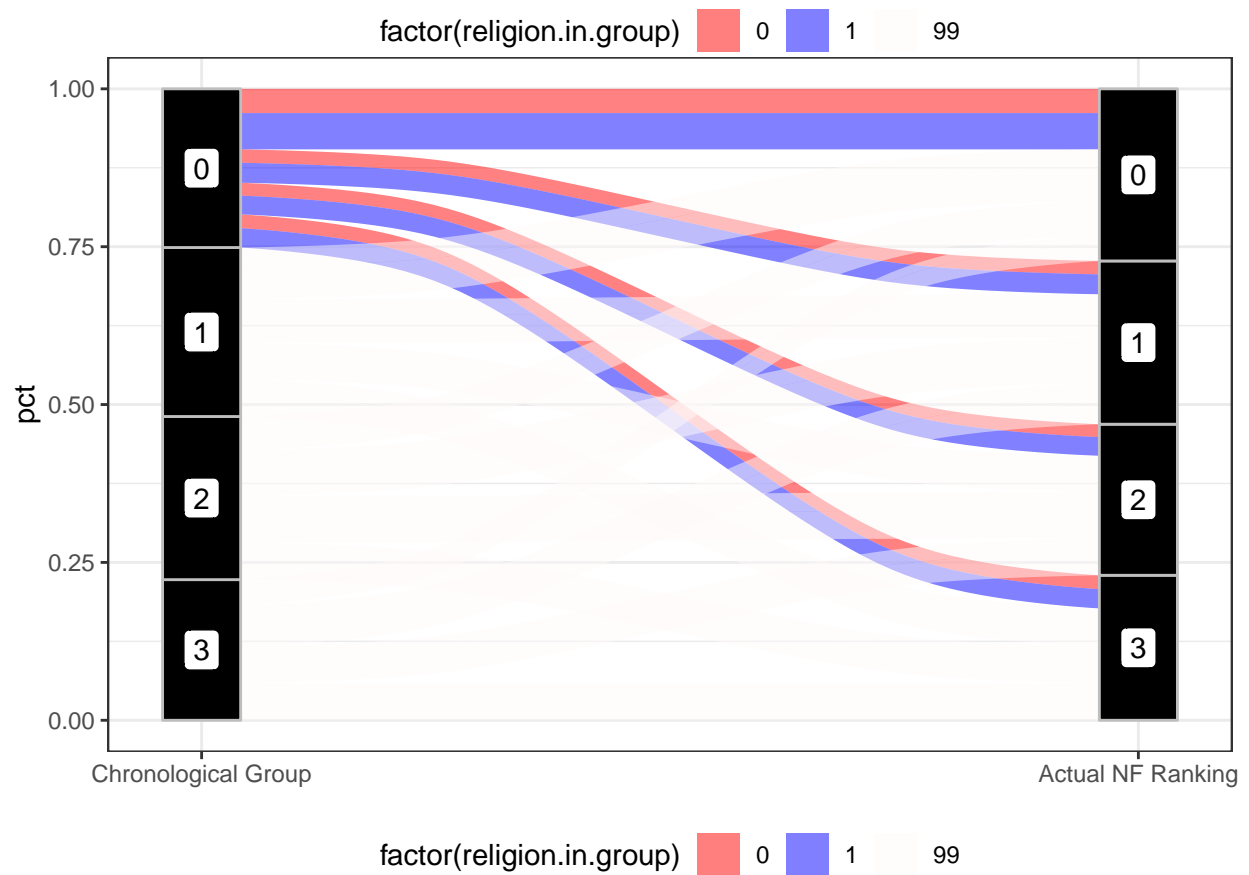
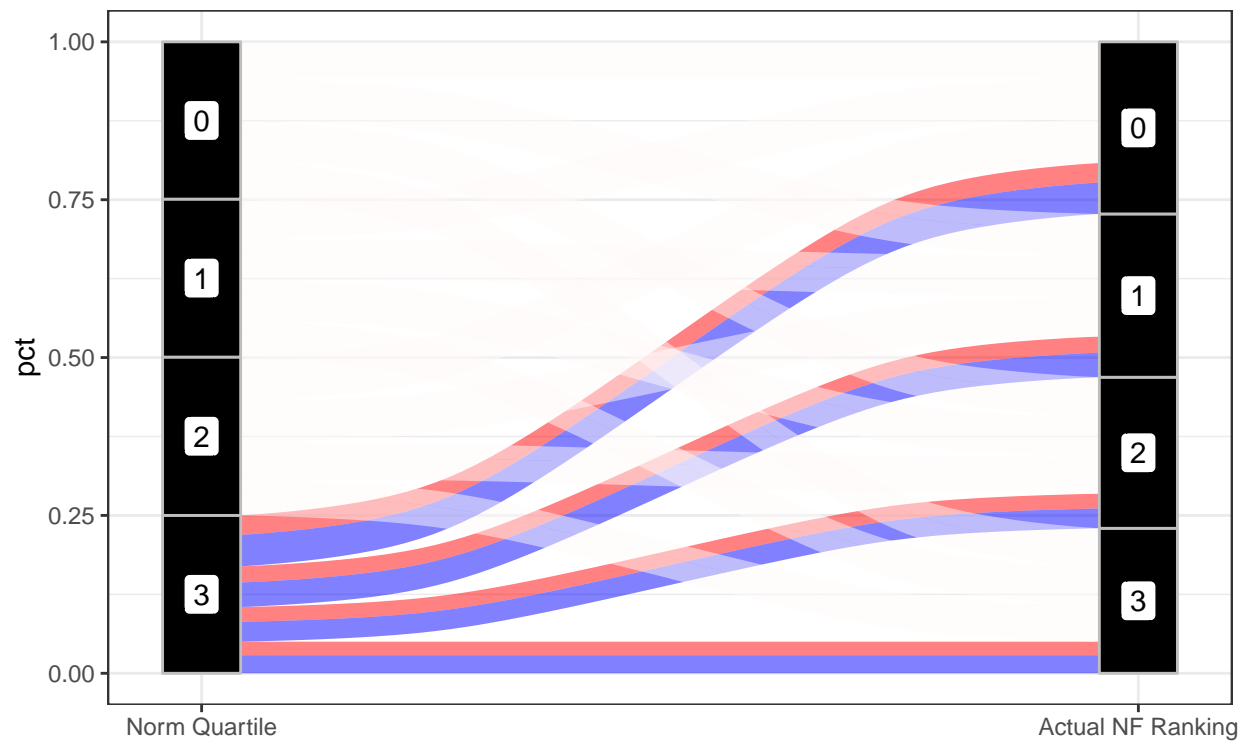


```
## geom_path: Each group consists of only one observation. Do you need to adjust  
## the group aesthetic?
```

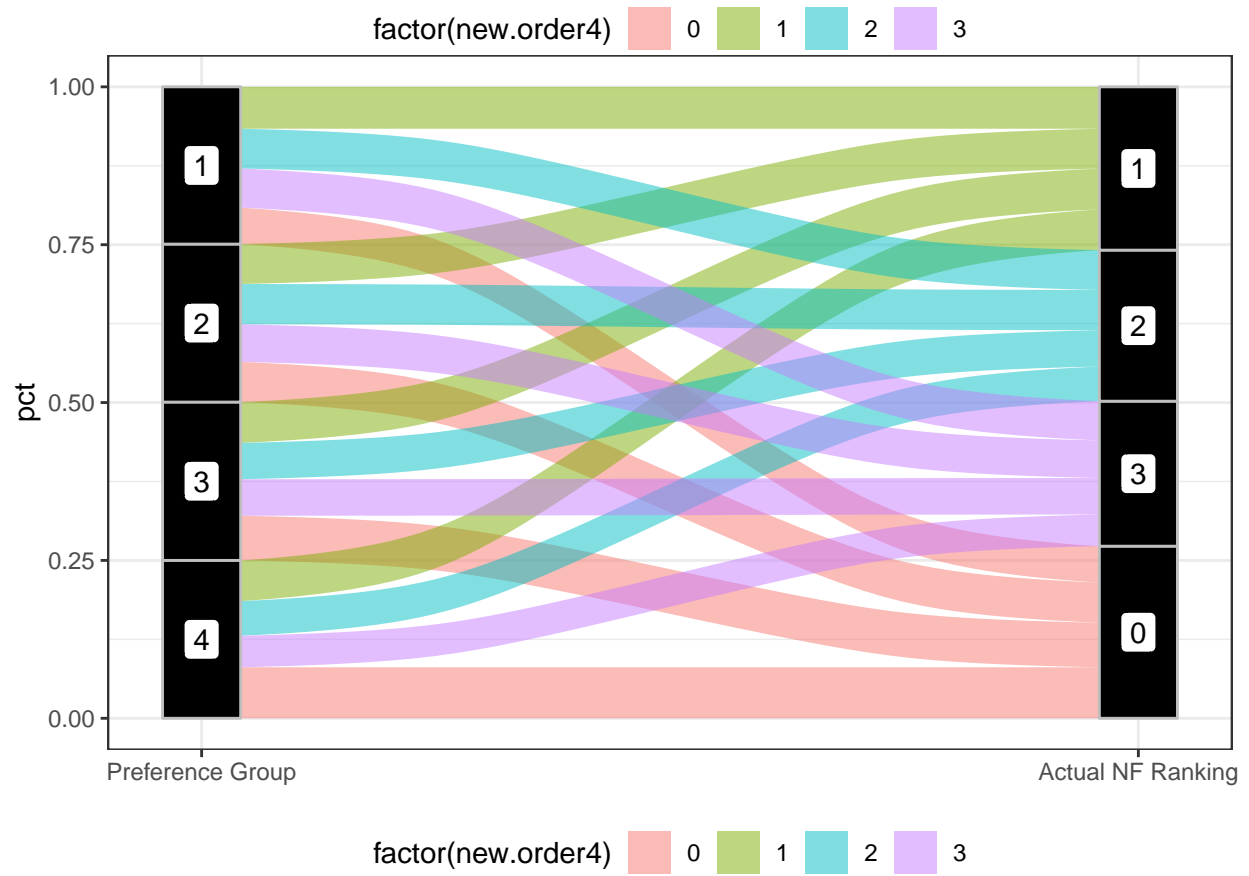
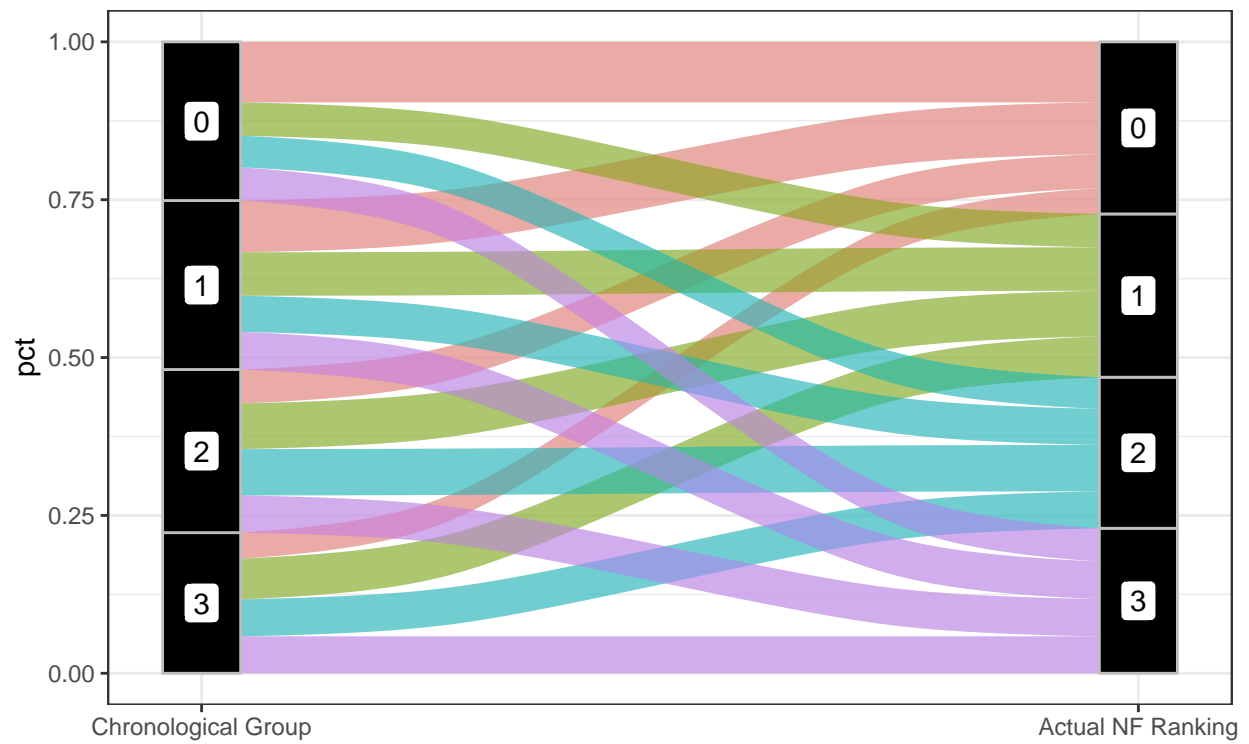
## Newsfeed preference for user's religion (India)

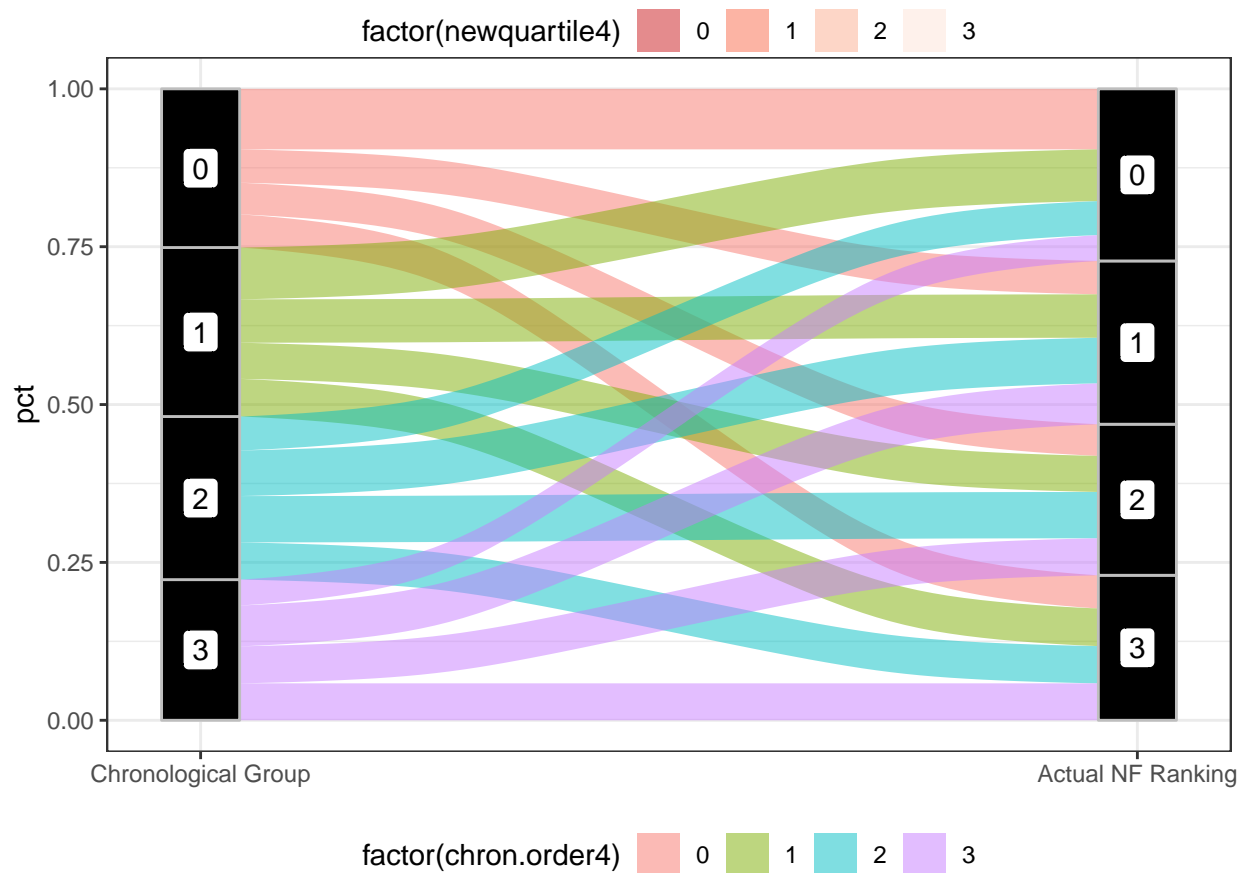
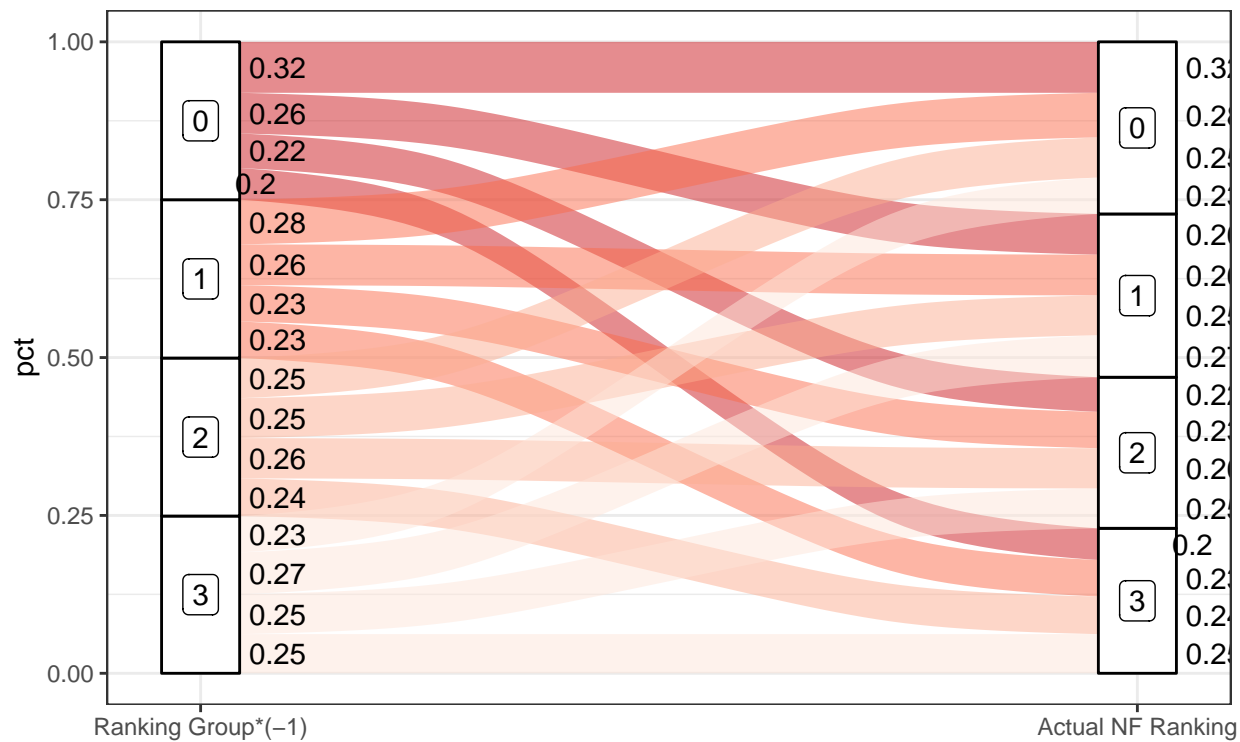
Same-religion posts get sorted closer to the top

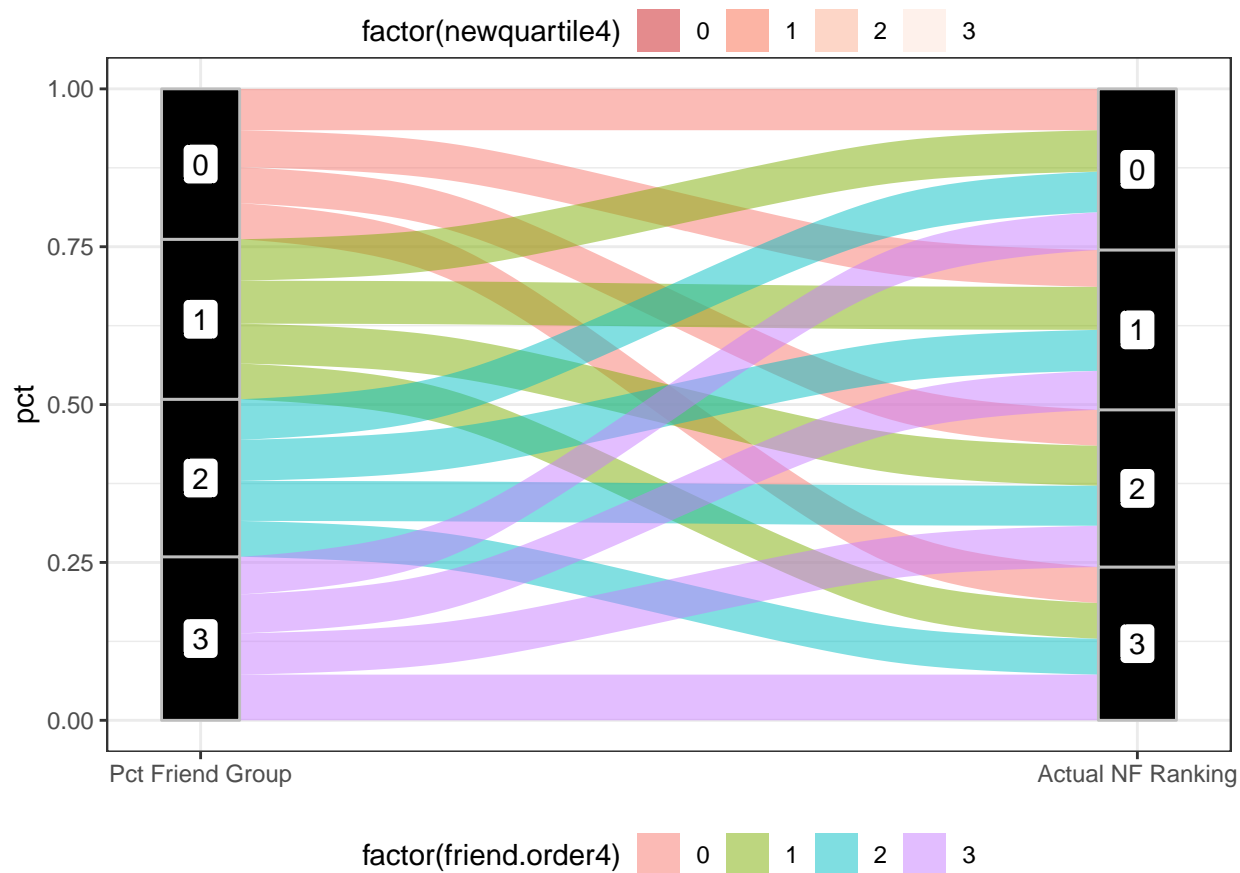
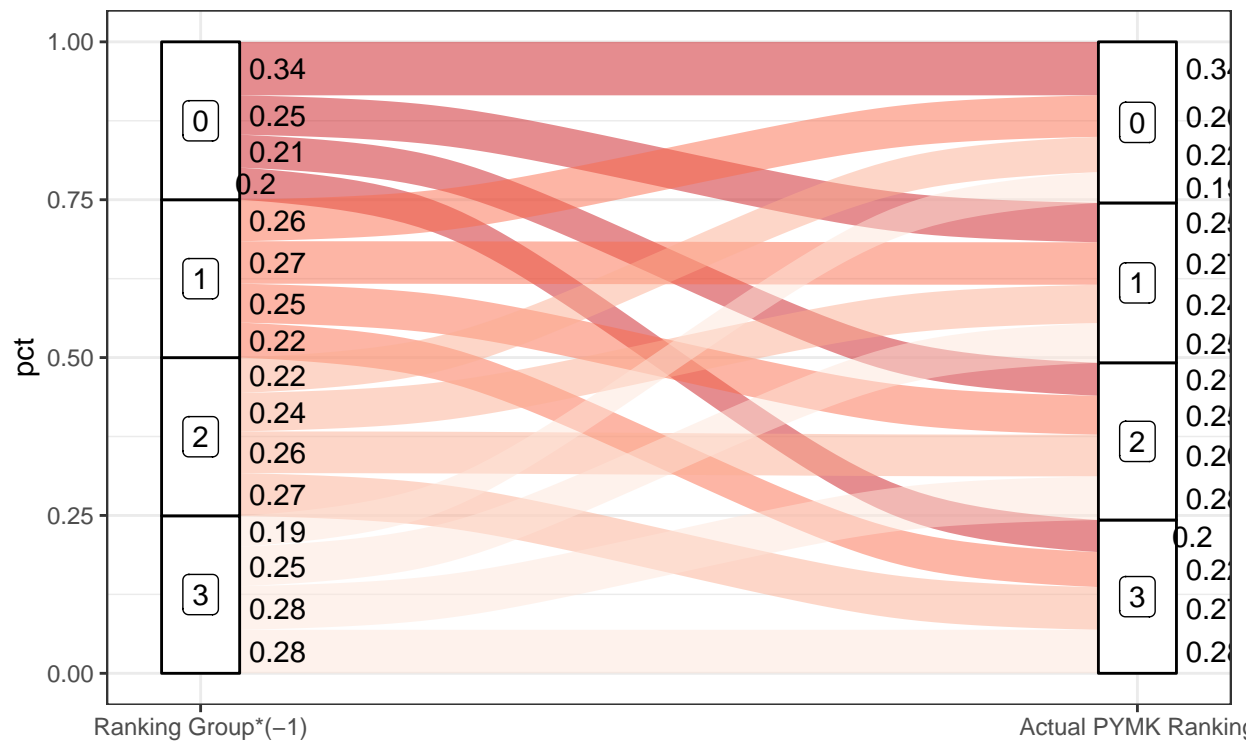


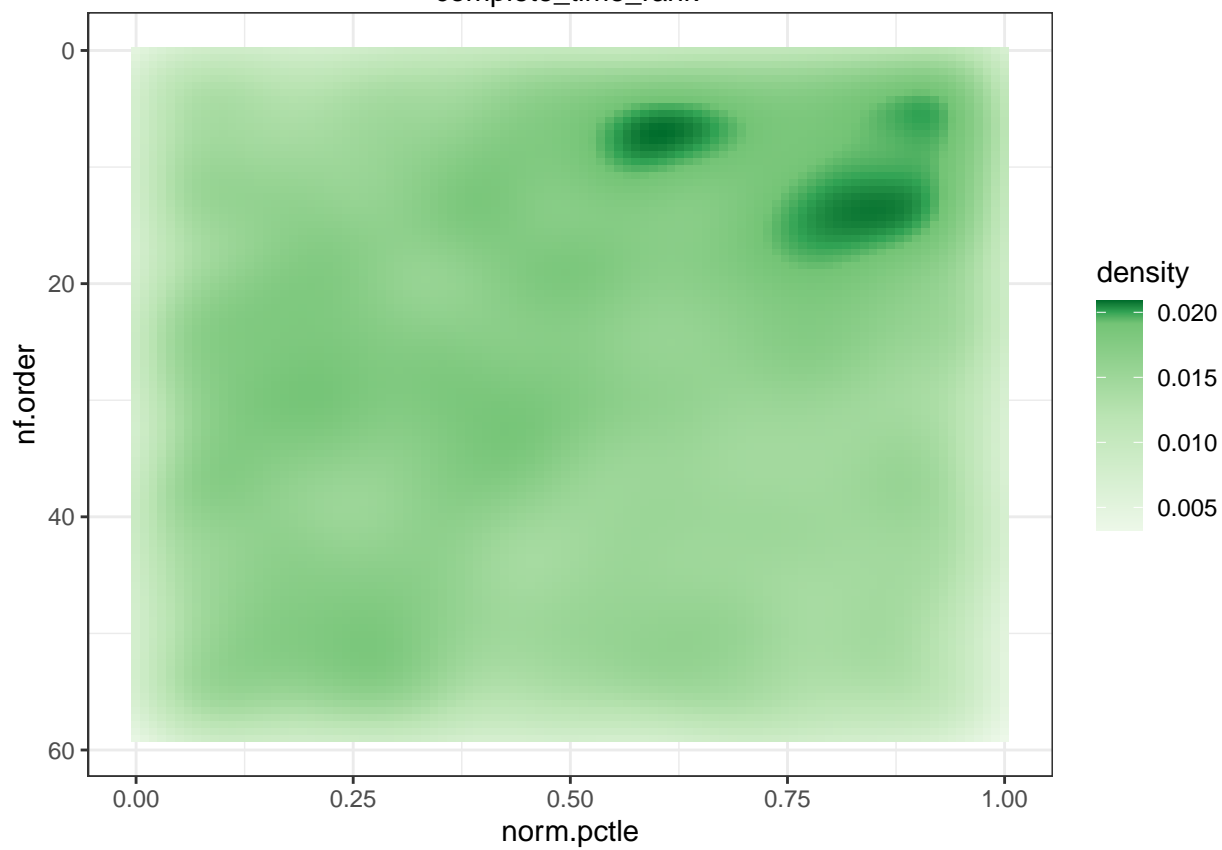
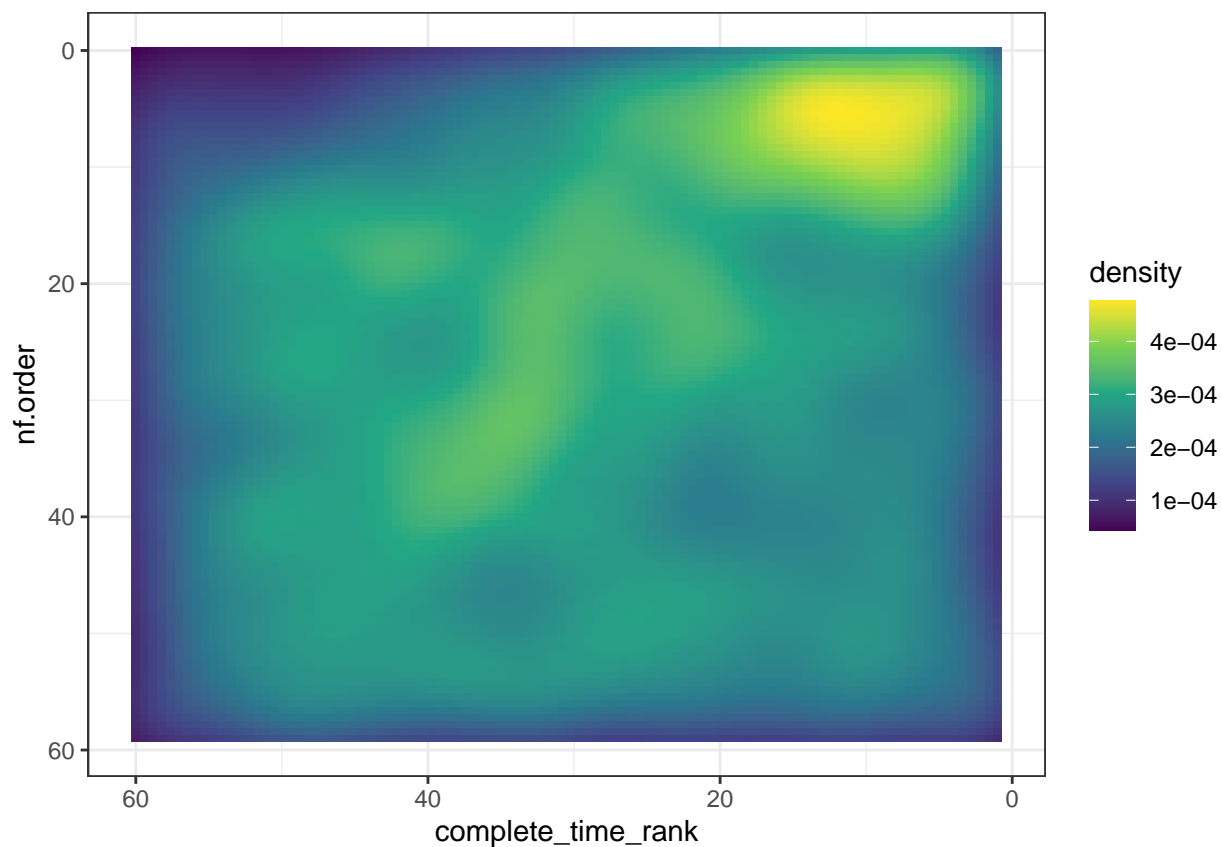


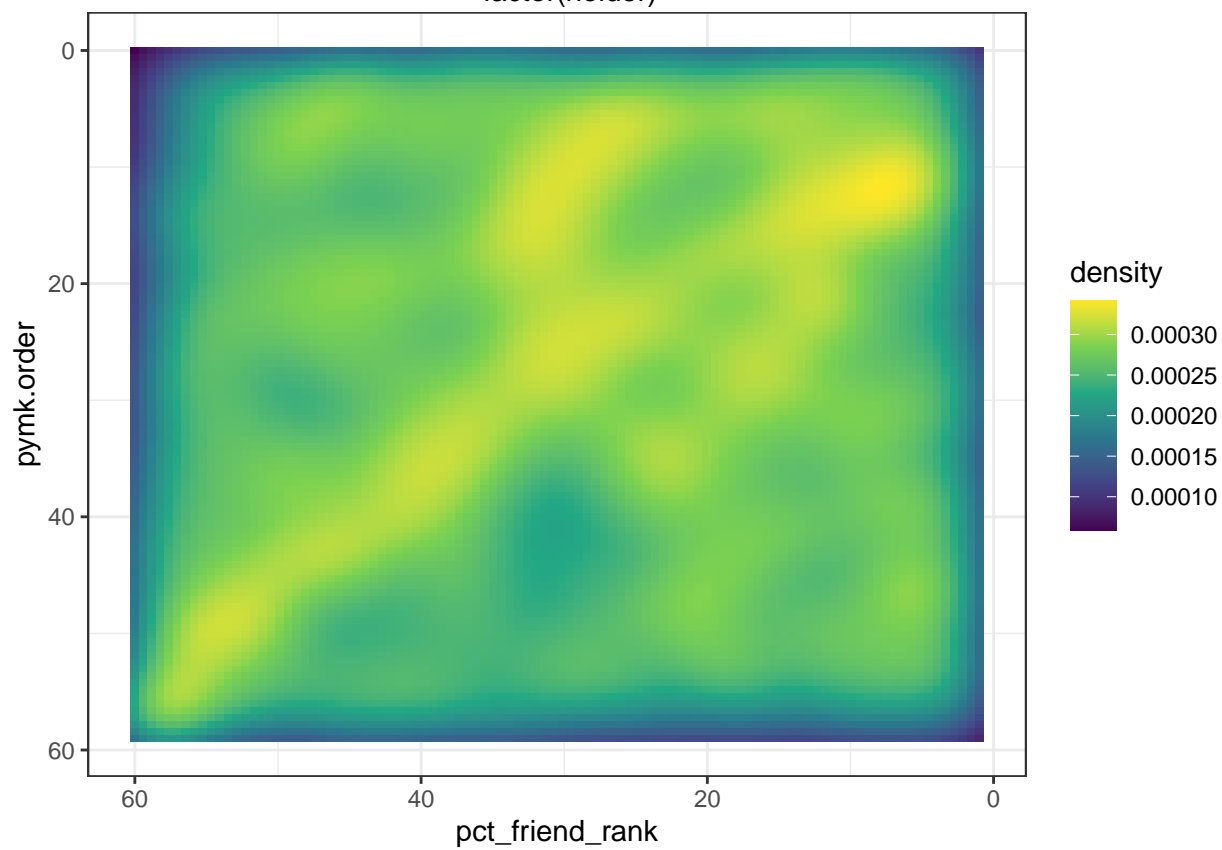
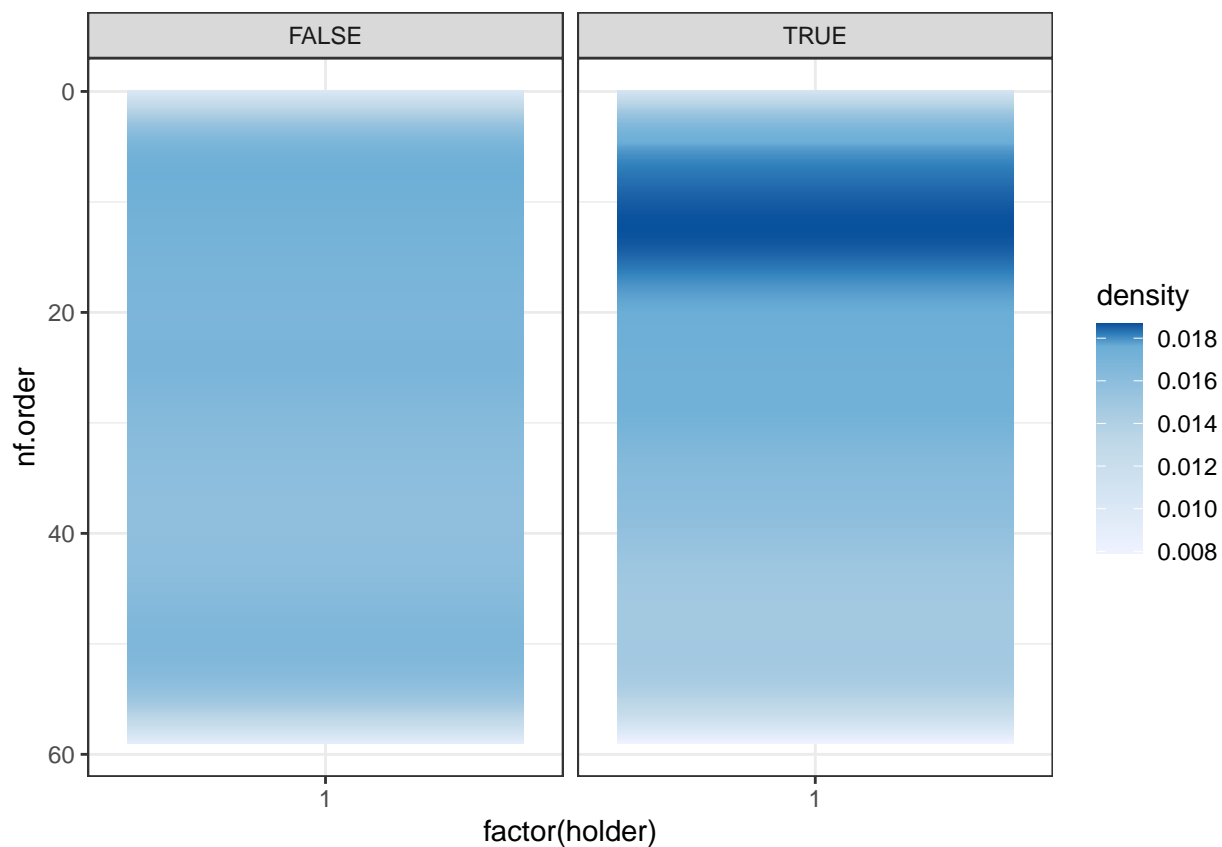


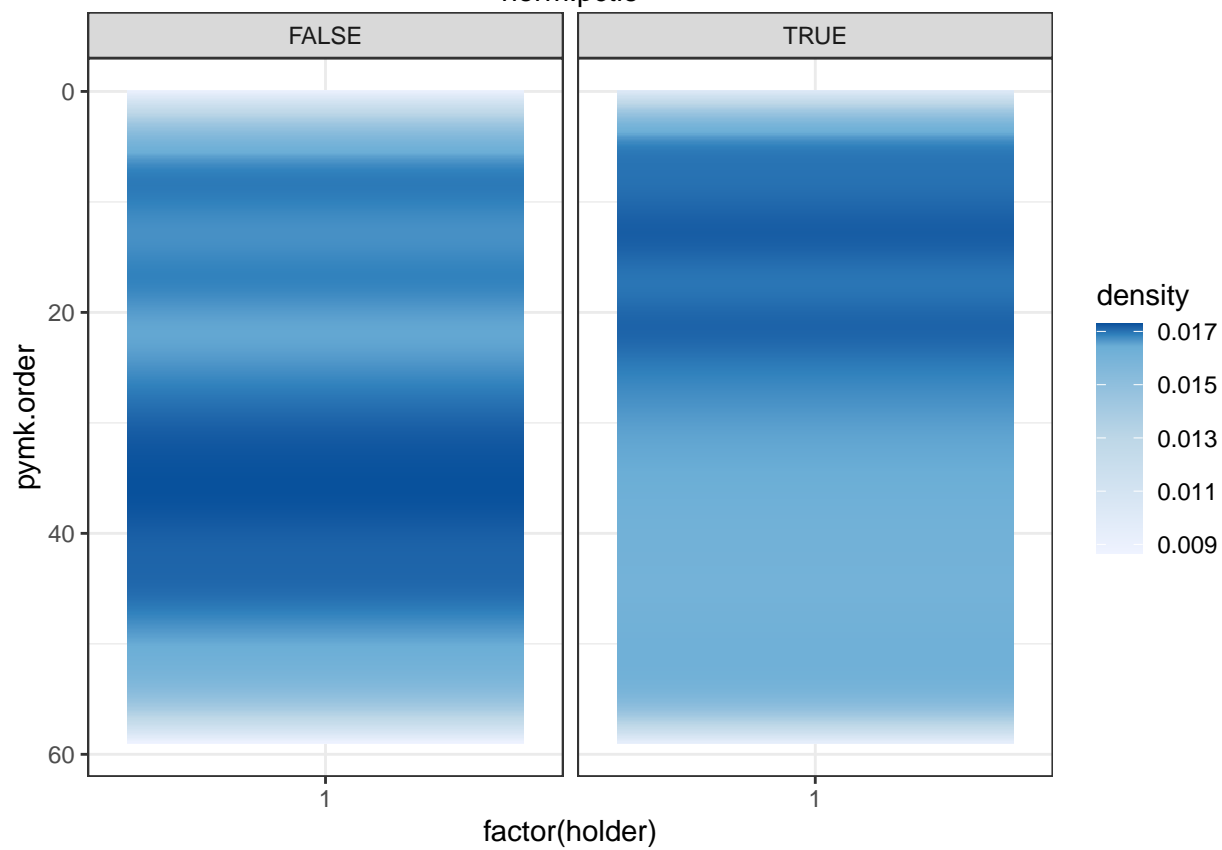
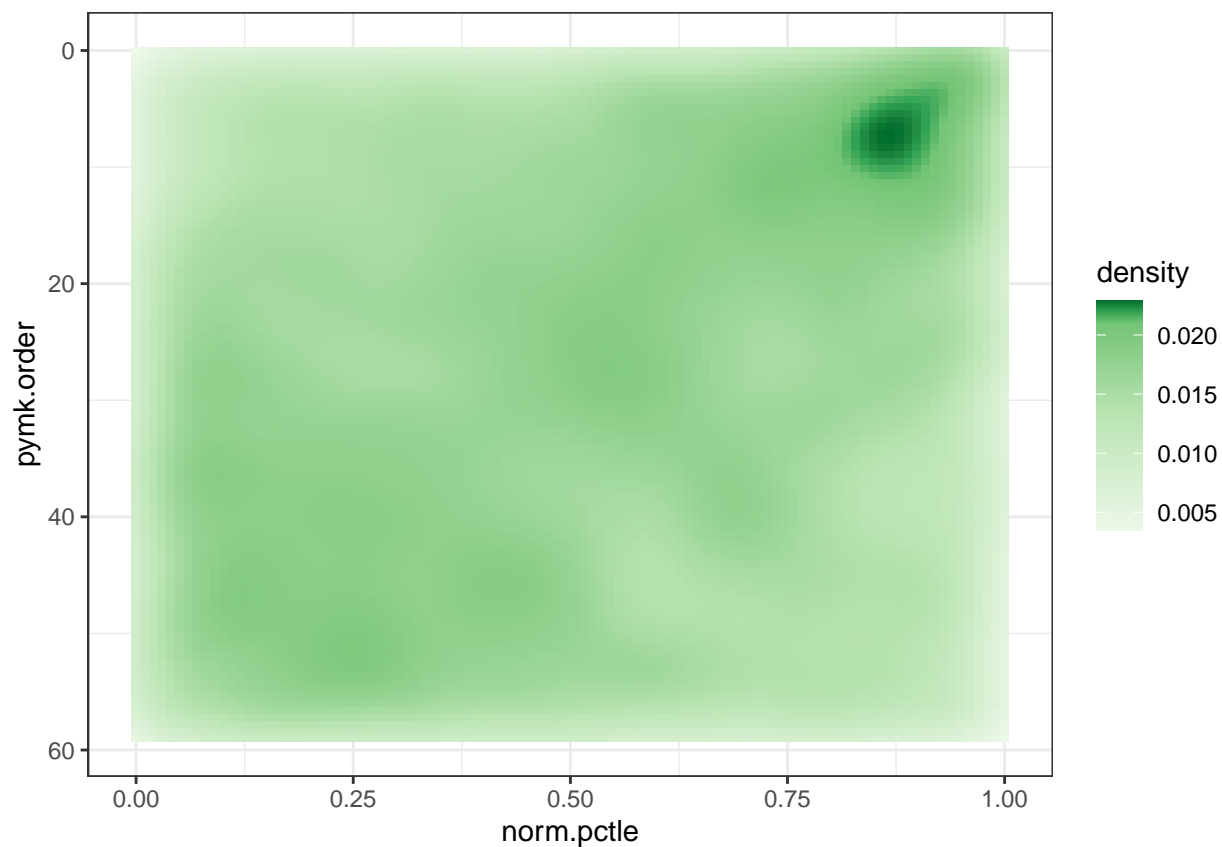




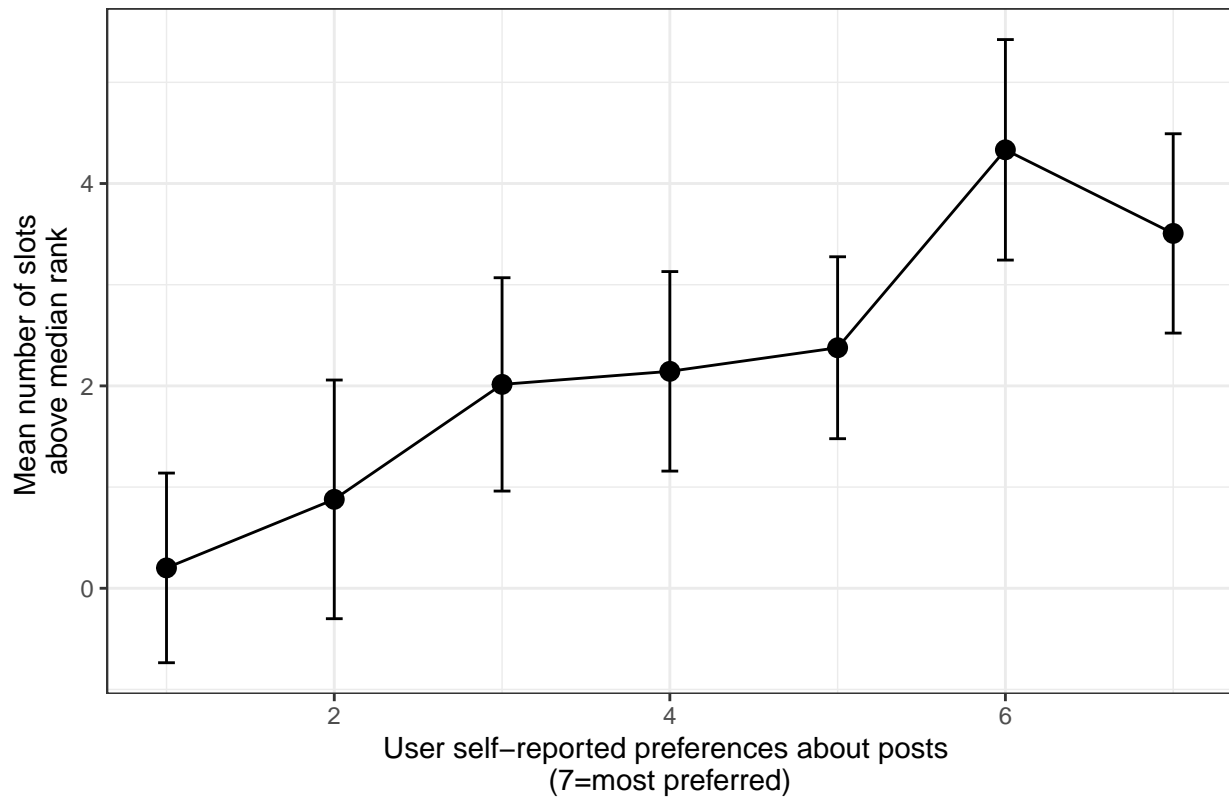




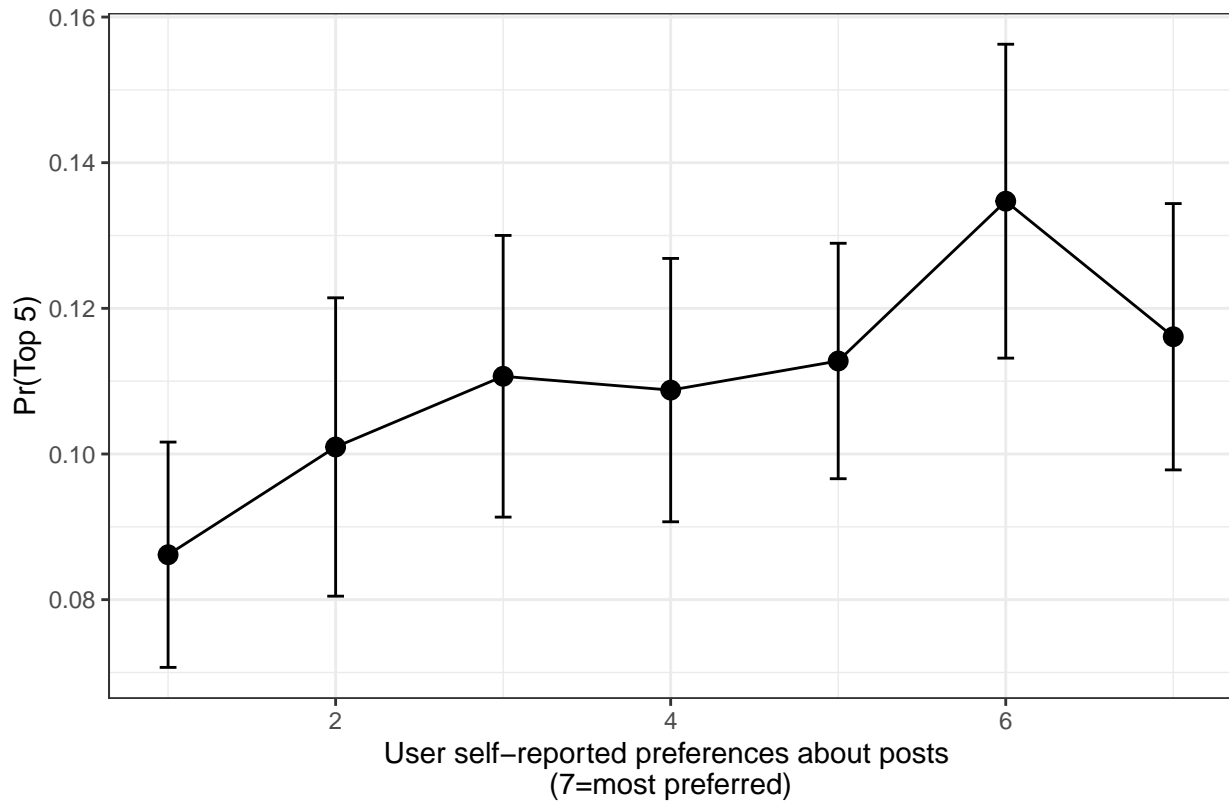




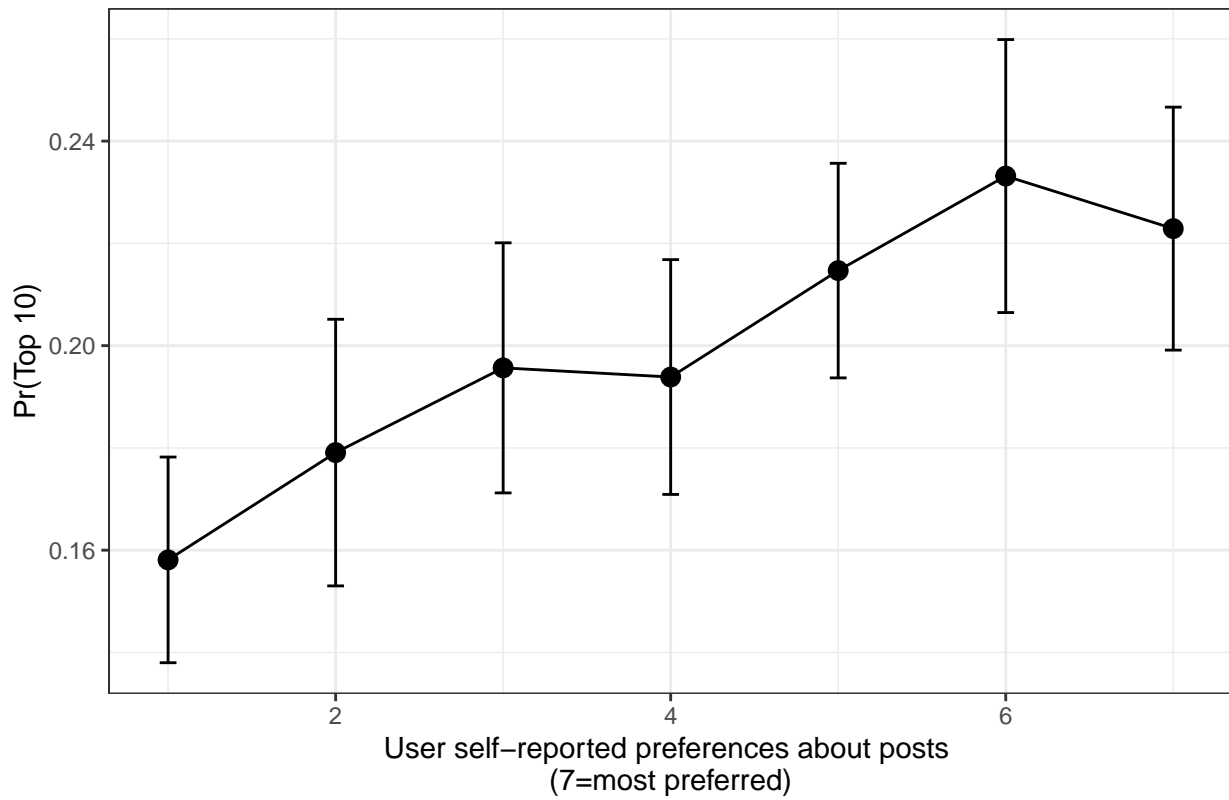
Newsfeed Ranking by Preference (India)



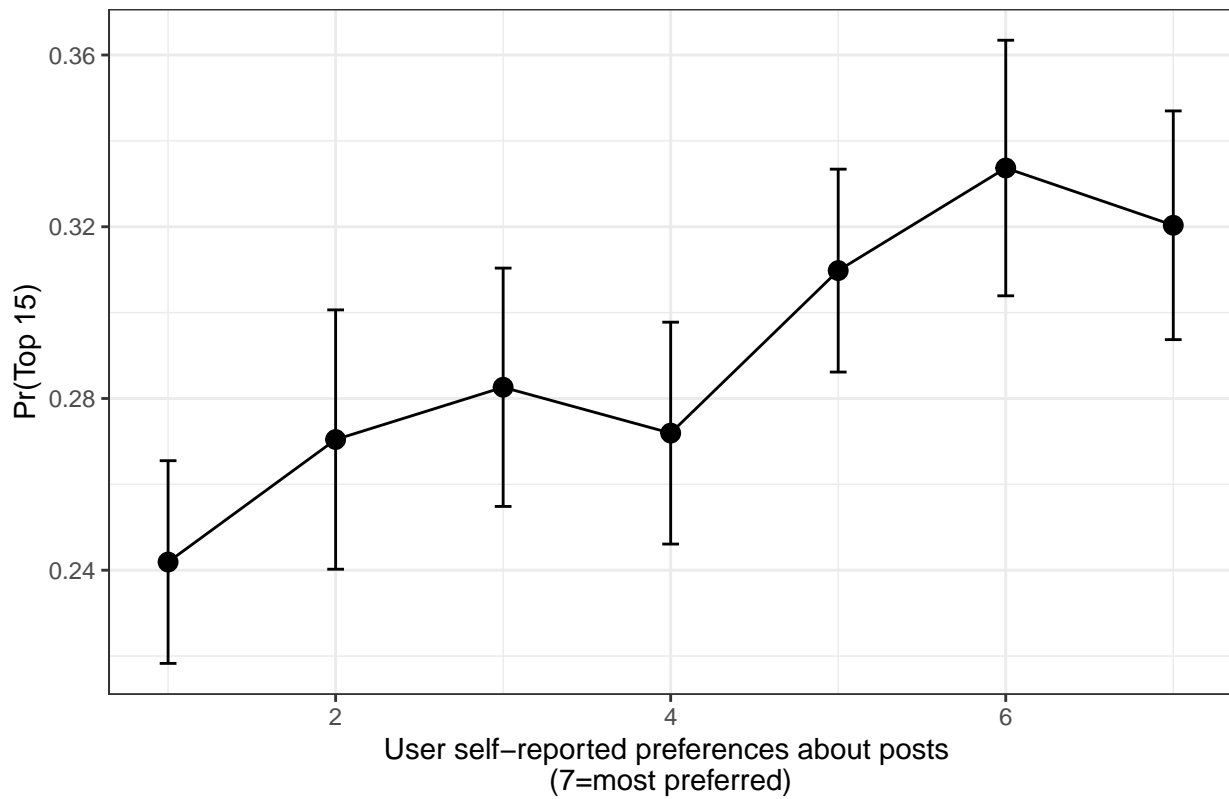
Newsfeed Top 5 by Preference (India)



Newsfeed Top 10 by Preference (India)

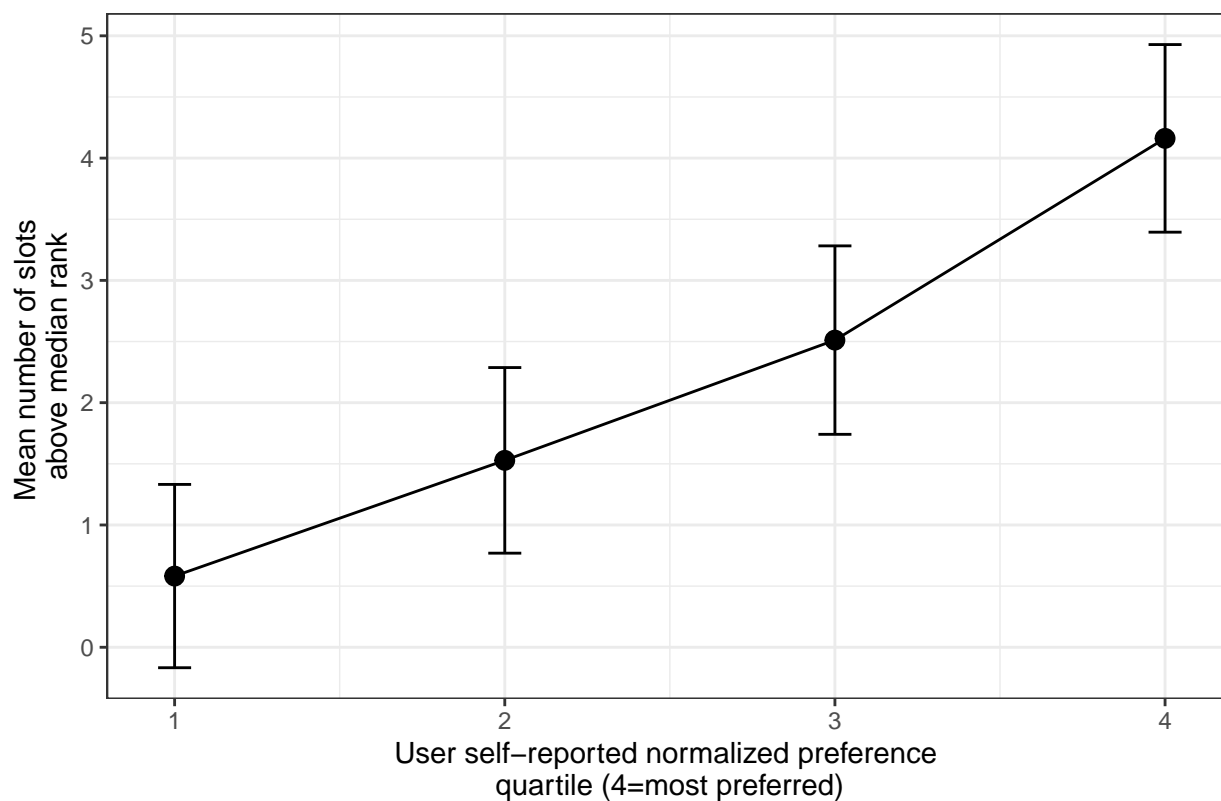


Newsfeed Top 15 by Preference (India)

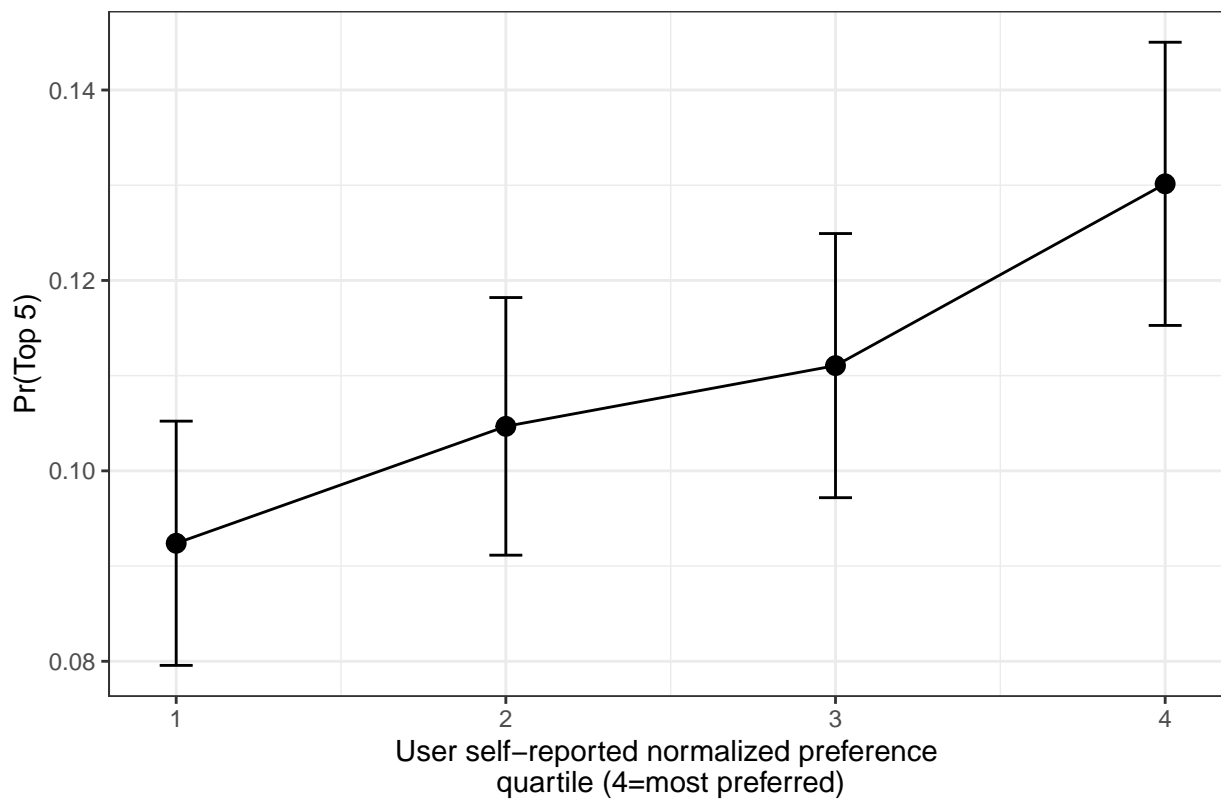




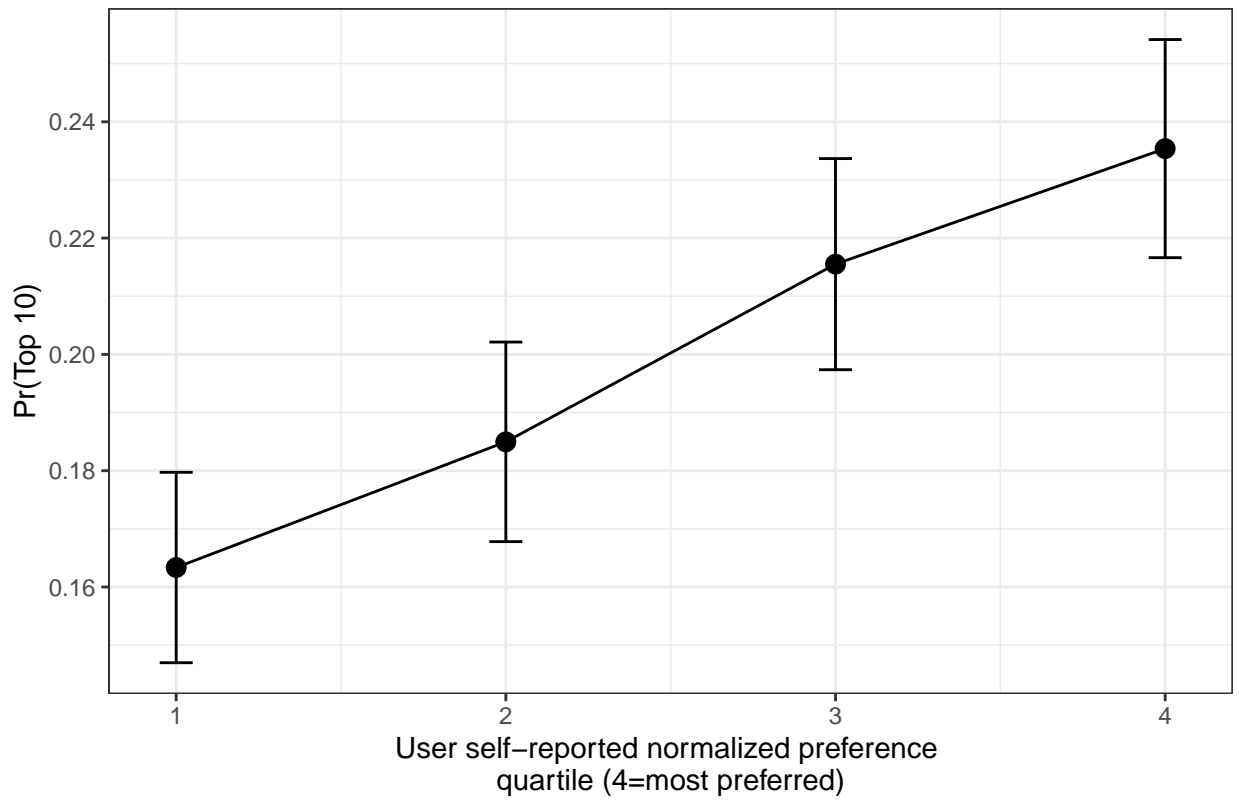
Newsfeed Ranking by Preference (India)



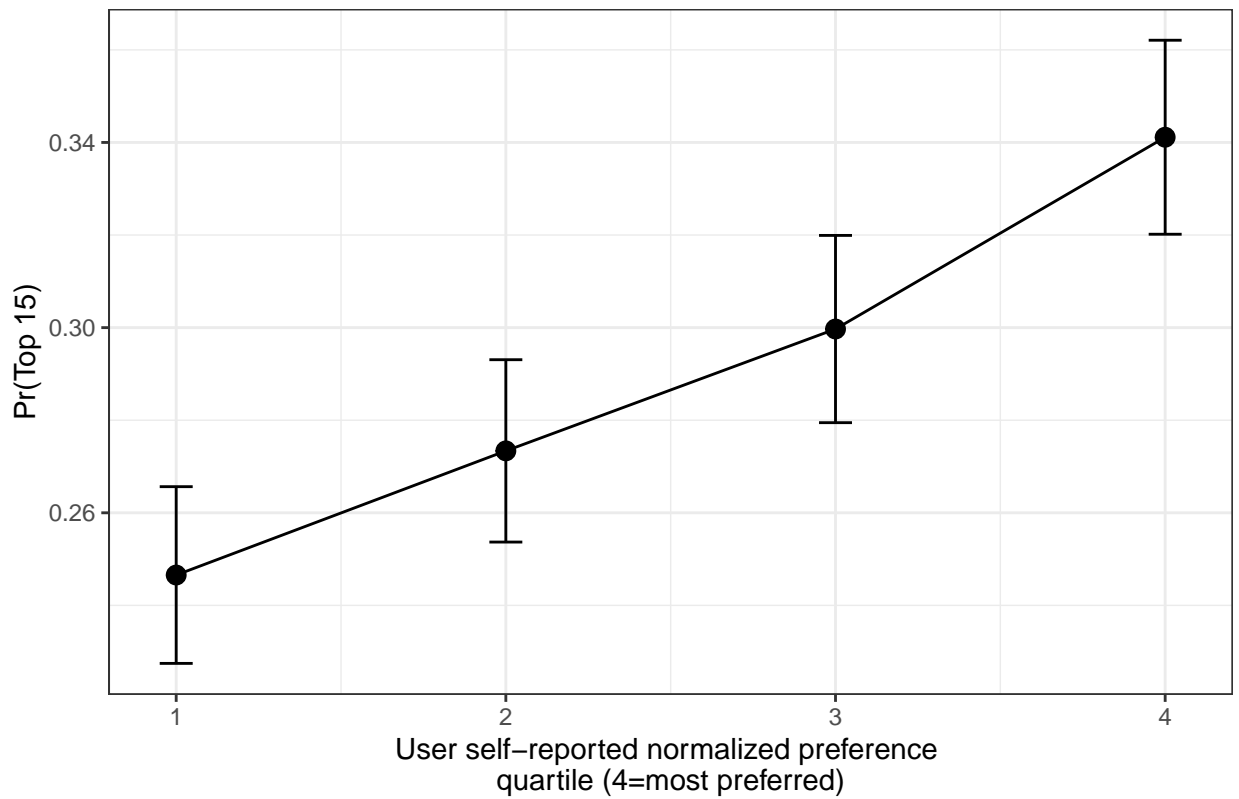
Newsfeed Top 5 by Preference (India)

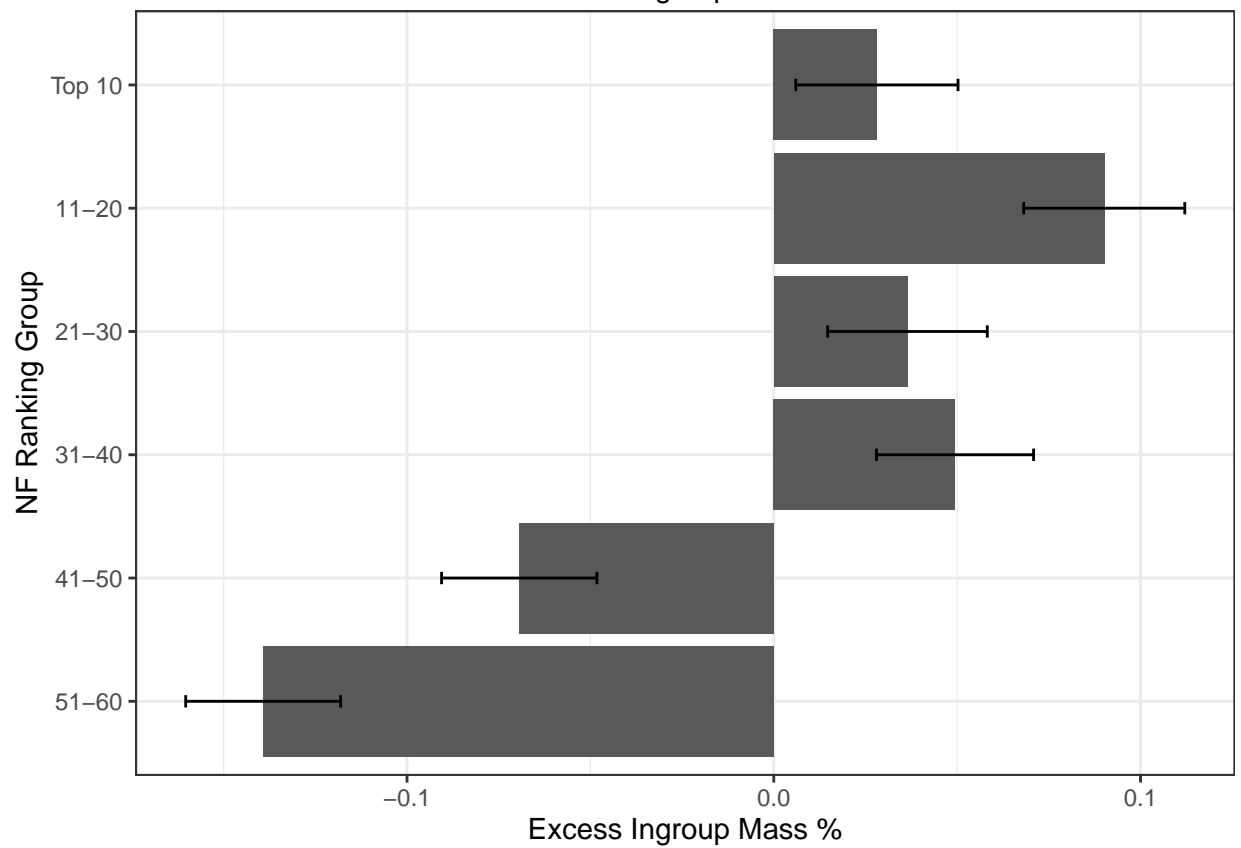
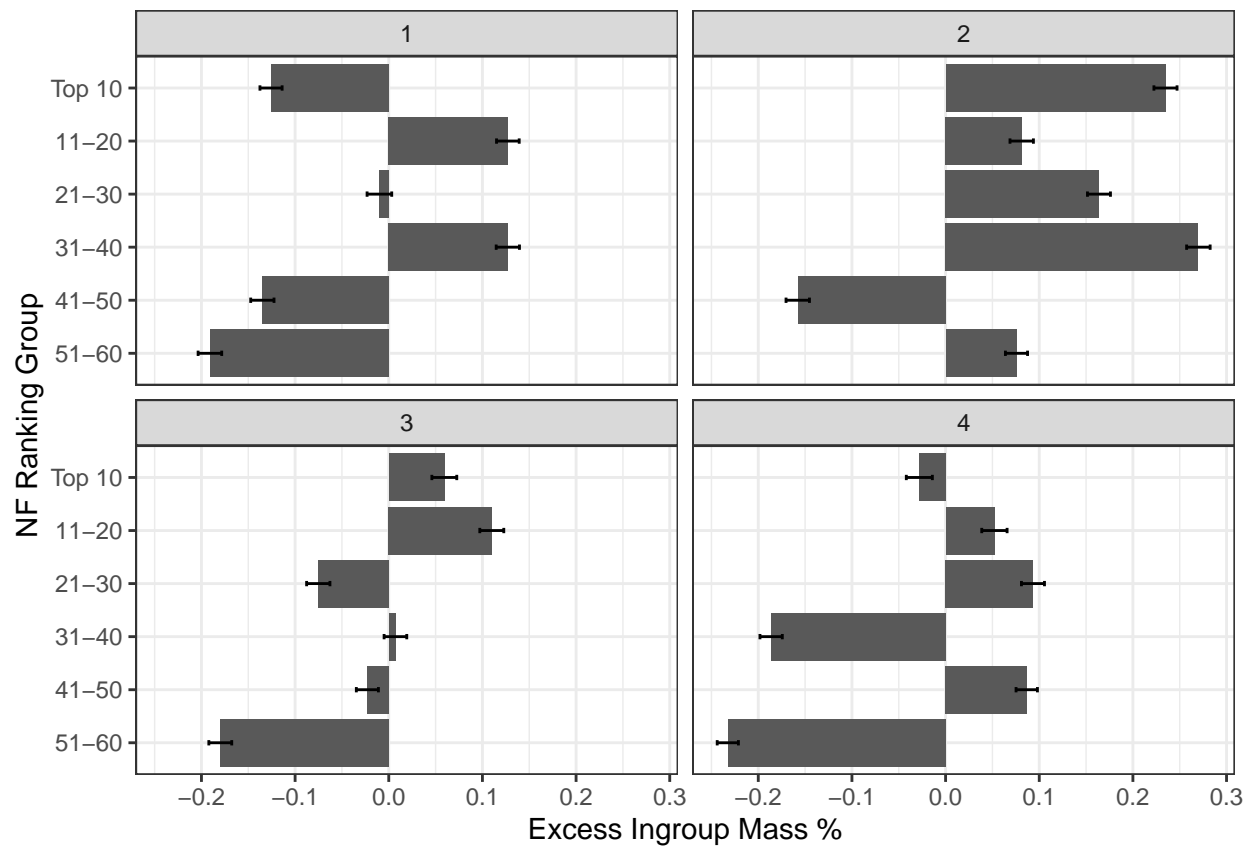


Newsfeed Top 10 by Preference (India)

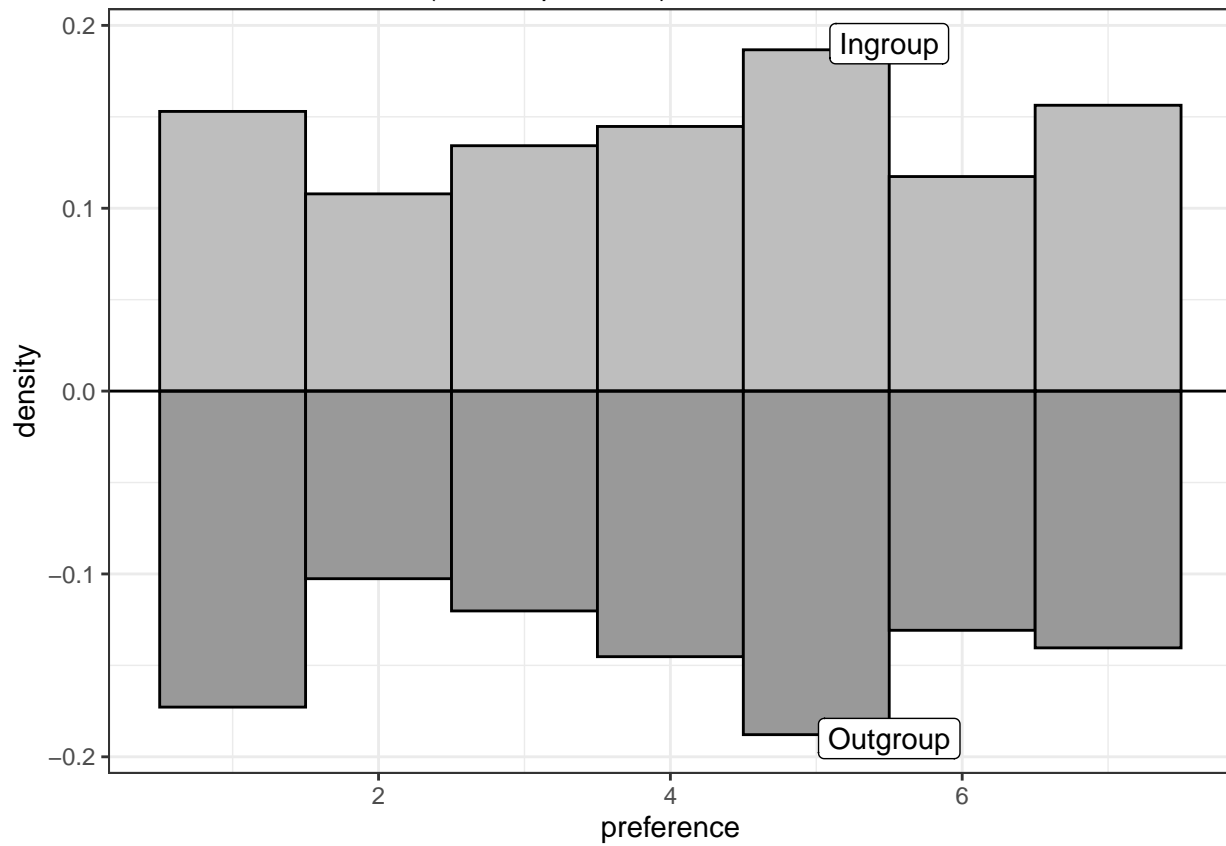
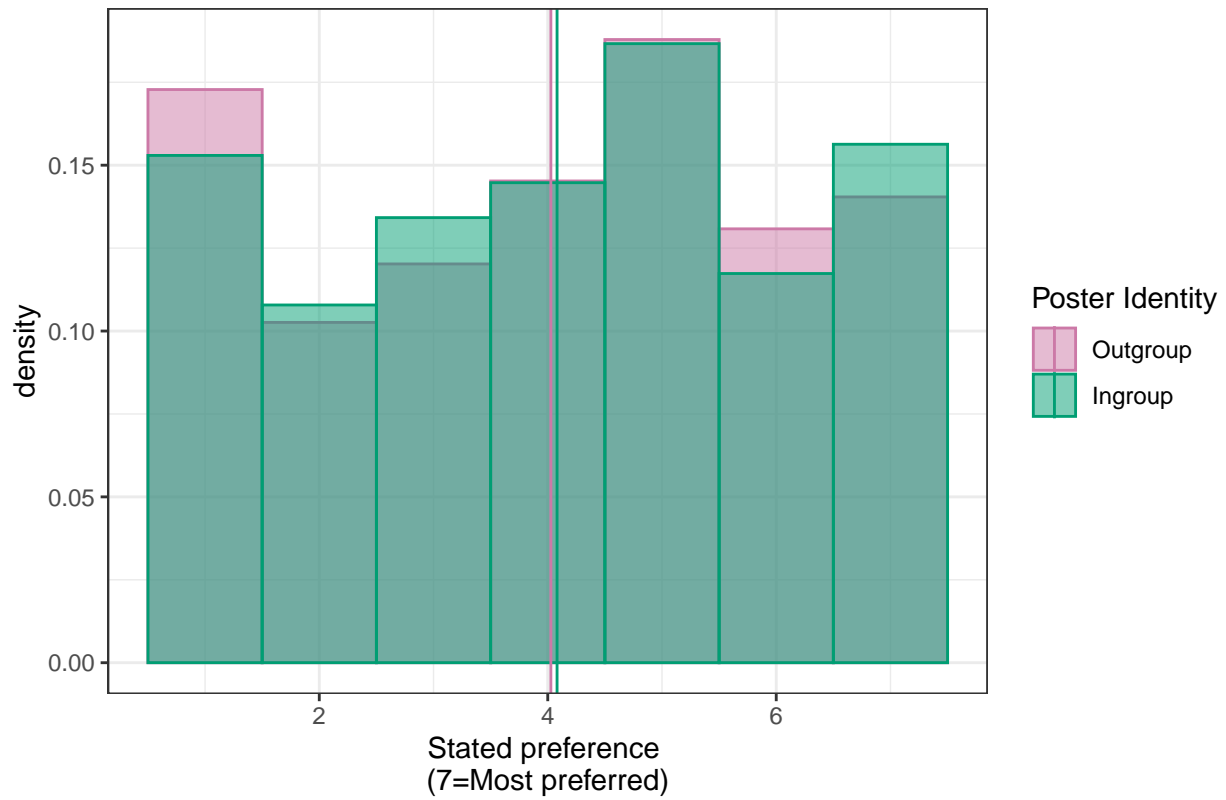


Newsfeed Top 15 by Preference (India)

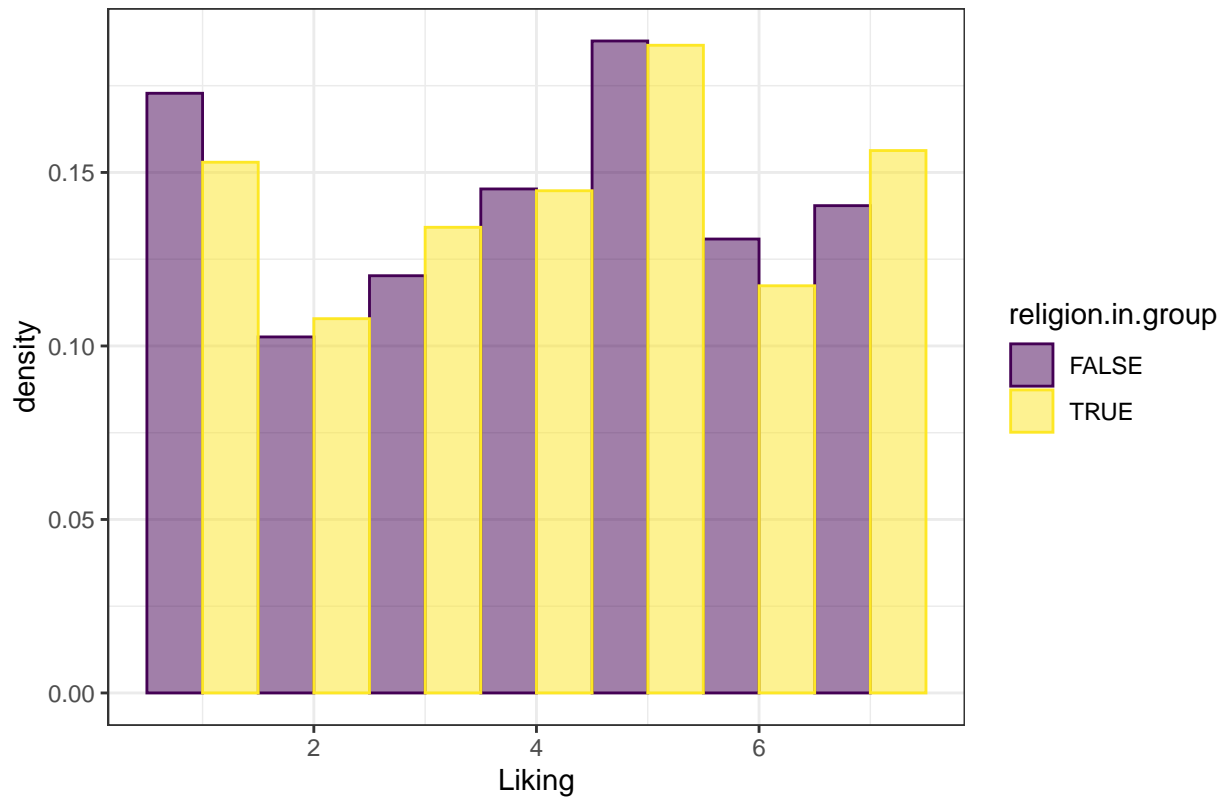




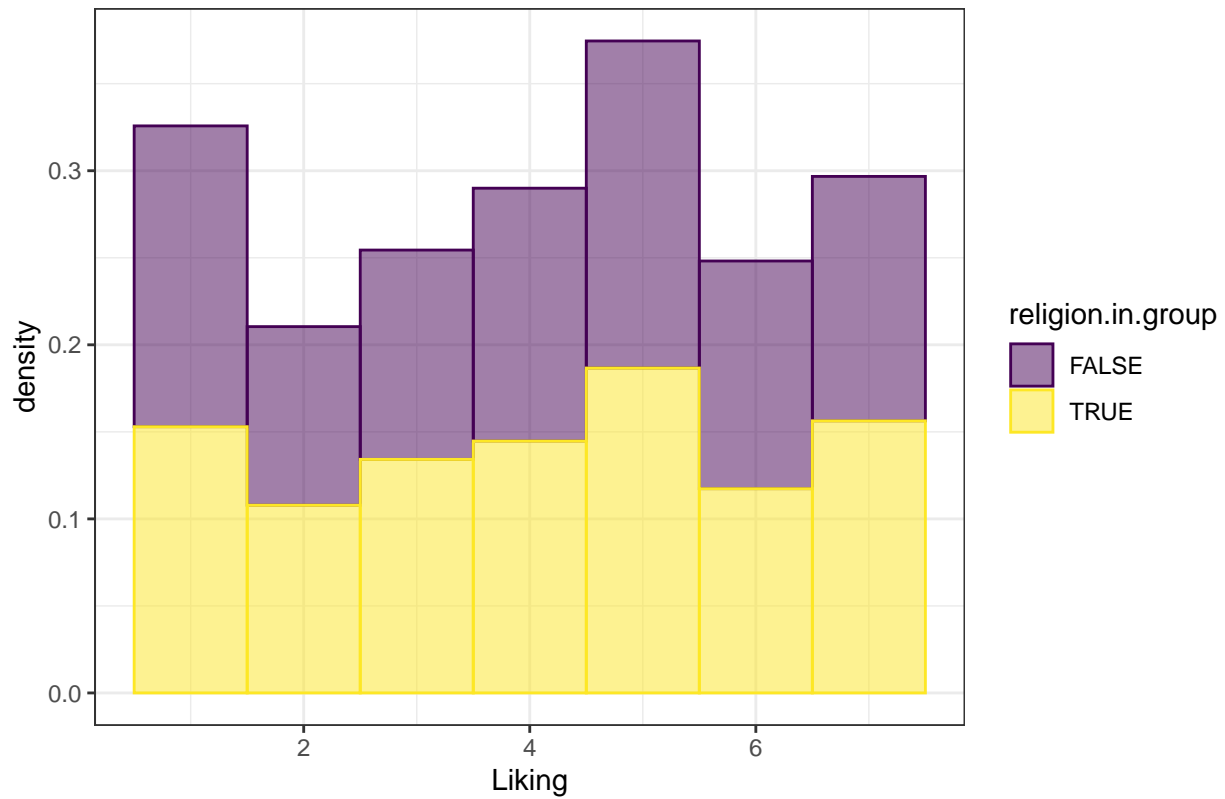
Distribution of stated preference by religion

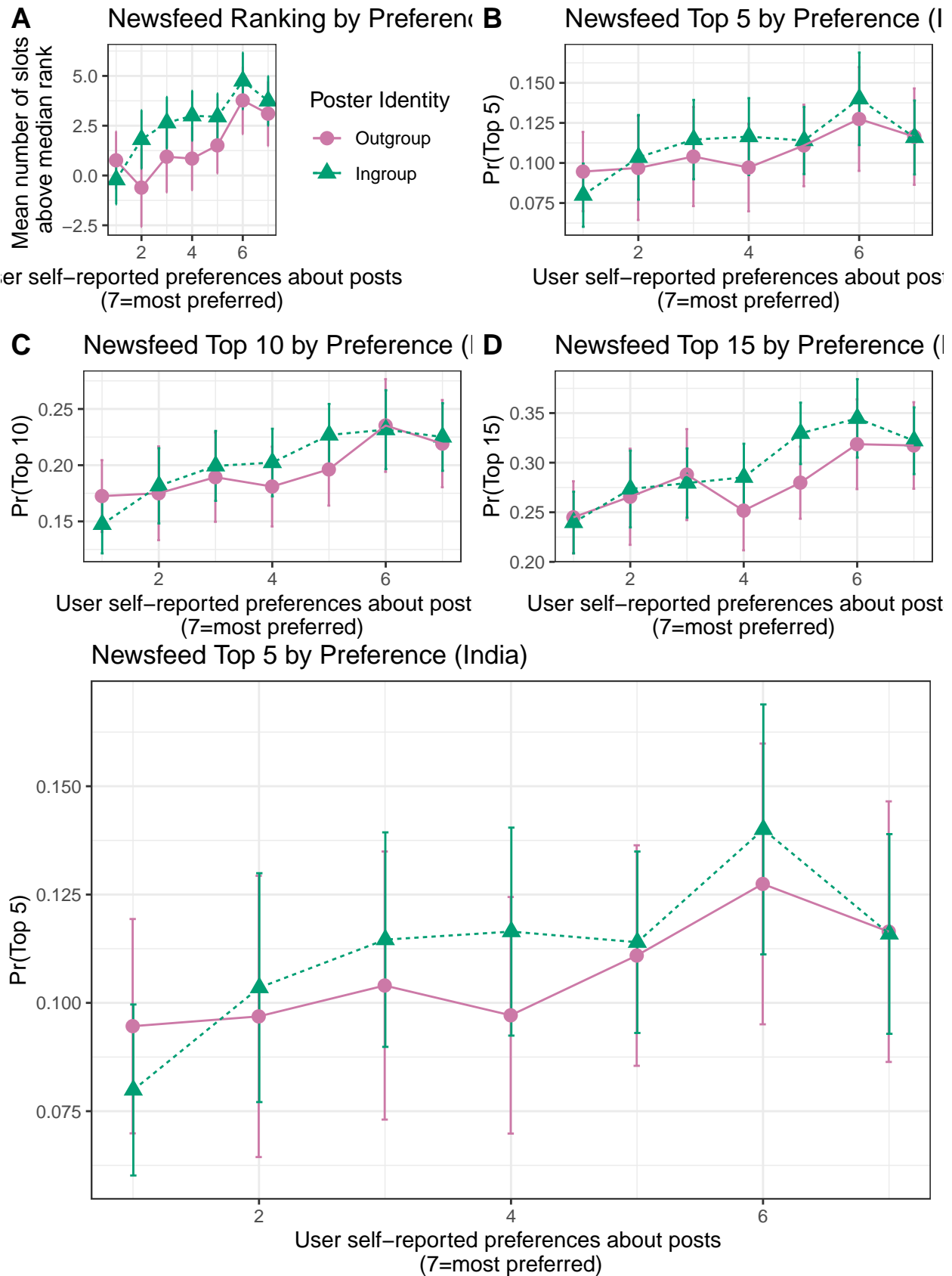


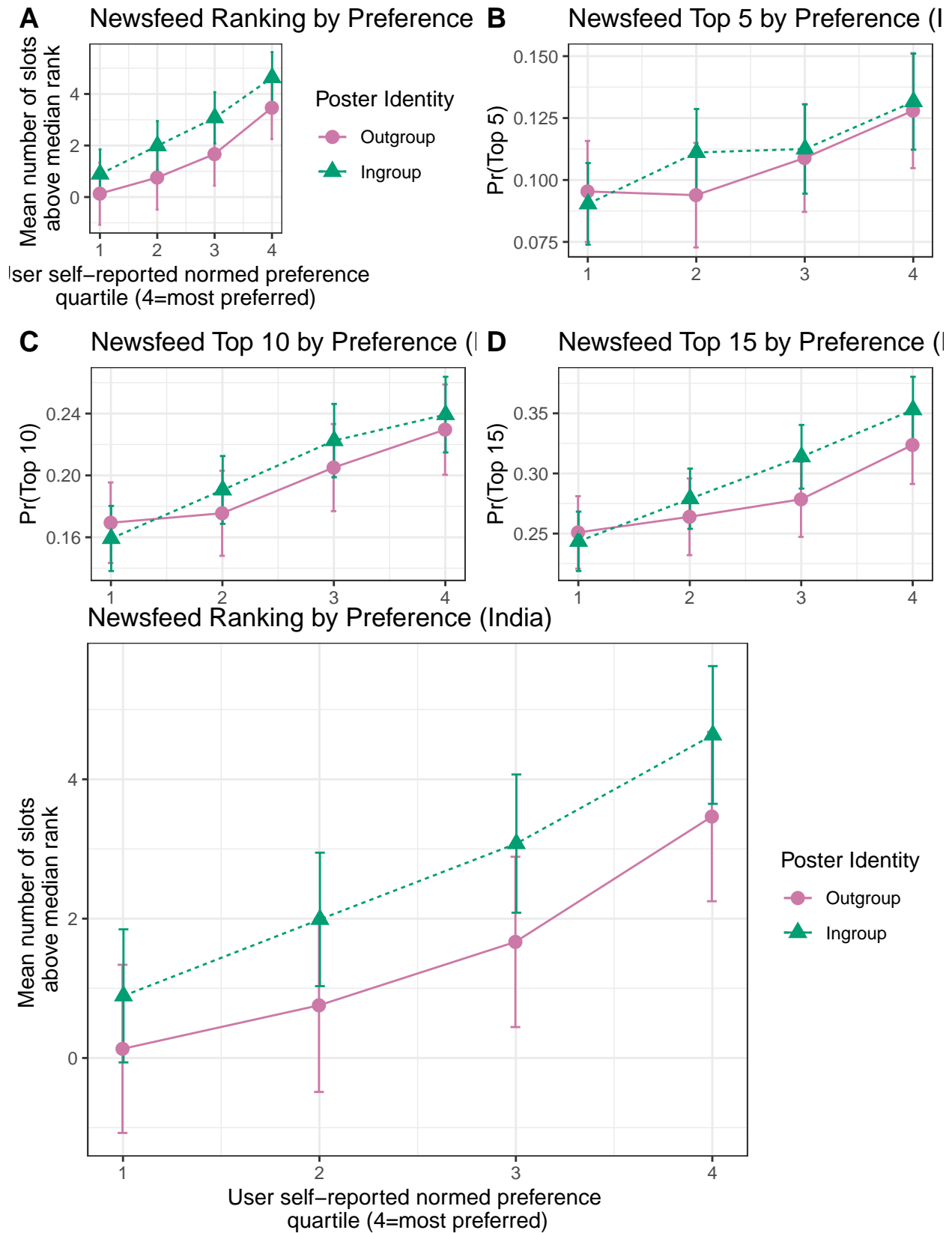
Distribution of raw pref by religion

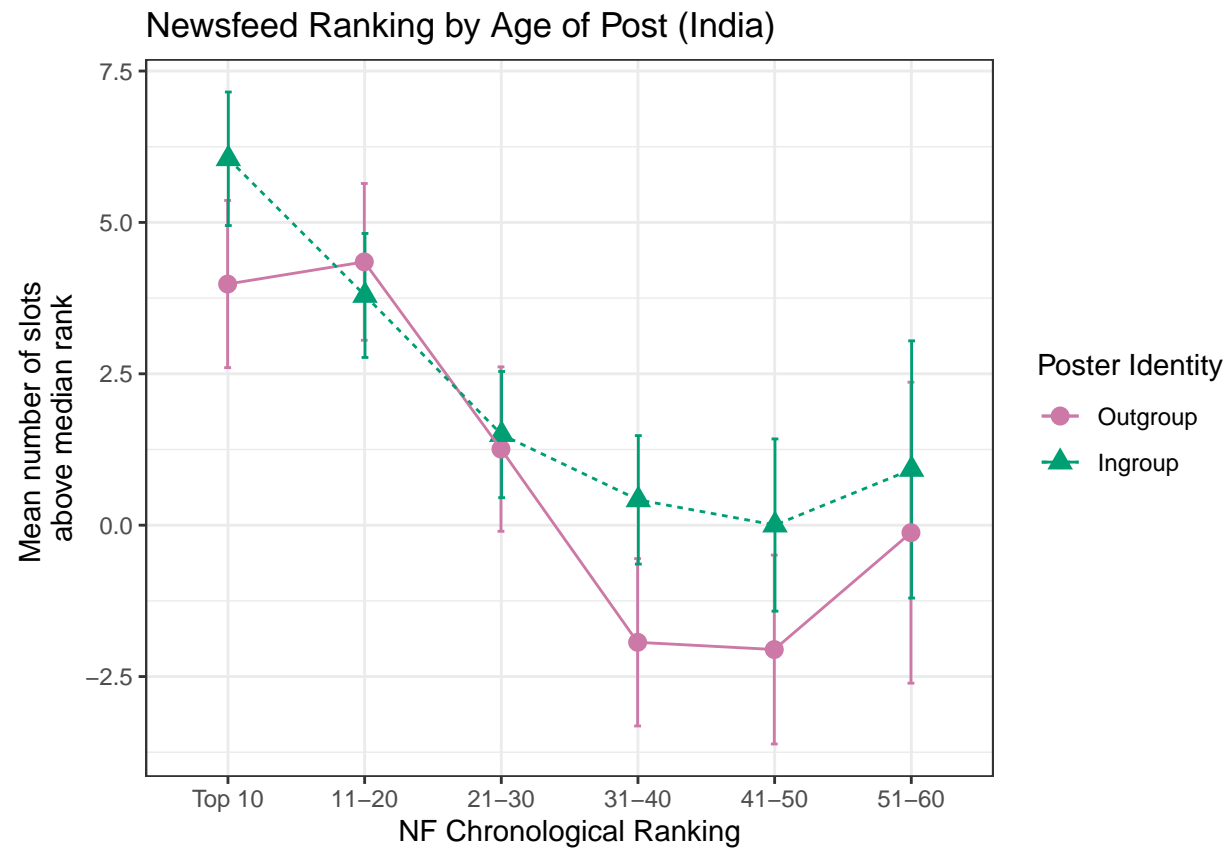


Distribution of raw pref by religion



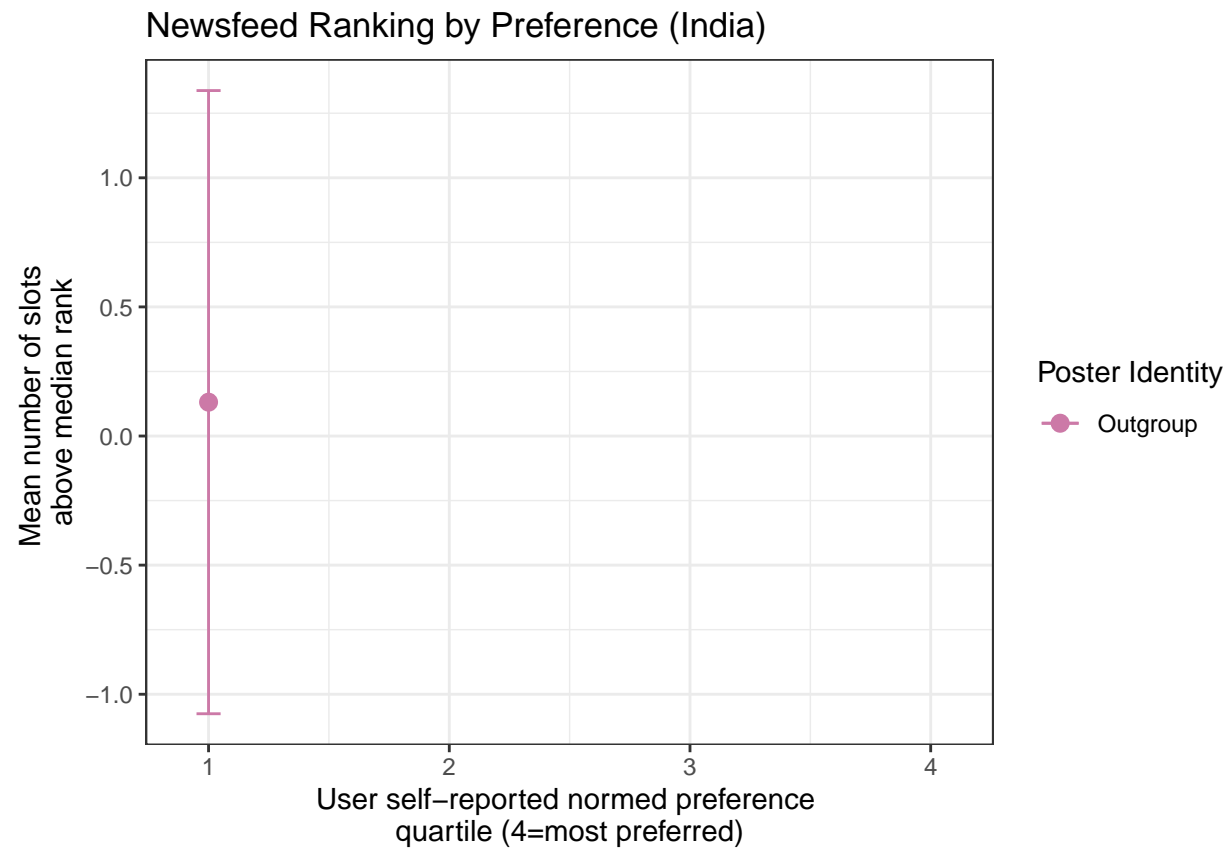






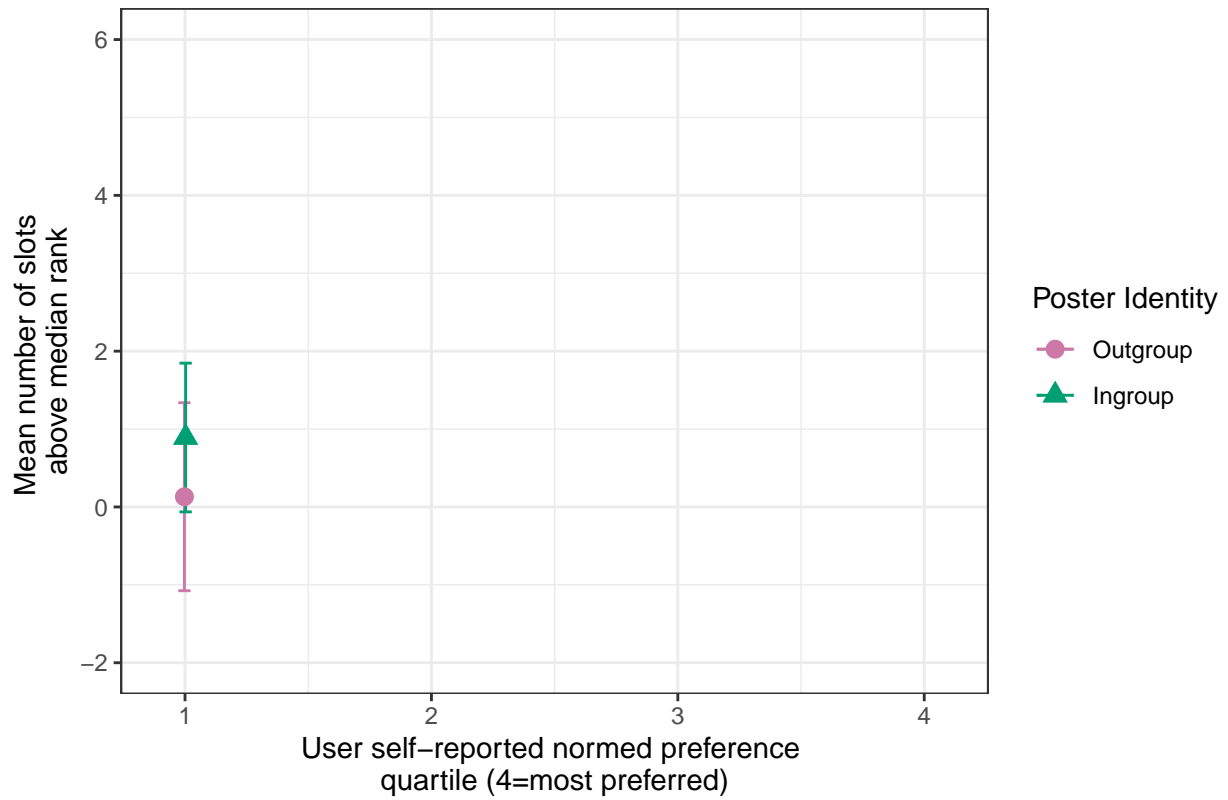
## geom\_path: Each group consists of only one observation. Do you need to adjust  
## the group aesthetic?



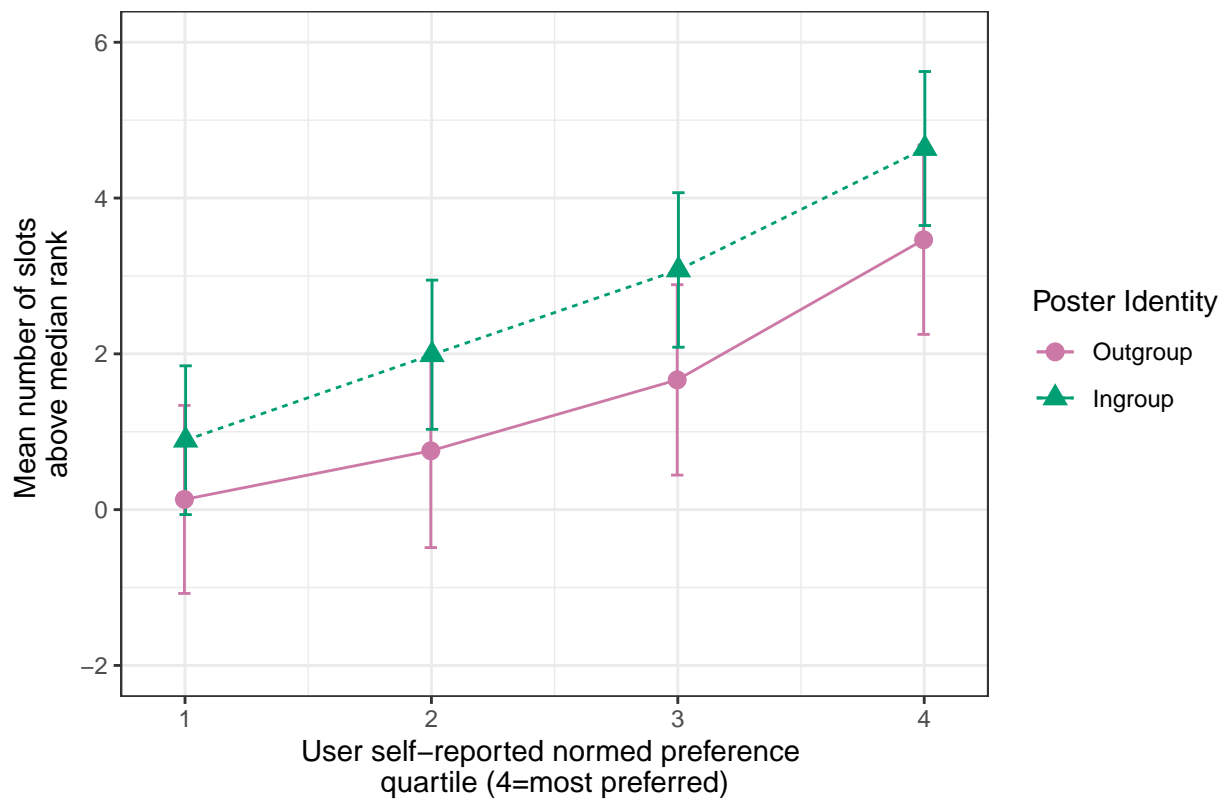


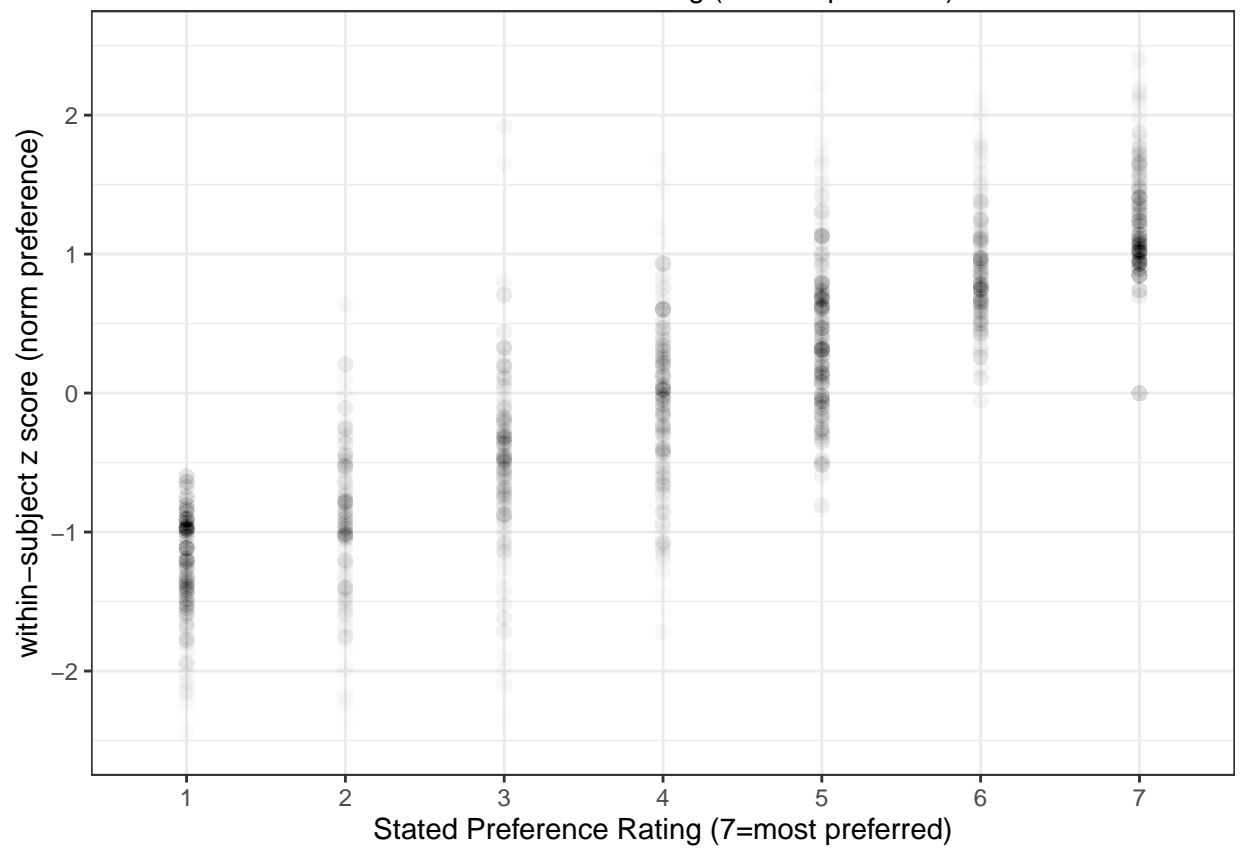
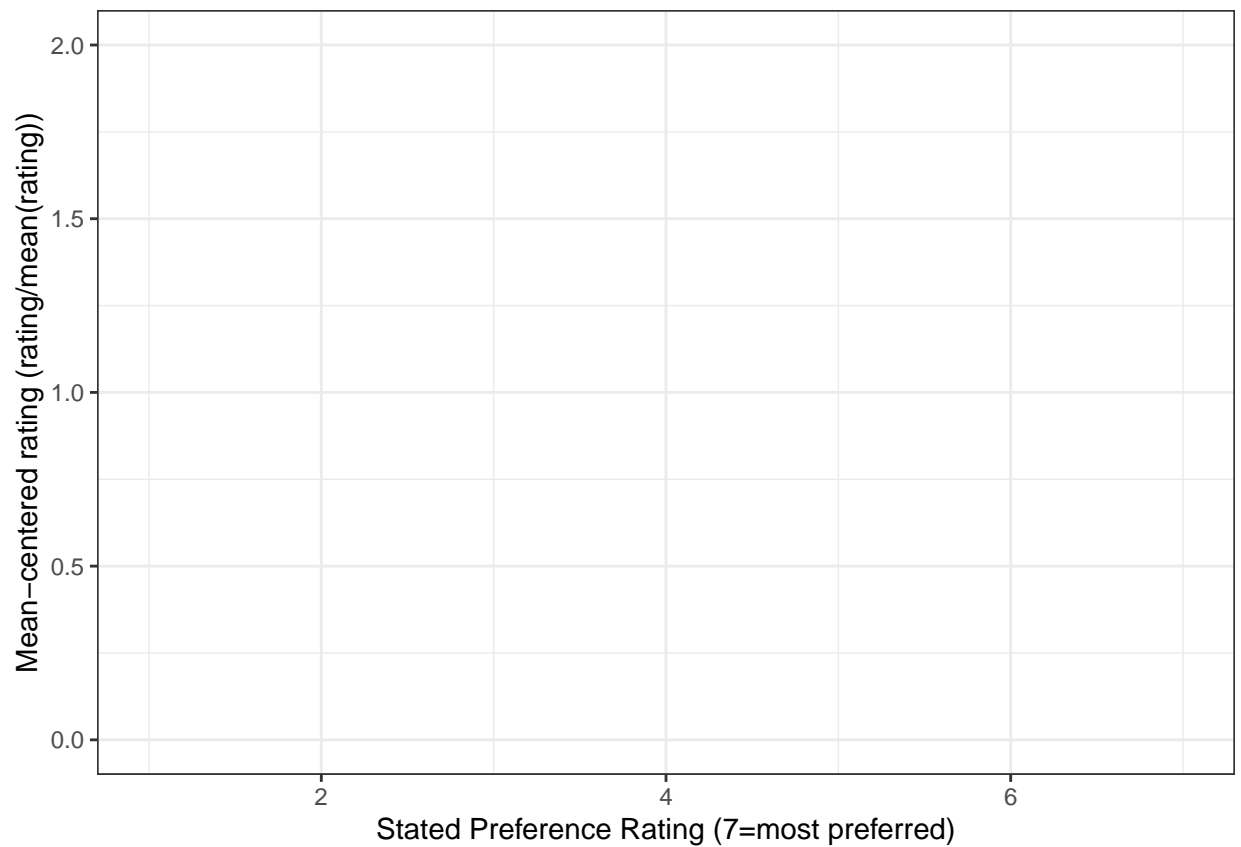
```
## geom_path: Each group consists of only one observation. Do you need to adjust  
## the group aesthetic?
```

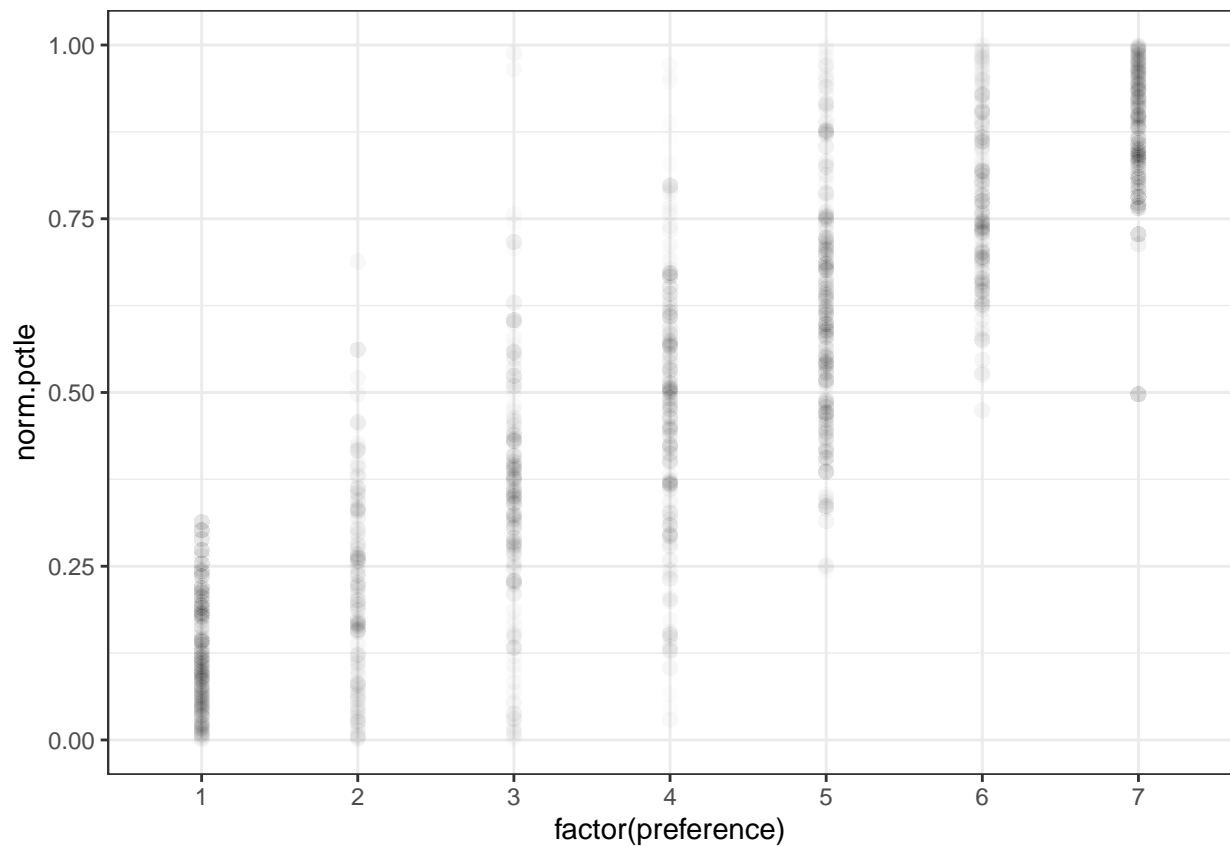
Newsfeed Ranking by Preference (India)



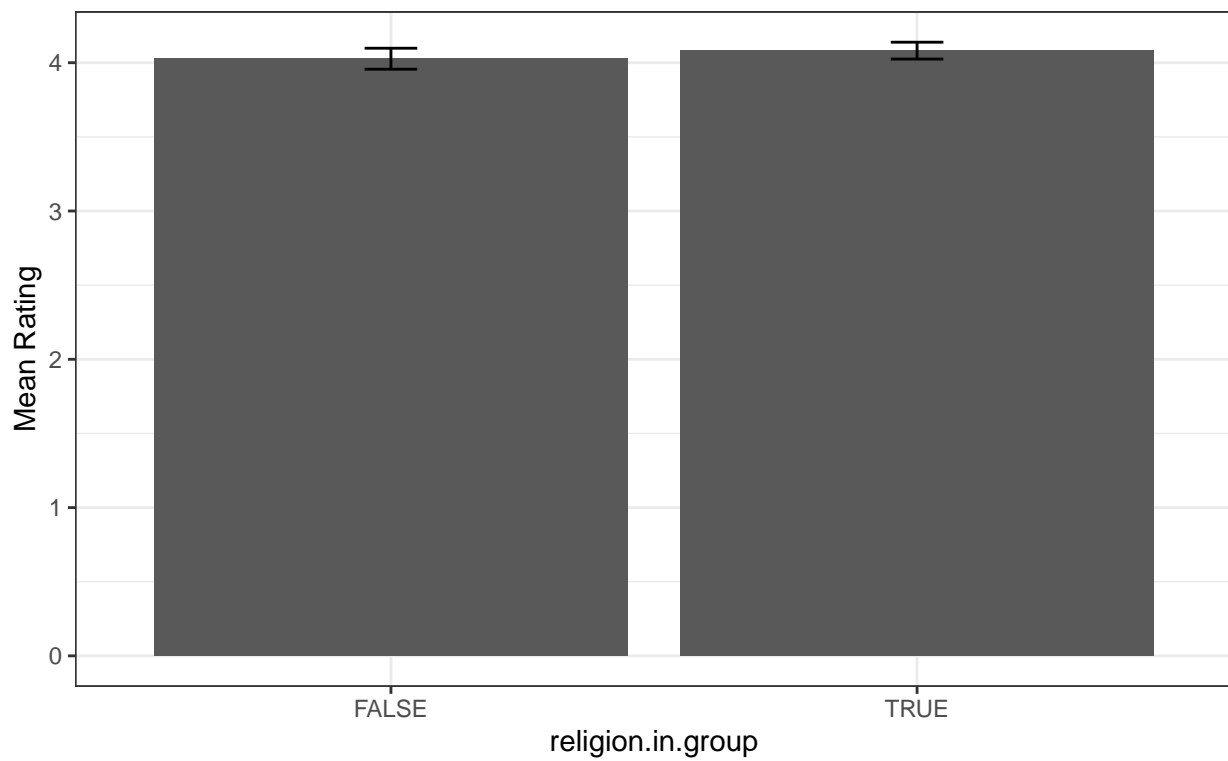
Newsfeed Ranking by Preference (India)







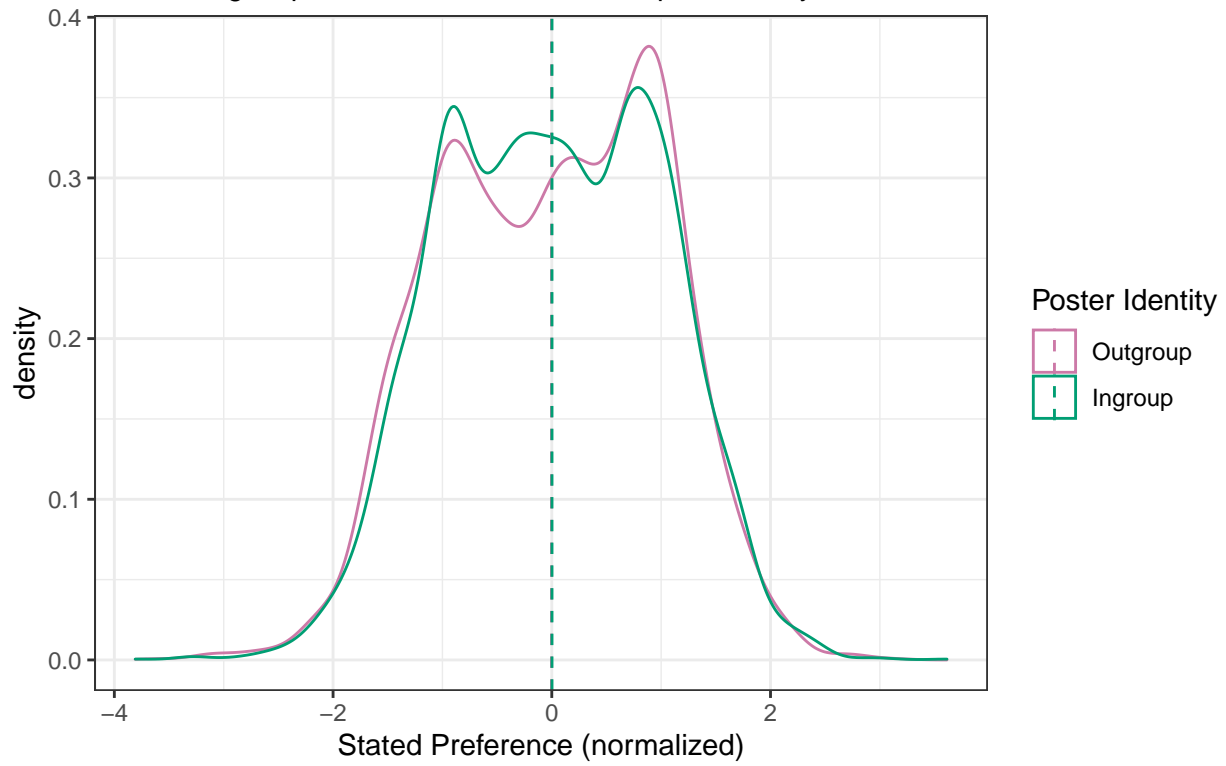
Raw Reported Preference by Race Group  
Same-religion posts are slightly more preferred



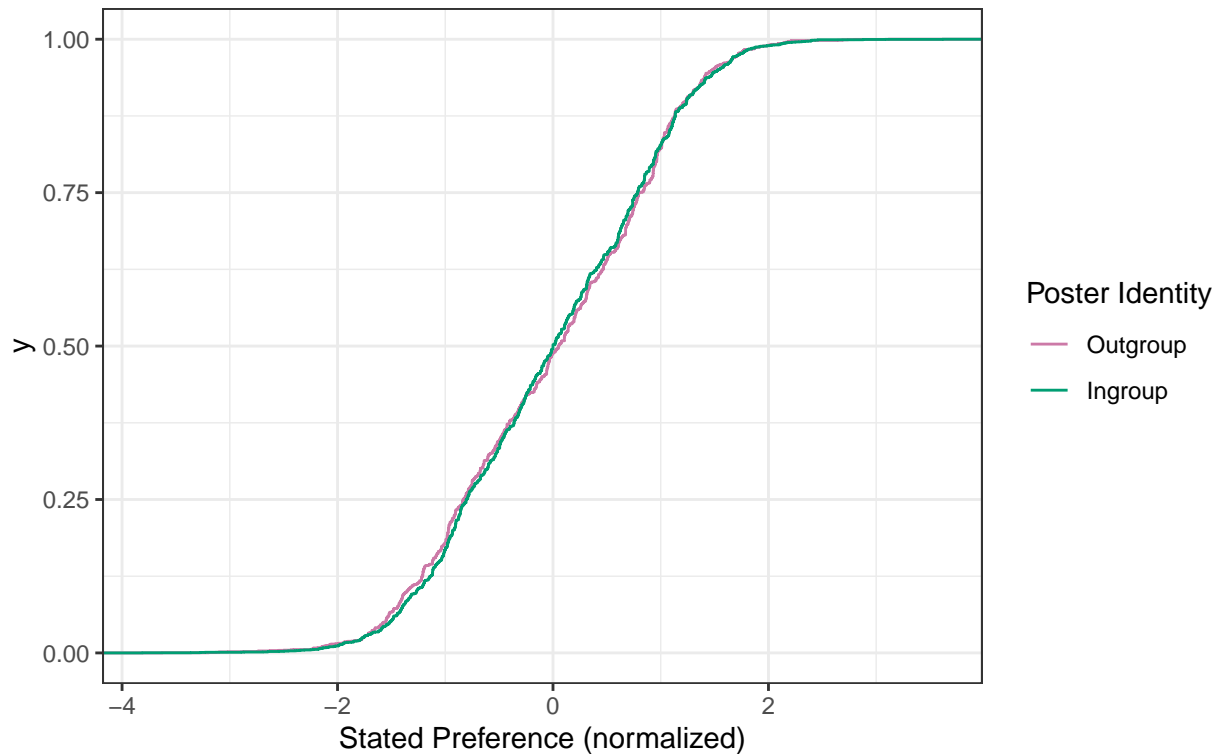
```
## Adding missing grouping variables: `dedupid`
```

### Distribution of normalized preference by religion

Same-religion posts are not rated as more preferred by the user



Cumulative distribution of normalized preference by religion  
 Same-religion posts are not rated as more preferred by the user



```
## Adding missing grouping variables: `dedupid`
```

```
## Adding missing grouping variables: `dedupid`
```

```
% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Sun, Jan 17, 2021 - 13:35:46
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% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Sun, Jan 17, 2021 - 13:35:47
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% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Sun, Jan 17, 2021 - 13:35:47
```

Table 6: Time Results - Rank

	<i>Dependent variable:</i>		
	nf.order		
	(1)	(2)	(3)
	all	all2	base
I(100 *norm.pctle)	−0.048*** (0.007)	−0.048*** (0.007)	−0.047*** (0.007)
time_rank	0.164*** (0.021)	0.150*** (0.013)	
religion.in.group	−0.510 (0.736)	−1.078*** (0.394)	−1.126*** (0.397)
time_rank:religion.in.group	−0.024 (0.027)		
Constant	27.529*** (0.657)	27.864*** (0.545)	31.340*** (0.457)
Observations	7,866	7,866	7,866
R <sup>2</sup>	0.024	0.023	0.007
Adjusted R <sup>2</sup>	0.023	0.023	0.007

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

Table 7: Time Results - Top 10

	<i>Dependent variable:</i>			
	nf.order			
	(1)	(2)	(3)	(4)
	all	days	hours	mins
religion.in.group	−1.078*** (0.394)	−1.106*** (0.397)	−0.520 (0.617)	0.061 (1.635)
I(100 *norm.pctle)	−0.048*** (0.007)	−0.049*** (0.007)	−0.039*** (0.011)	−0.005 (0.028)
time_rank	0.150*** (0.013)	0.147*** (0.013)	0.147*** (0.034)	0.168 (0.225)
Constant	27.864*** (0.545)	28.015*** (0.550)	27.484*** (0.830)	27.718*** (2.090)
Observations	7,866	7,758	3,512	542
R <sup>2</sup>	0.023	0.023	0.010	0.001
Adjusted R <sup>2</sup>	0.023	0.023	0.009	−0.004

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

Table 8: Time Results - Top 10

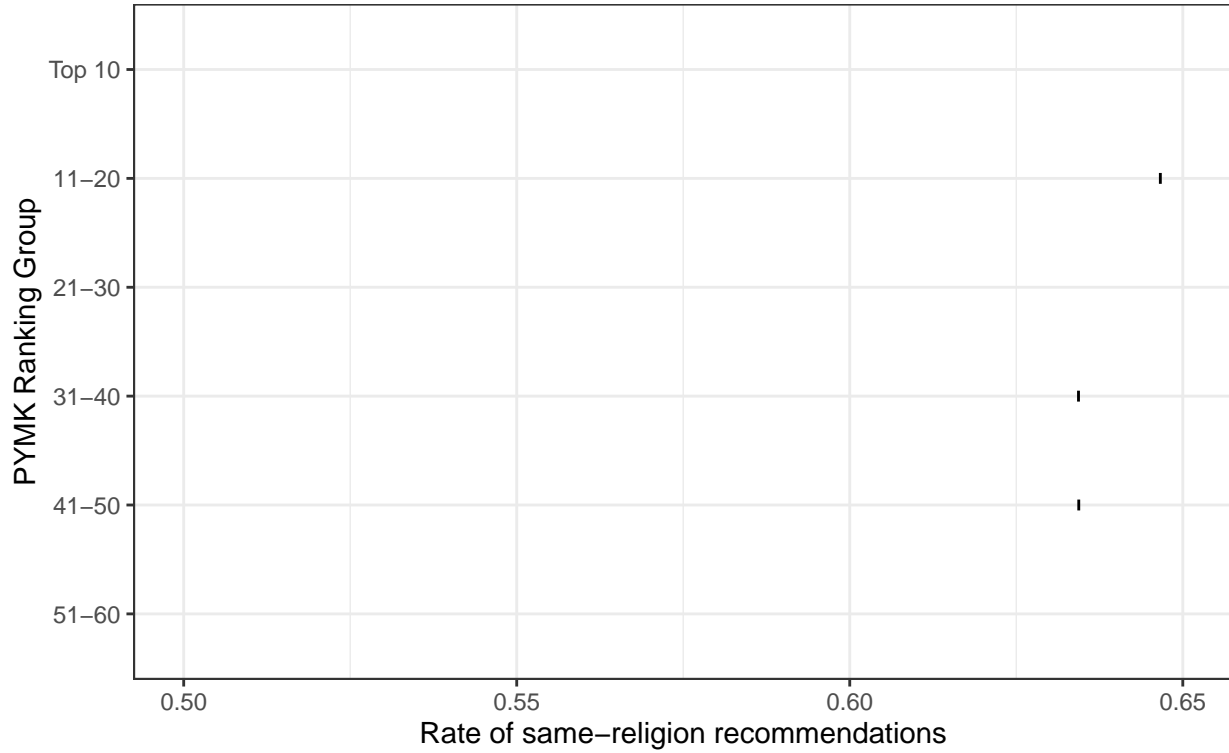
	<i>Dependent variable:</i>			
	nf.order			
	(1) all	(2) recent10	(3) recent20	(4) recent30
religion.in.group	−1.078*** (0.394)	−1.476* (0.847)	−0.605 (0.598)	−0.615 (0.491)
I(100 *norm.pctle)	−0.048*** (0.007)	−0.047*** (0.014)	−0.043*** (0.010)	−0.044*** (0.008)
time_rank	0.150*** (0.013)	0.096 (0.144)	0.176*** (0.051)	0.187*** (0.028)
Constant	27.864*** (0.545)	27.974*** (1.246)	26.779*** (0.863)	26.796*** (0.704)
Observations	7,866	1,922	3,721	5,317
R <sup>2</sup>	0.023	0.008	0.008	0.014
Adjusted R <sup>2</sup>	0.023	0.006	0.008	0.014

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

### PYMK preference for user's religion (India)

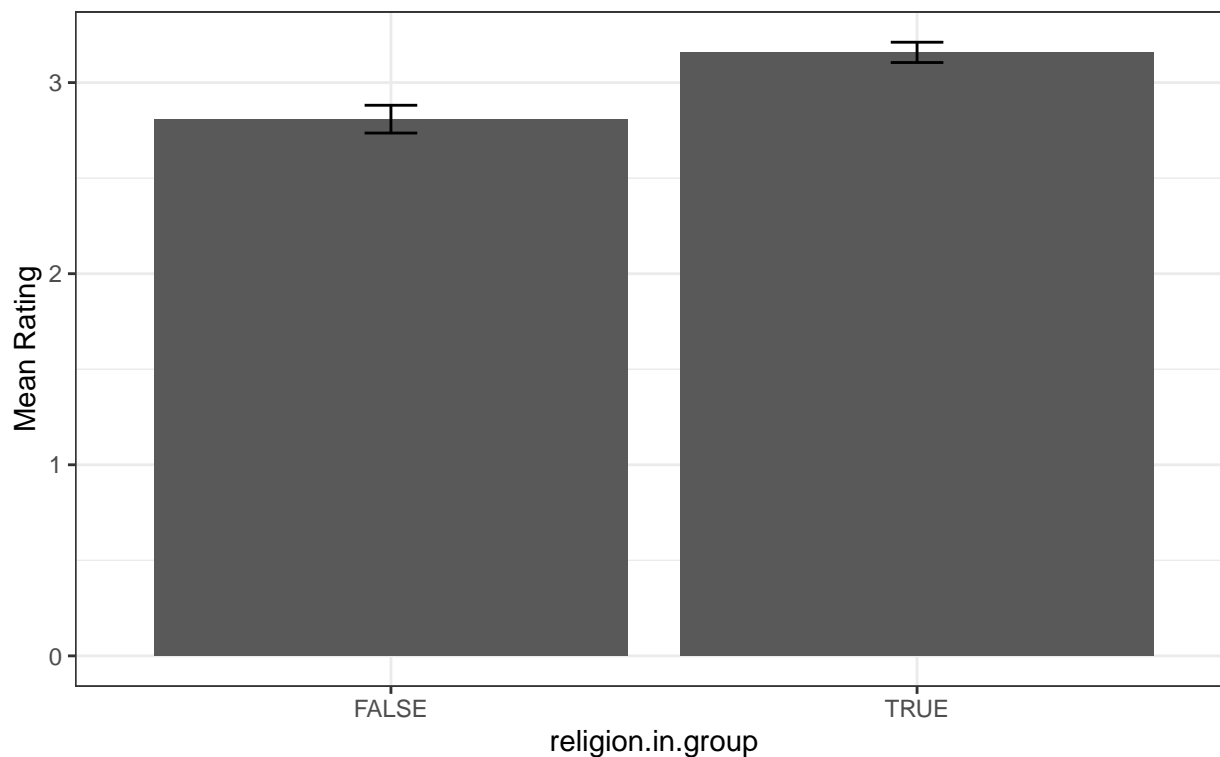
Same-religion recommendations are not sorted closer to the top



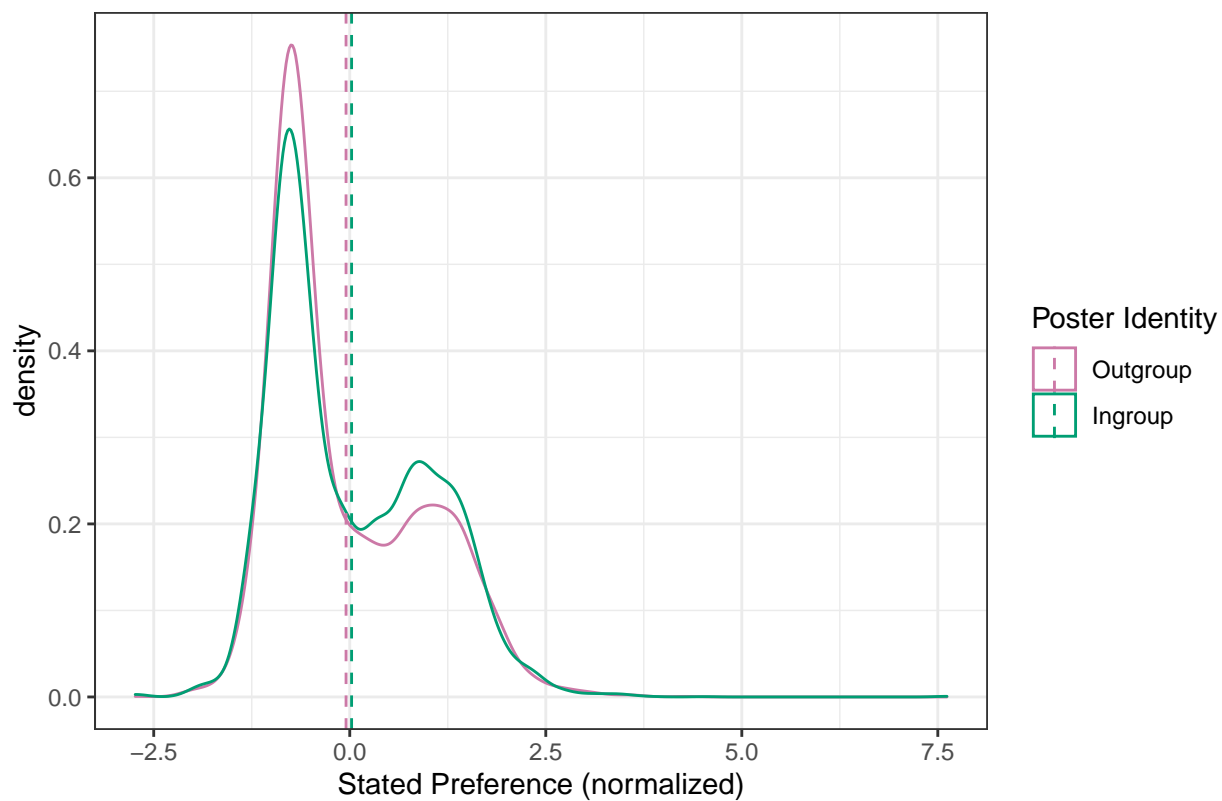


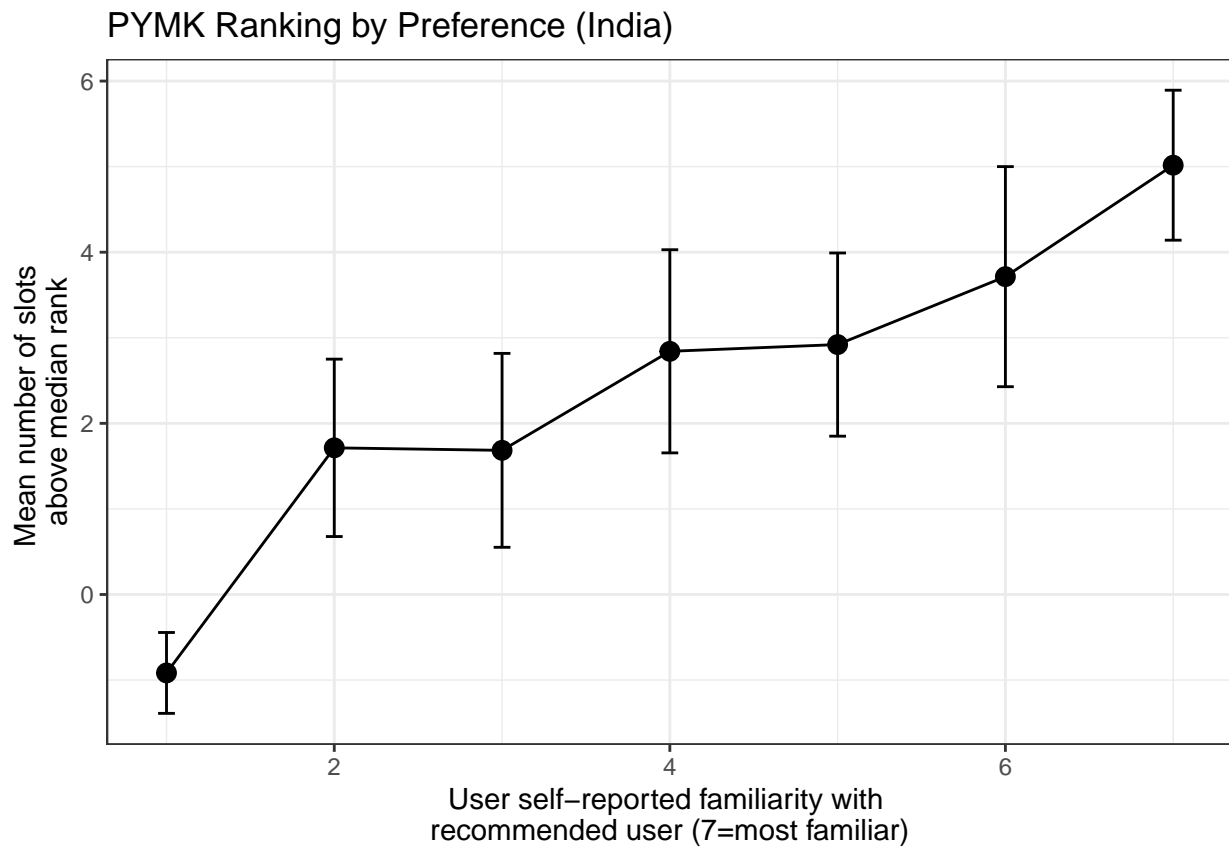
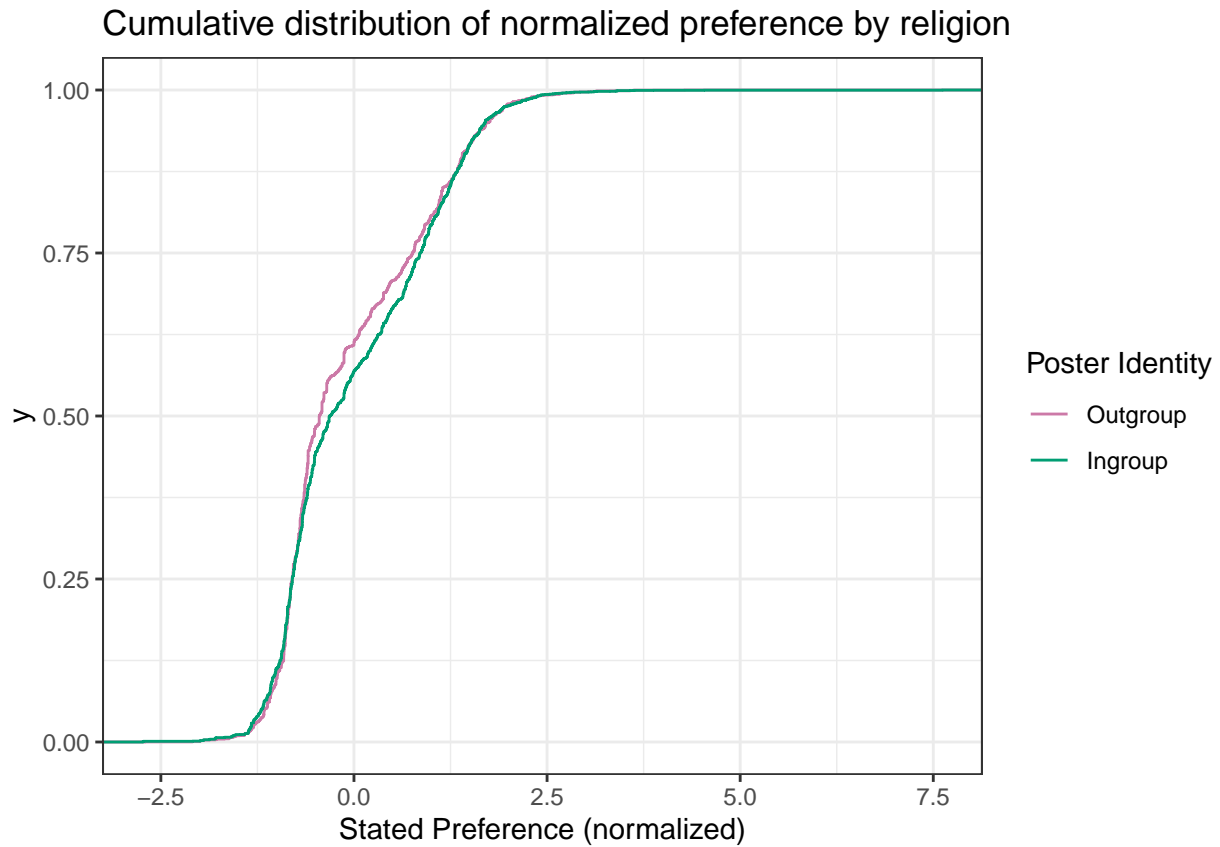
## Raw Reported Preference by Race Group

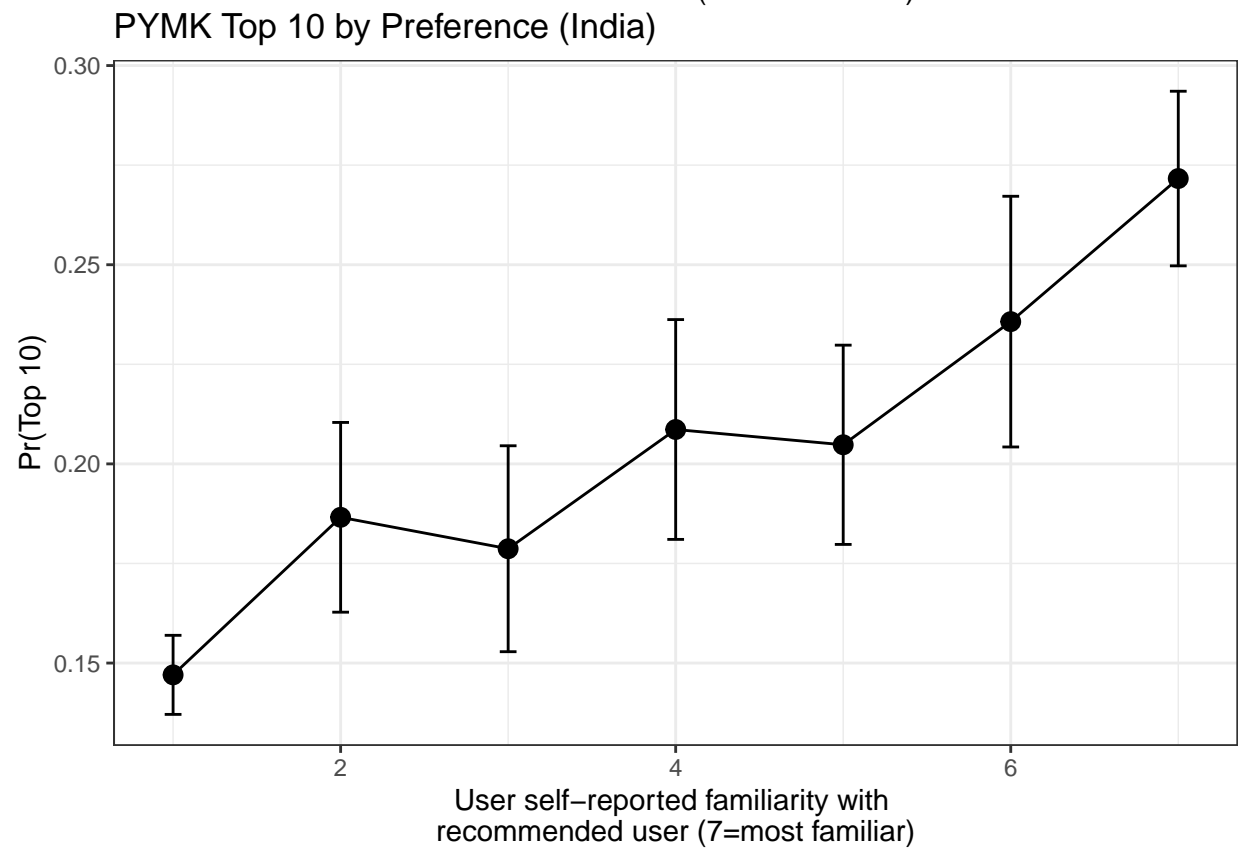
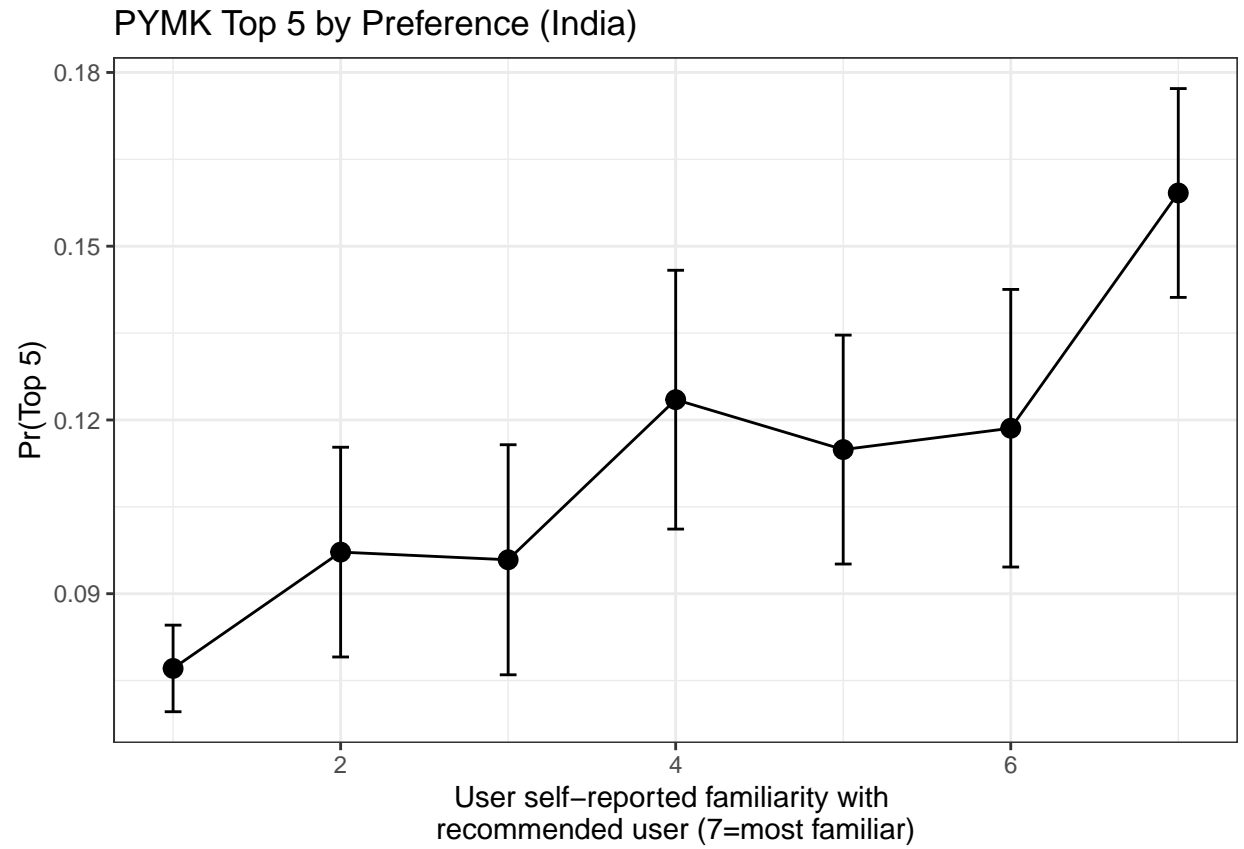
Same-religion posts are slightly more preferred

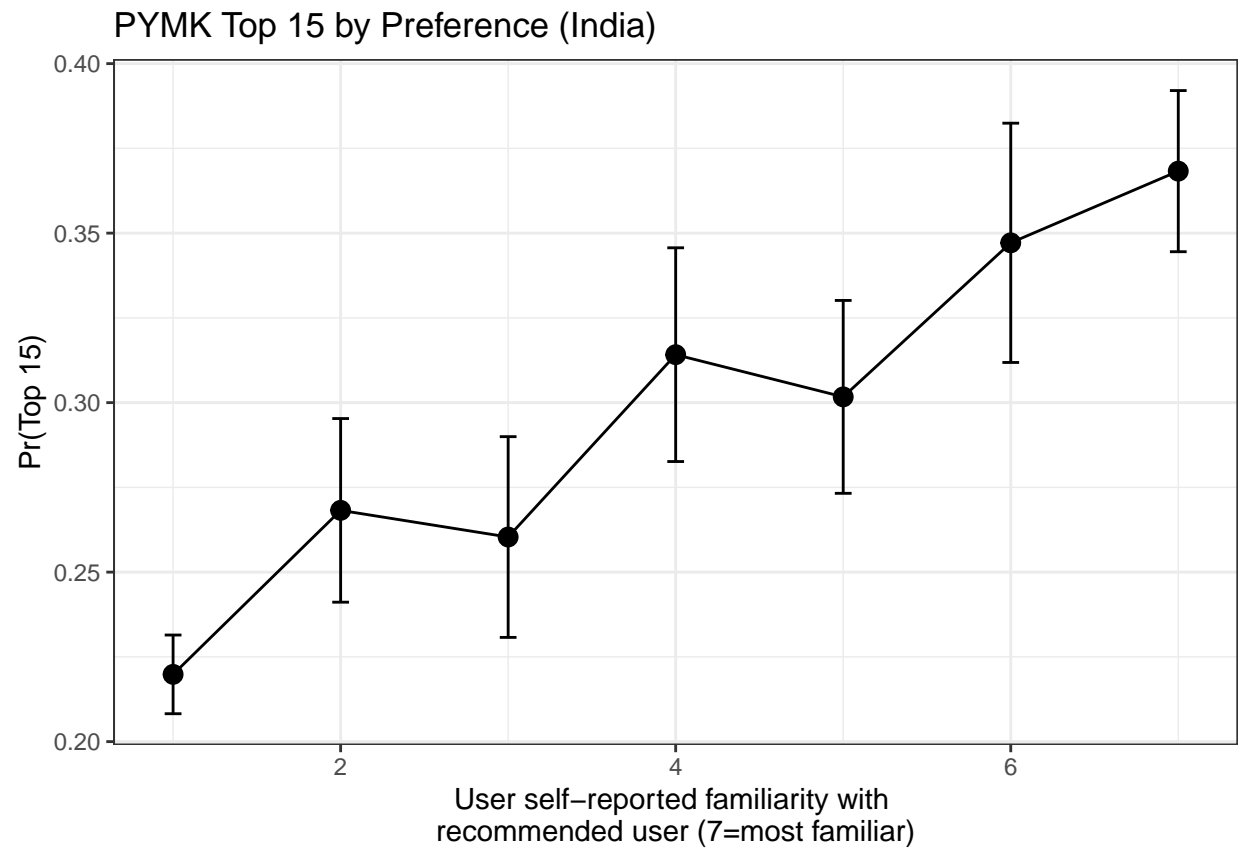


## Distribution of normalized preference by religion





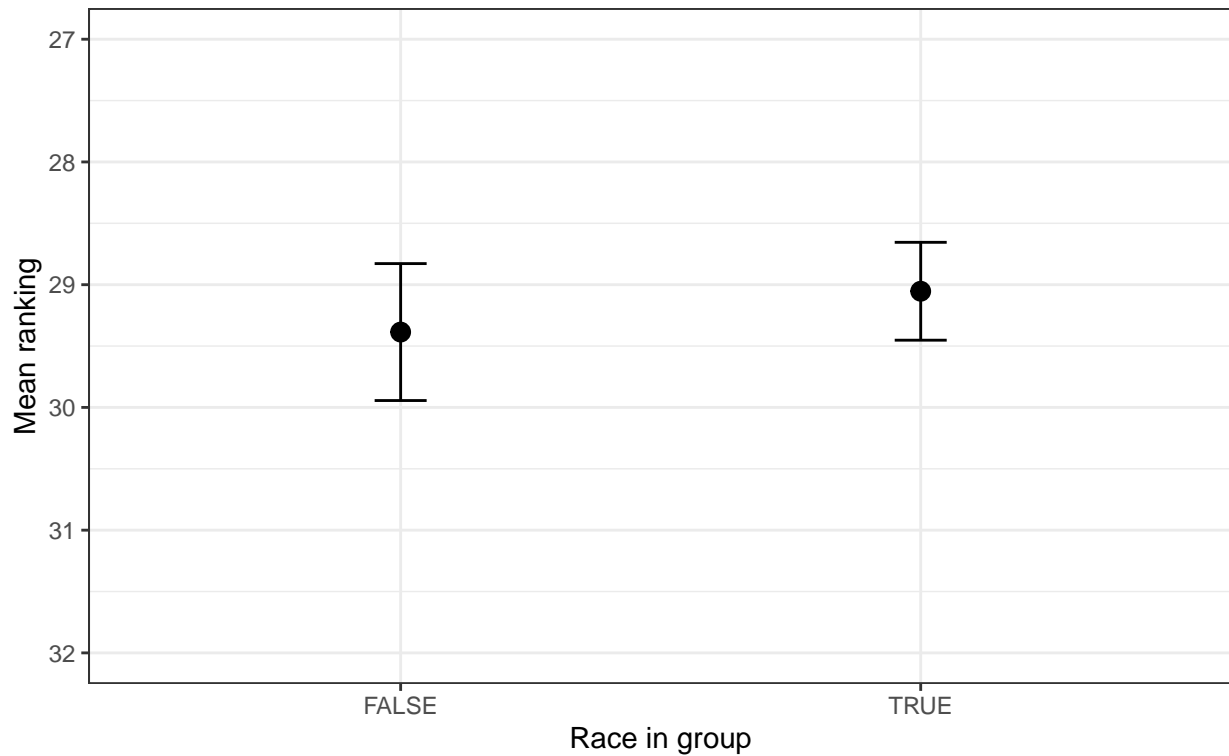




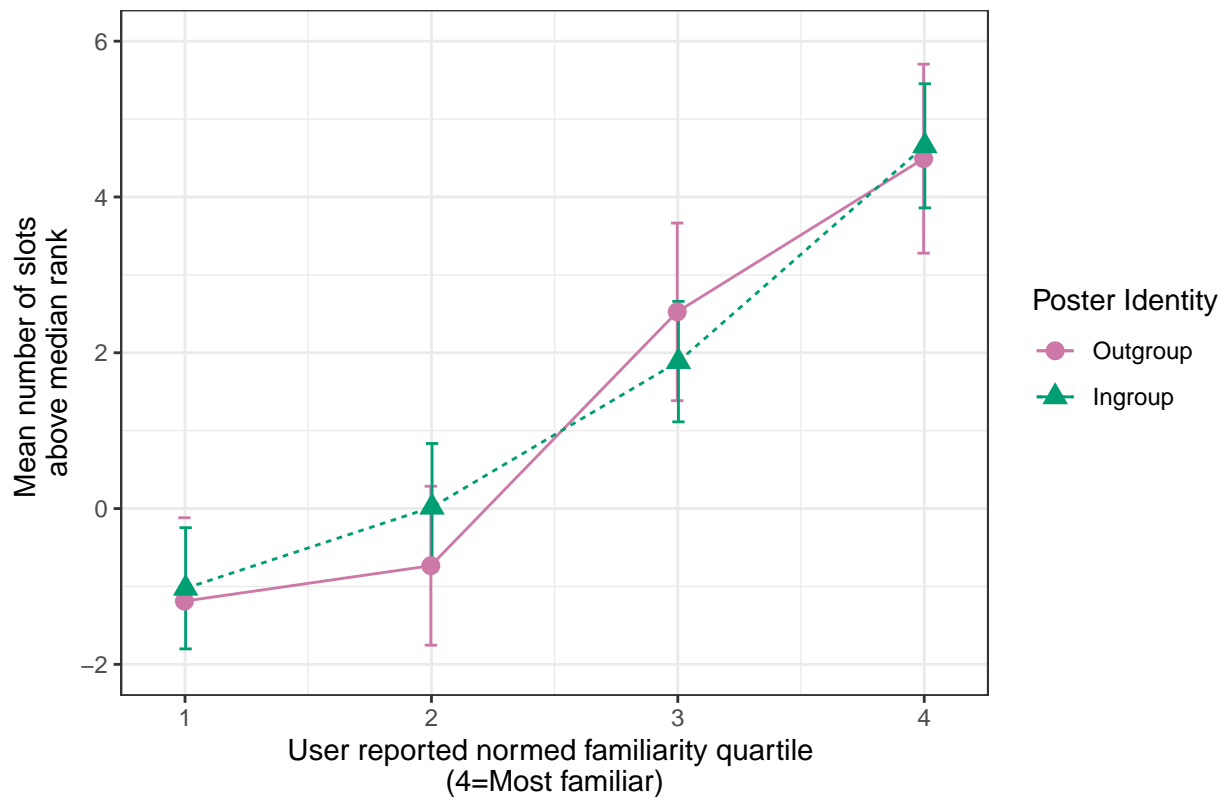
```
## geom_path: Each group consists of only one observation. Do you need to adjust  
## the group aesthetic?
```

## PYMK Ranking by Identity

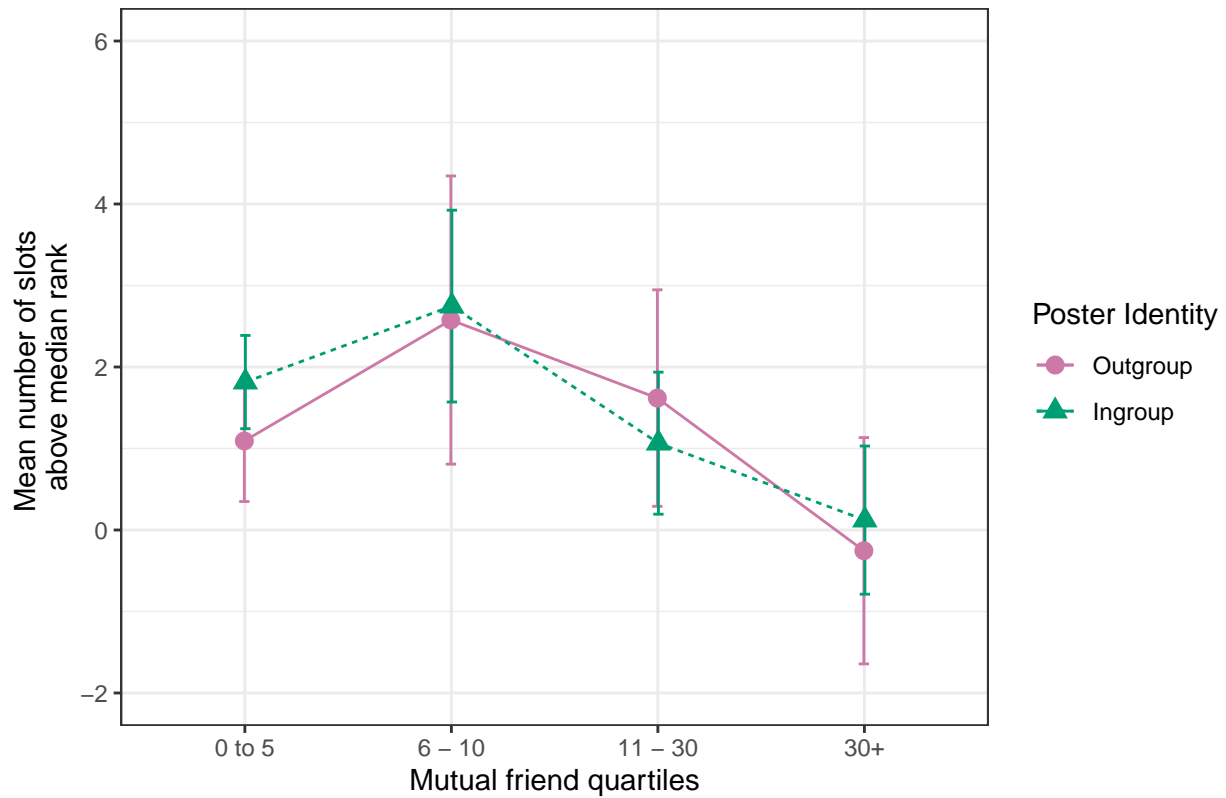
No evidence of differential treatments by religion



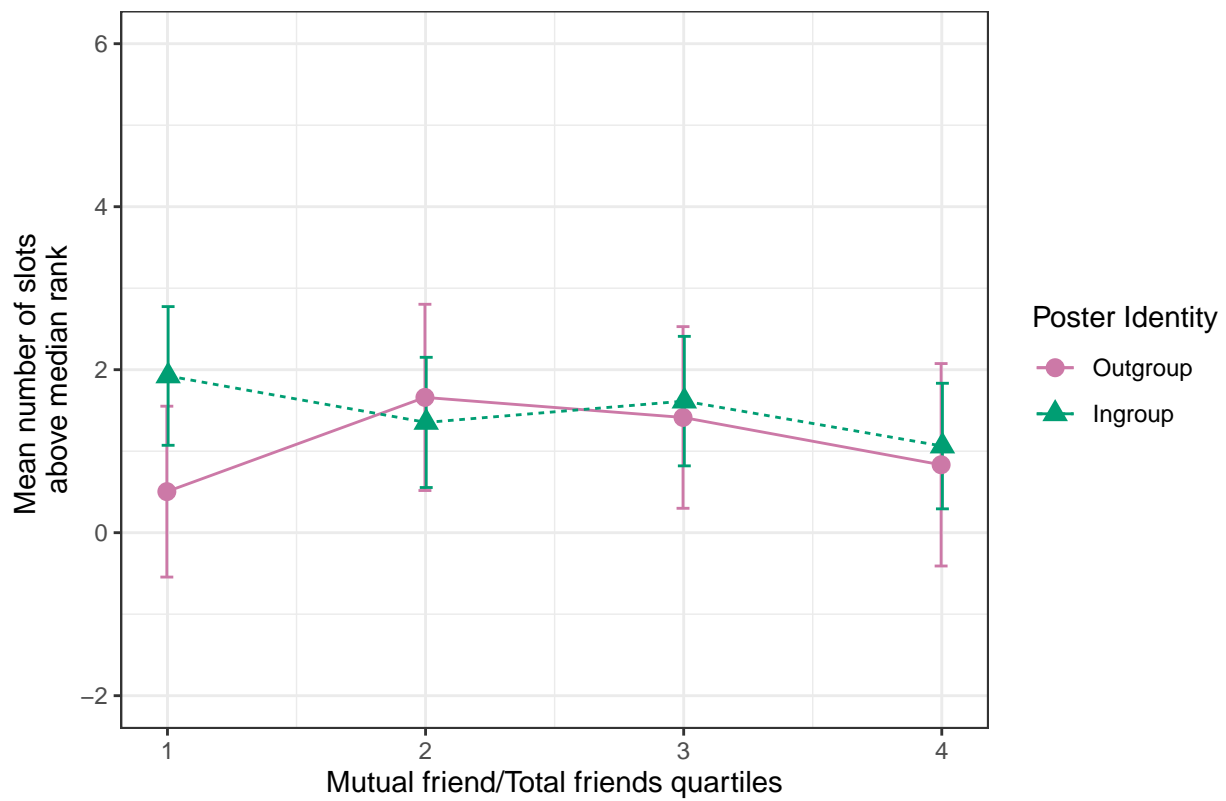
## PYMK Ranking by Familiarity (India)



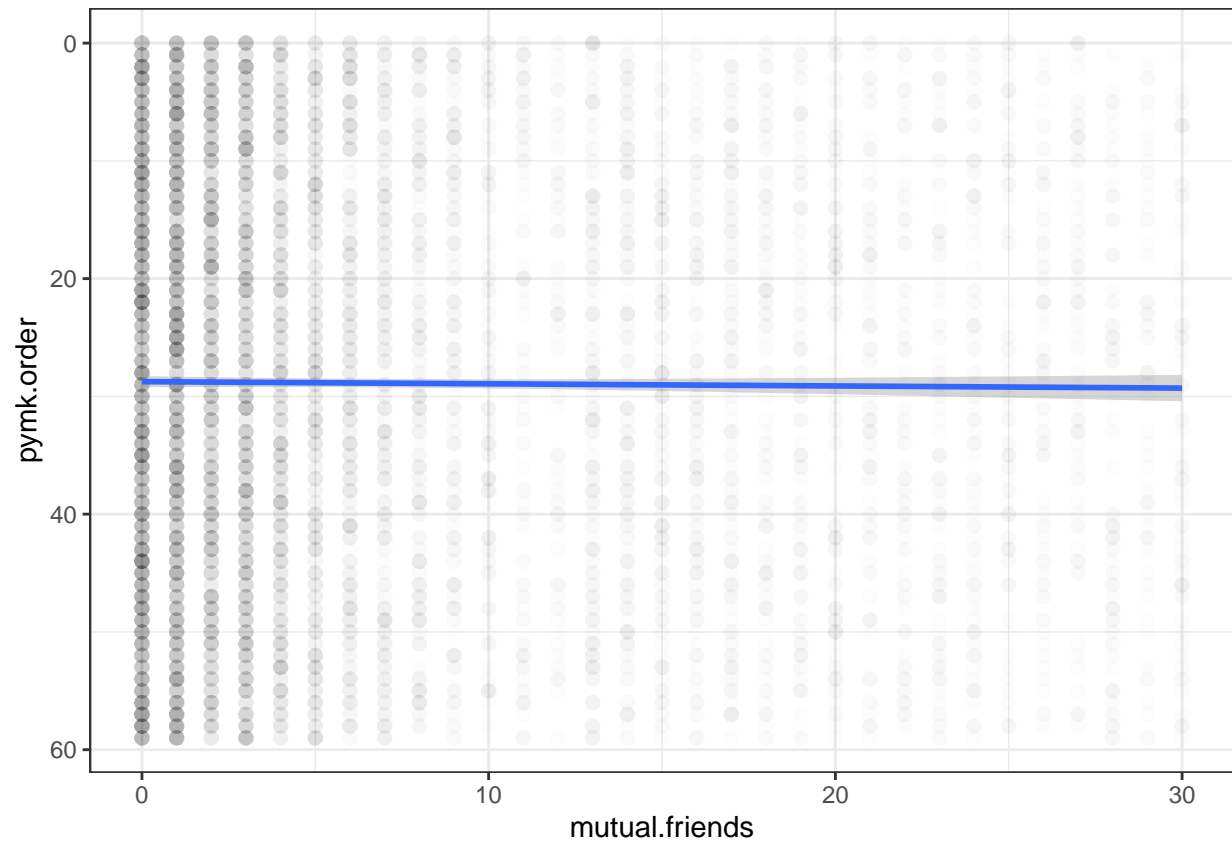
PYMK Ranking by Familiarity (India)

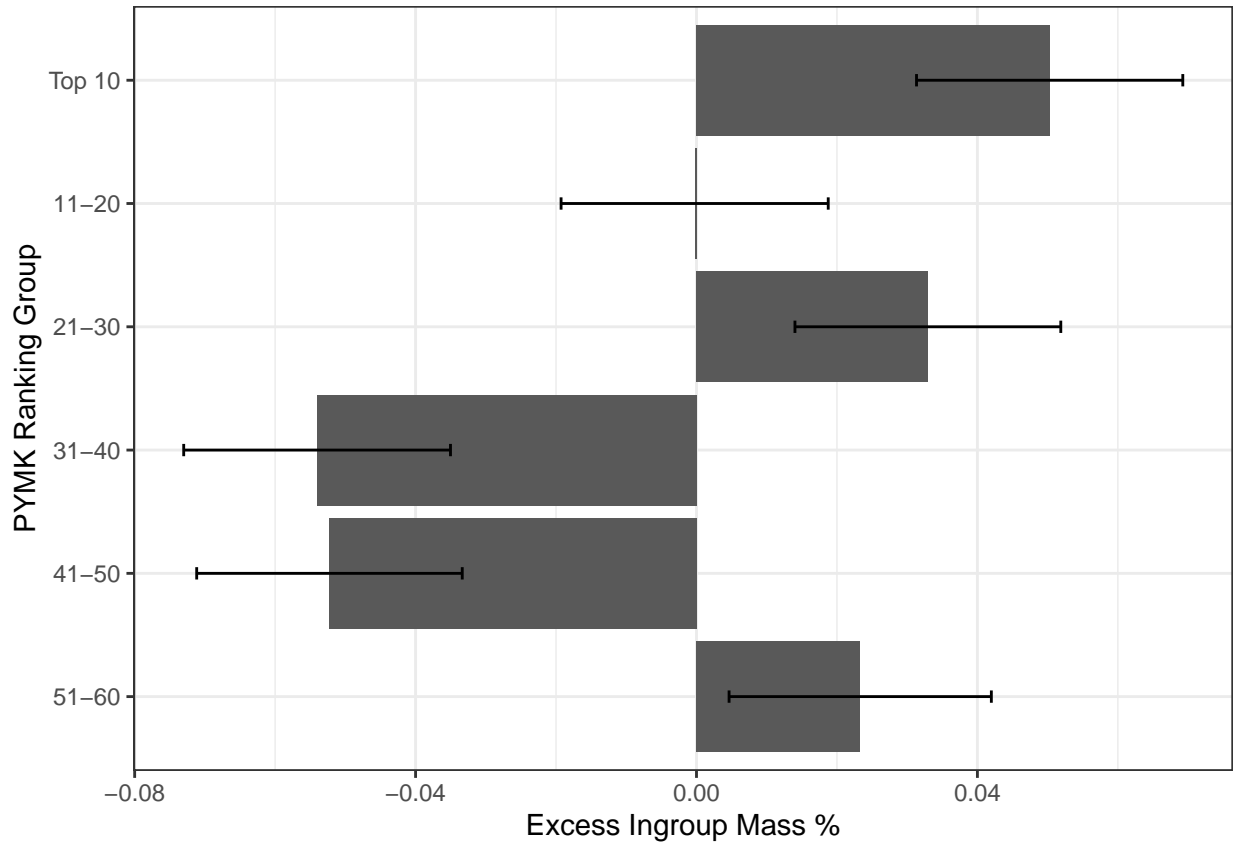


PYMK Ranking by Familiarity (India)



```
## `geom_smooth()` using formula 'y ~ x'
```





## Regression Tables

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:36:09

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:36:09

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:36:10

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Sun, Jan 17, 2021 - 13:36:10



Table 9: Primary NF Rank Results

	<i>Dependent variable:</i>			
	nf.order			
	(1) all.mdl	(2) hindu.mdl	(3) muslim.mdl	(4) other.mdl
religion.in.group	1.126*** (0.397)	1.492*** (0.538)	0.958 (0.692)	2.420 (2.156)
I(100 *norm.pctle)	0.047*** (0.007)	0.046*** (0.009)	0.043*** (0.012)	0.107*** (0.033)
Constant	-31.340*** (0.457)	-31.614*** (0.627)	-30.949*** (0.745)	-34.107*** (2.003)
Observations	7,866	4,912	2,521	319
R <sup>2</sup>	0.007	0.007	0.006	0.036
Adjusted R <sup>2</sup>	0.007	0.007	0.005	0.030
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		

Table 10: Primary NF Top 10 Results

	<i>Dependent variable:</i>			
	top10			
	(1) all.mdl	(2) hindu.mdl	(3) muslim.mdl	(4) other.mdl
I(100 *norm.pctle)	0.001*** (0.0002)	0.001*** (0.0002)	0.001*** (0.0003)	0.002*** (0.001)
religion.in.group	0.005 (0.009)	0.002 (0.012)	0.015 (0.015)	0.060 (0.049)
Constant	0.134*** (0.010)	0.136*** (0.014)	0.138*** (0.017)	0.076* (0.046)
Observations	7,866	4,912	2,521	319
R <sup>2</sup>	0.004	0.004	0.004	0.030
Adjusted R <sup>2</sup>	0.004	0.003	0.003	0.023
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		

Table 11: Primary PYMK Rank Results

	<i>Dependent variable:</i>			
	pymk.order			
	(1) all.mdl	(2) hindu.mdl	(3) muslim.mdl	(4) other.mdl
religion.in.group	0.186 (0.349)	0.200 (0.540)	0.561 (0.584)	-2.191 (2.241)
I(100 *norm.pctle)	0.080*** (0.006)	0.077*** (0.007)	0.089*** (0.010)	0.041 (0.028)
Constant	-33.272*** (0.398)	-33.282*** (0.592)	-33.639*** (0.647)	-31.209*** (1.639)
Observations	10,882	6,833	3,449	480
R <sup>2</sup>	0.018	0.017	0.022	0.007
Adjusted R <sup>2</sup>	0.018	0.017	0.021	0.003
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		

Table 12: Primary PYMK Top 10 Results

	<i>Dependent variable:</i>			
	top10			
	(1) all.mdl	(2) hindu.mdl	(3) muslim.mdl	(4) other.mdl
I(100 *norm.pctle)	0.002*** (0.0001)	0.001*** (0.0002)	0.002*** (0.0002)	0.001 (0.001)
religion.in.group	0.003 (0.008)	0.015 (0.012)	-0.007 (0.013)	-0.027 (0.050)
Constant	0.107*** (0.009)	0.100*** (0.013)	0.103*** (0.015)	0.139*** (0.037)
Observations	10,882	6,833	3,449	480
R <sup>2</sup>	0.013	0.012	0.017	0.006
Adjusted R <sup>2</sup>	0.013	0.012	0.016	0.002
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		