Facebook Results Memo

ddd

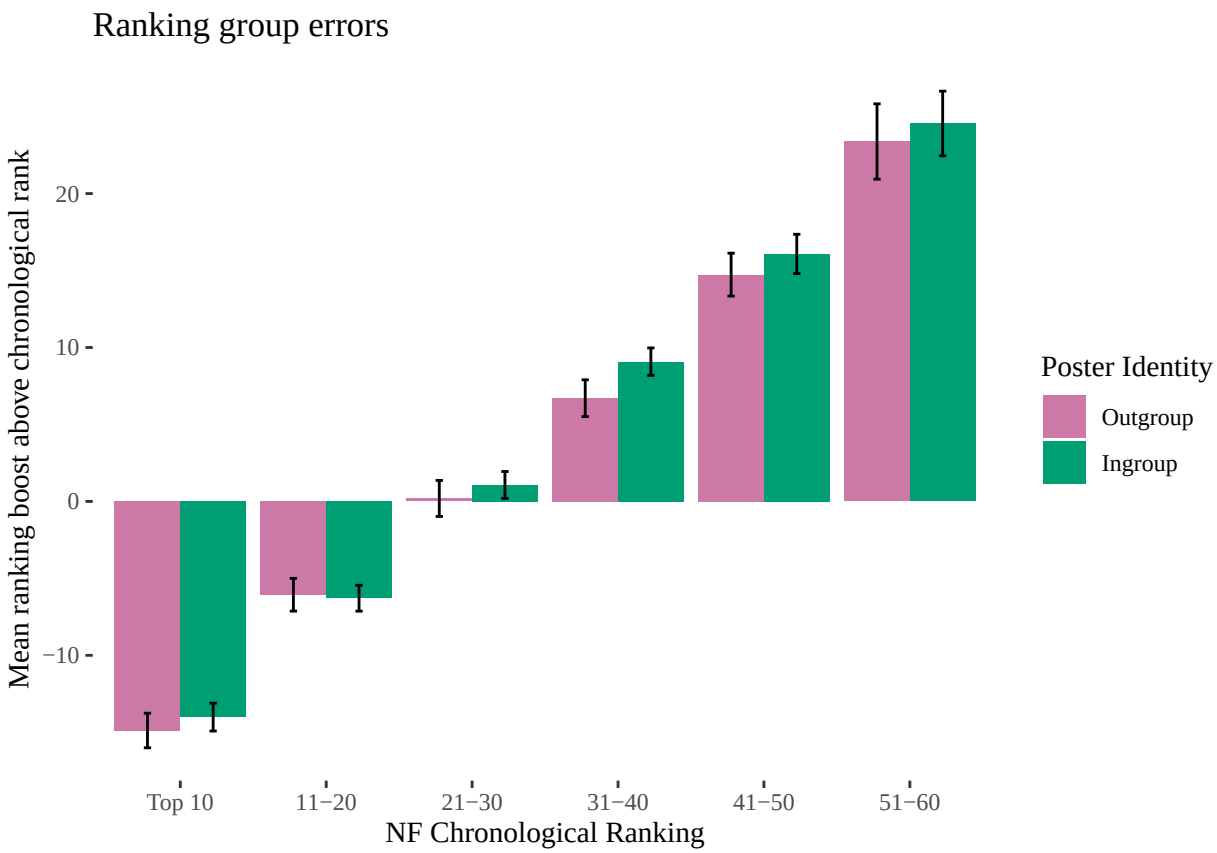
8/27/2020

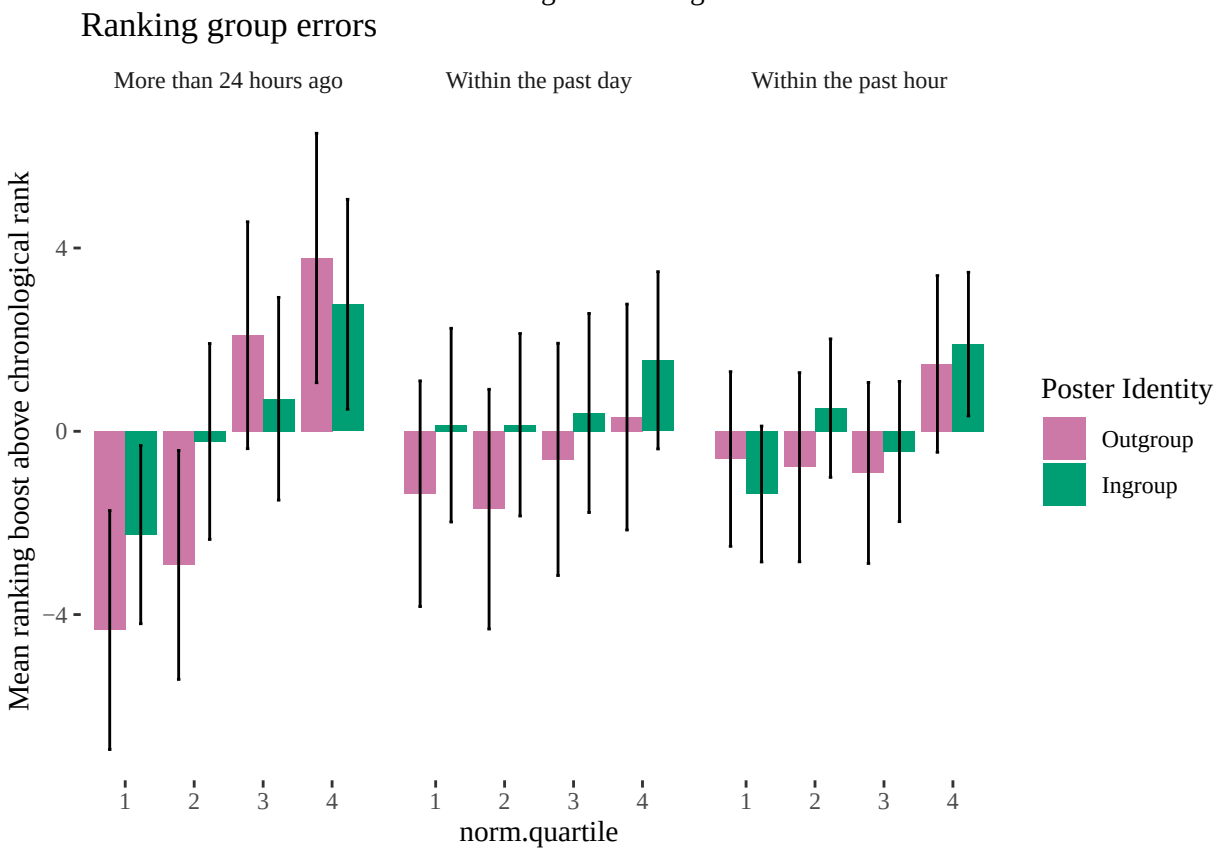
Executive Summary

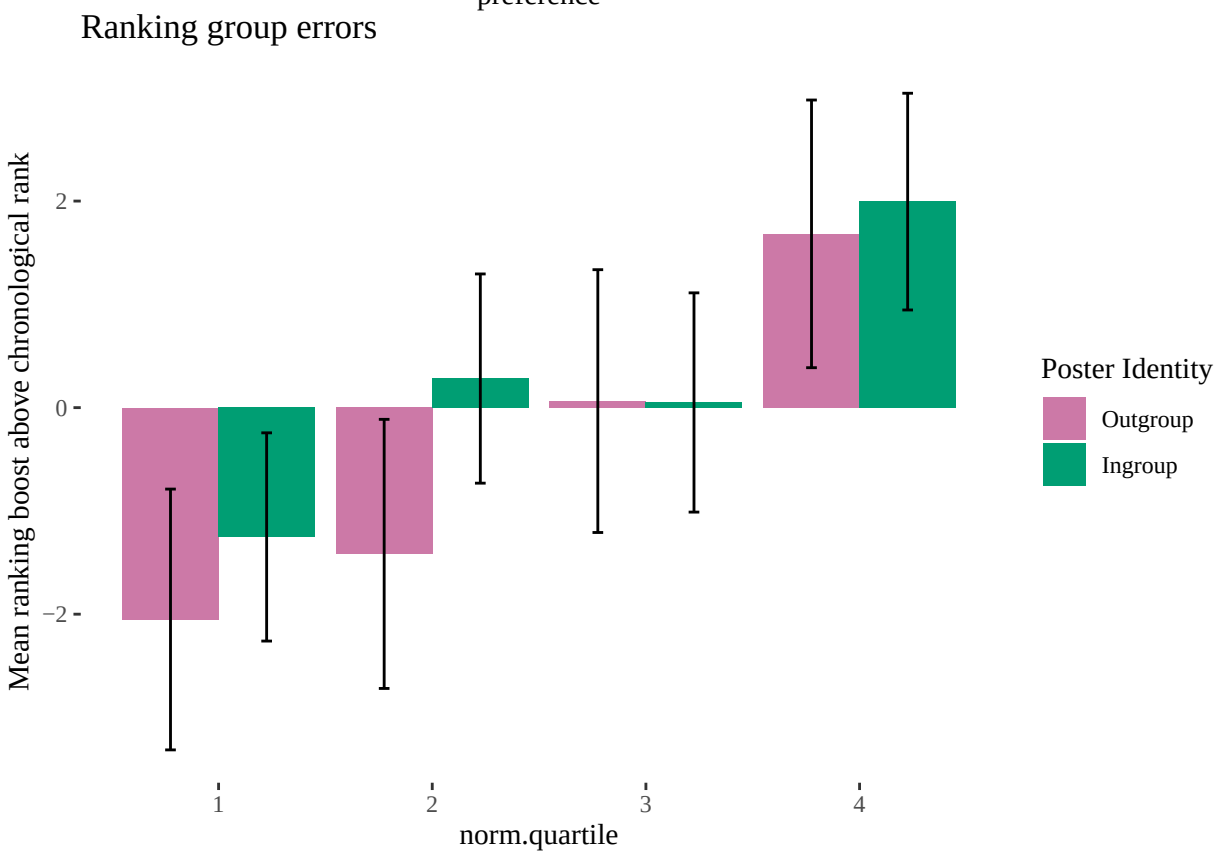
Artificial intelligence has become an important component of how social media platforms try to achieve the goal of bringing people together, by helping prioritize what we see and consume online. These algorithms have the potential to expand people's social networks, but – given evidence of bias with 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: Fri, Jan 08, 2021 - 09:07:12

Table 1:

	Dependent variable:					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−1.006296***			−1.007704***	−0.931093***	
	(0.339386)			(0.338416)	(0.330125)	
I(100 ∗norm.pctle)		−0.038949***		−0.038960***		−0.040080***
		(0.005737)		(0.005735)		(0.005579)
time_rank			0.232724***		0.232392***	0.233469***
			(0.010967)		(0.010963)	(0.010932)
Constant	23.903490***	25.246370***	17.874620***	25.855030***	18.444260***	19.864020***
	(0.263650)	(0.331596)	(0.302280)	(0.389394)	(0.363434)	(0.409220)
Observations	7,866	7,866	7,866	7,866	7,866	7,866
R^2	0.001117	0.005826	0.054160	0.006946	0.055116	0.060329
Adjusted R^2	0.000990	0.005700	0.054040	0.006693	0.054876	0.060090
Note:						*p<0.1; **p<0

% 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 2:

	Dependent variable:					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−0.320043			−0.173920	−0.260766	
	(0.351422)			(0.348483)	(0.351182)	
I(100 ∗norm.pctle)		−0.079599***		−0.079514***		−0.077353***
		(0.005687)		(0.005690)		(0.005939)
friend_rank			0.050286***		0.050057***	0.013012
			(0.009575)		(0.009580)	(0.009923)
Constant	30.368040***	34.141870***	28.637850***	34.253810***	28.819020***	33.636990***
	(0.287258)	(0.328728)	(0.332681)	(0.397966)	(0.412562)	(0.506265)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R^2	0.000076	0.017689	0.002529	0.017711	0.002579	0.017844
Adjusted R^2	−0.000016	0.017599	0.002437	0.017531	0.002396	0.017664
Note:						*p<0.1; **p<0.0

% 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 3:

	Dependent variable:					
				new.rank		
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−0.320043			−0.173920	−0.251979	
	(0.351422)			(0.348483)	(0.350972)	
I(100 ∗norm.pctle)		−0.079599***		−0.079514***		−0.075465***
		(0.005687)		(0.005690)		(0.005937)
pct_friend_rank			0.060297***		0.060085***	0.023990**
			(0.009570)		(0.009574)	(0.009920)
Constant	30.368040***	34.141870***	28.335990***	34.253810***	28.510760***	33.211360***
	(0.287258)	(0.328728)	(0.332496)	(0.397966)	(0.412088)	(0.506023)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R^2	0.000076	0.017689	0.003636	0.017711	0.003683	0.018217
Adjusted R^2	−0.000016	0.017599	0.003544	0.017531	0.003500	0.018036
Note:						*p<0.1; **p<0.0

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

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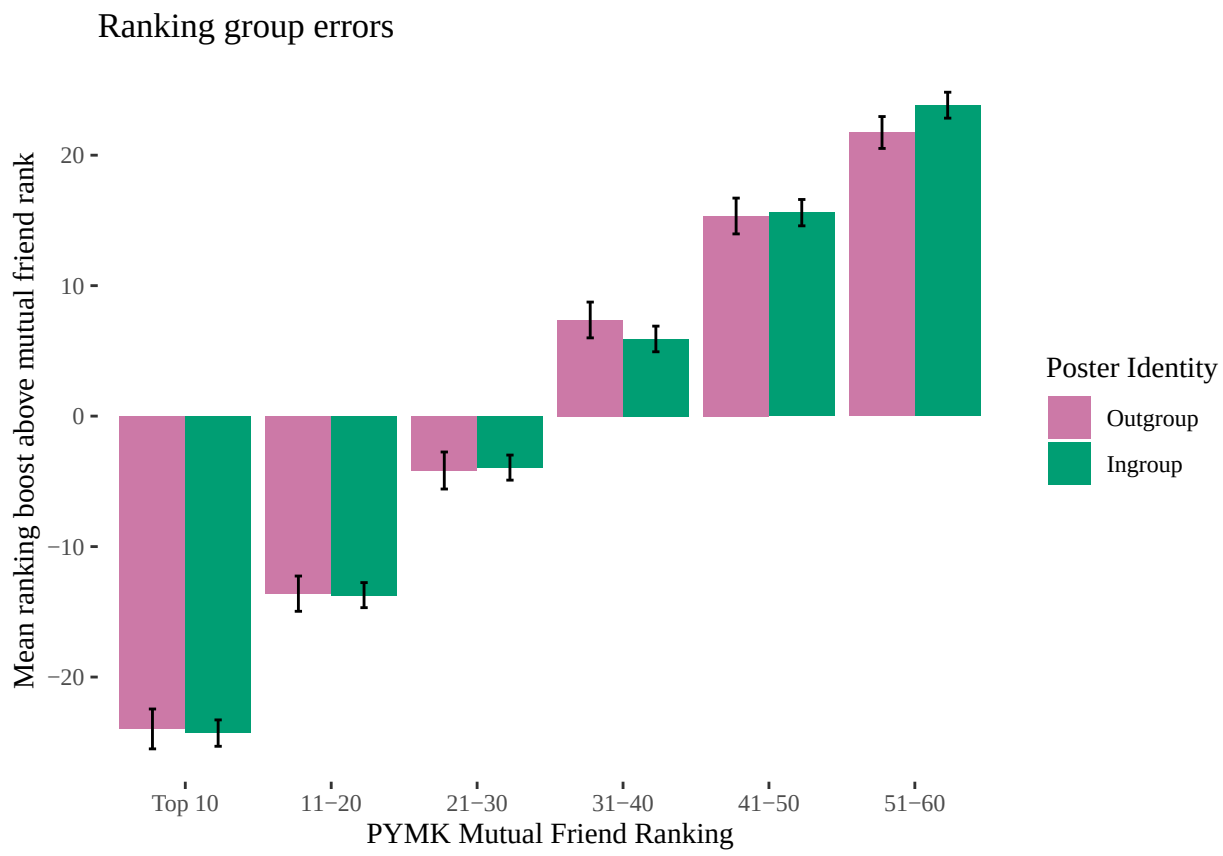
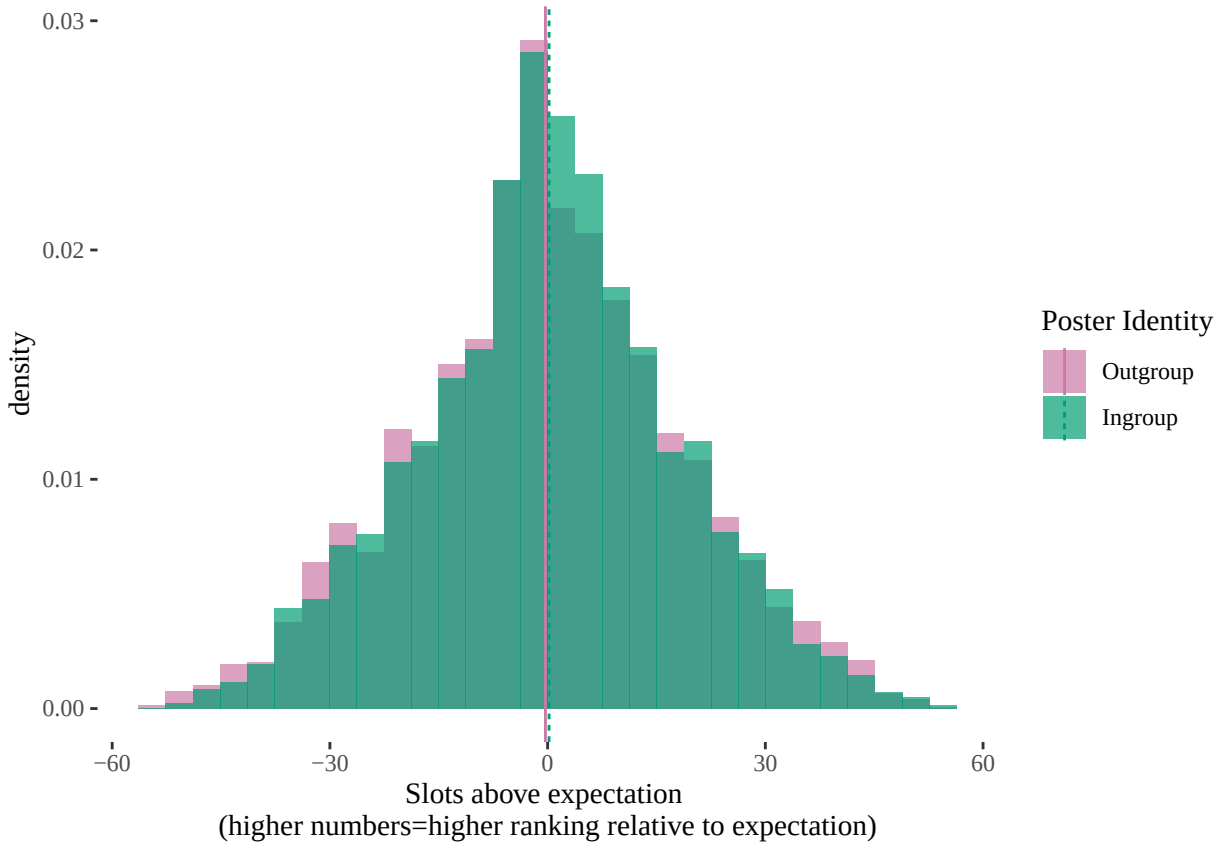
Table 5: Correlations 2

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

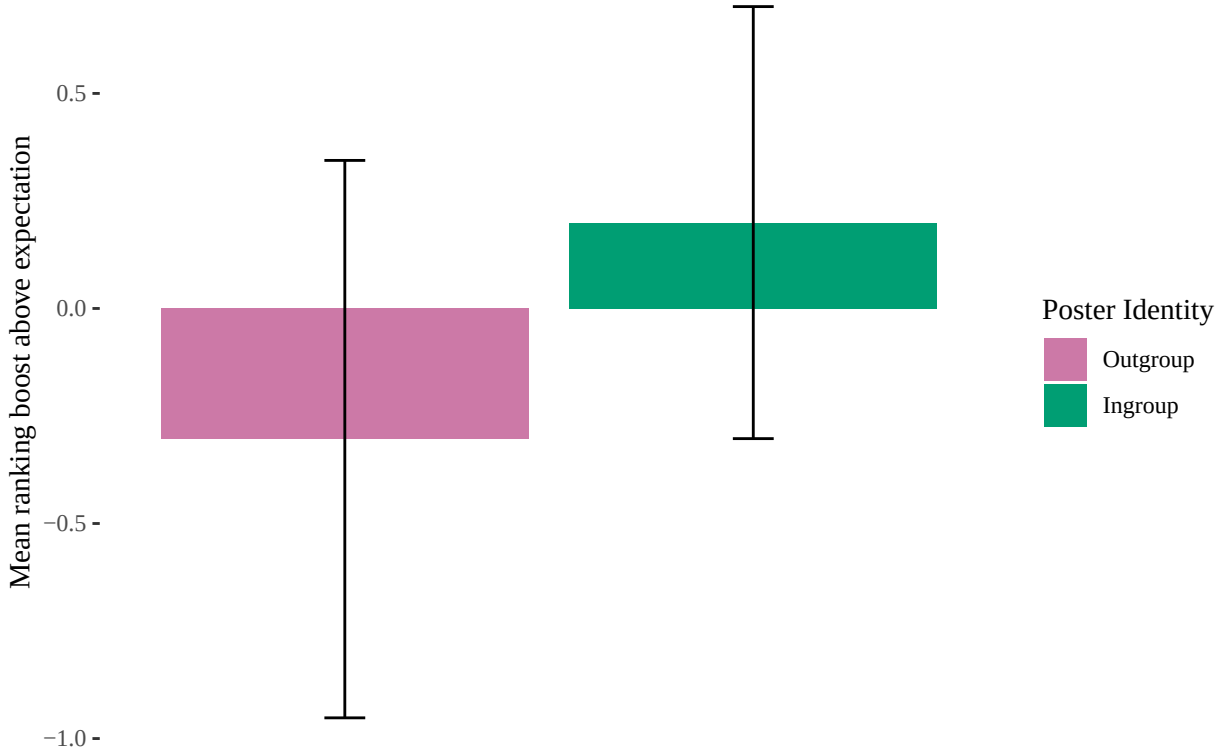
Correlation matrix for preferences

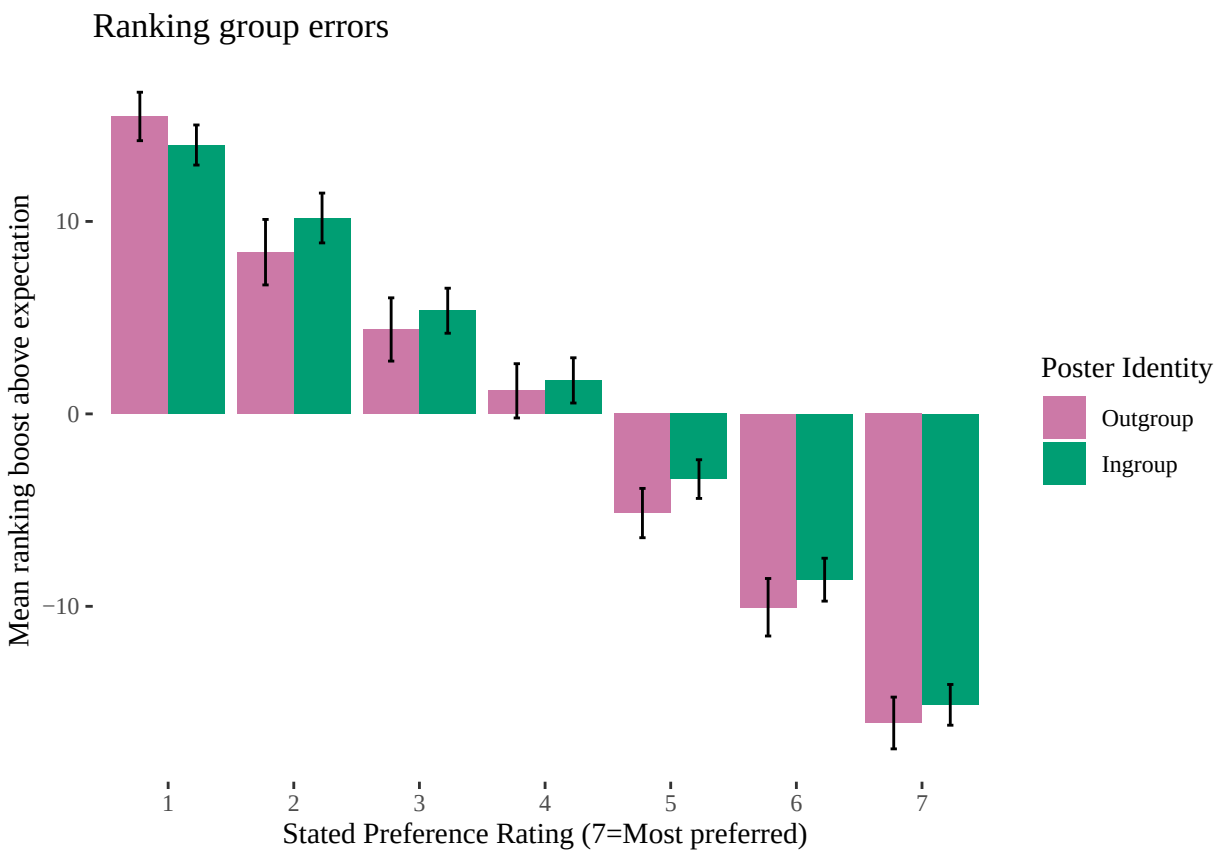


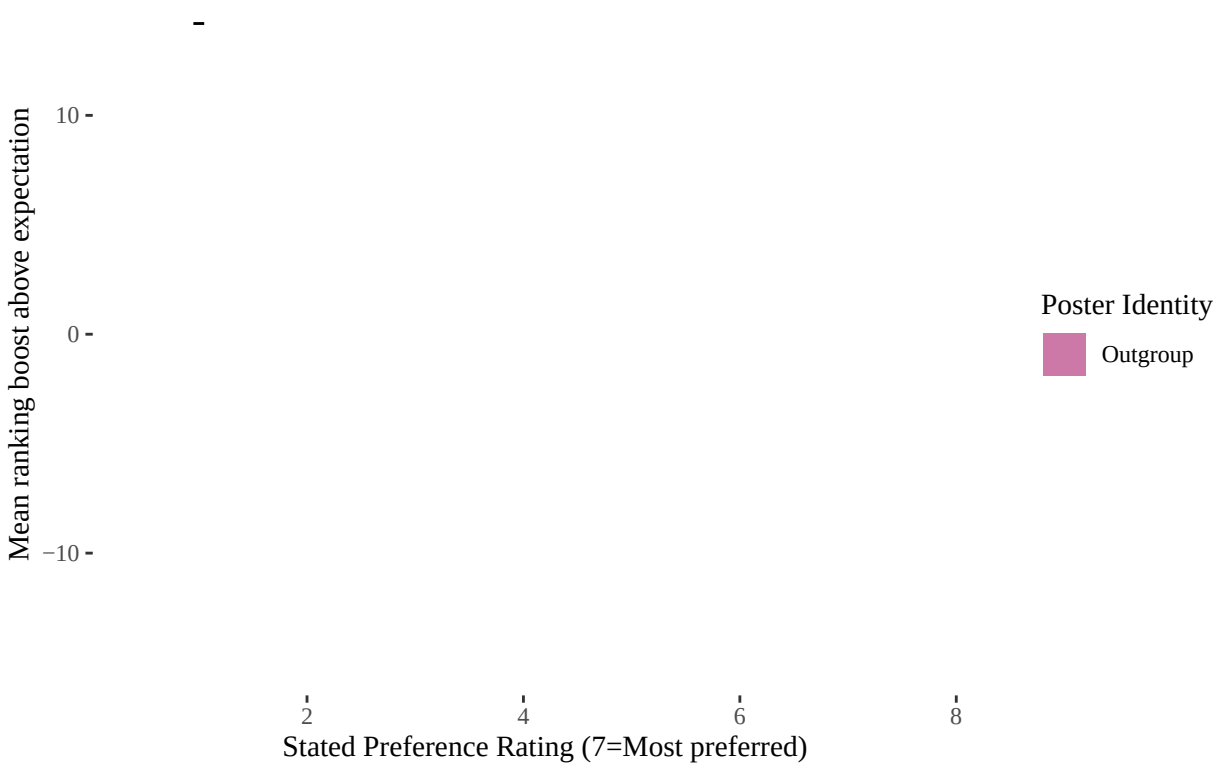

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

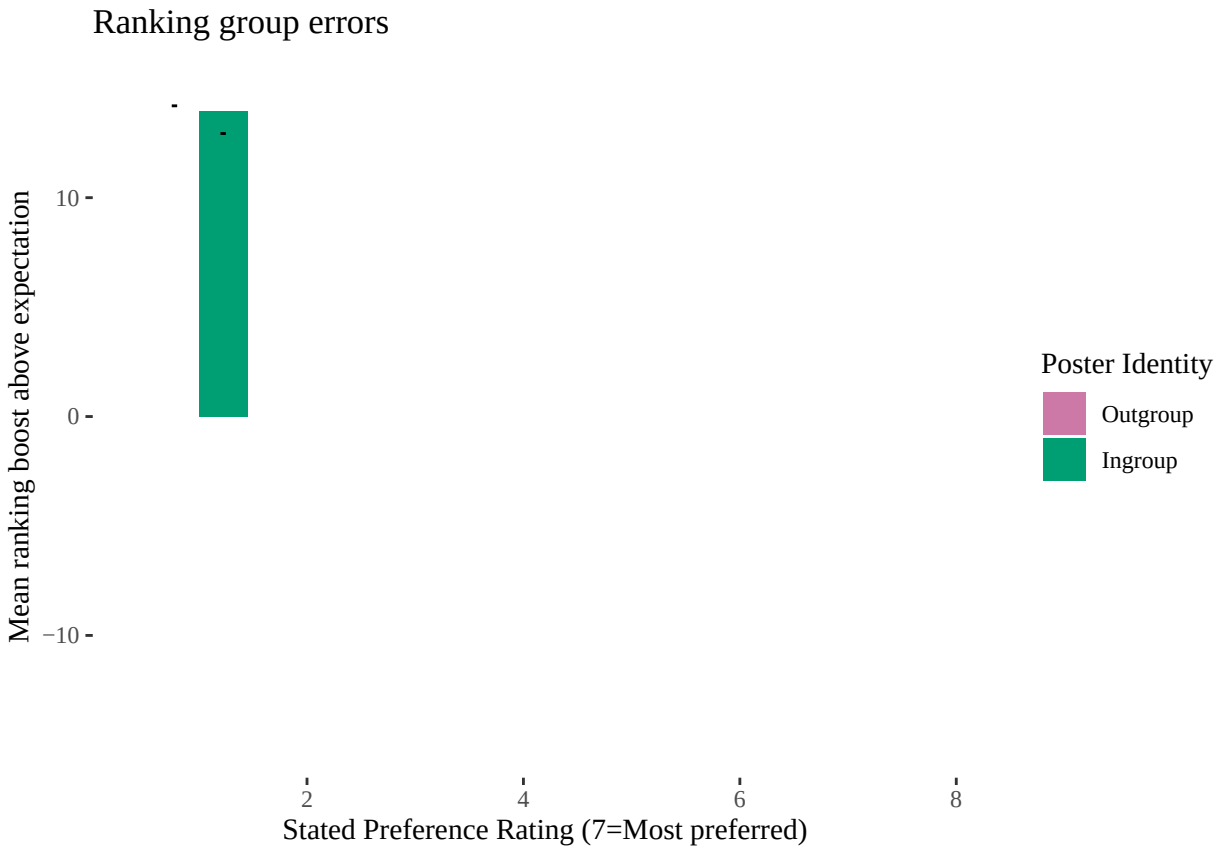


Ranking group errors



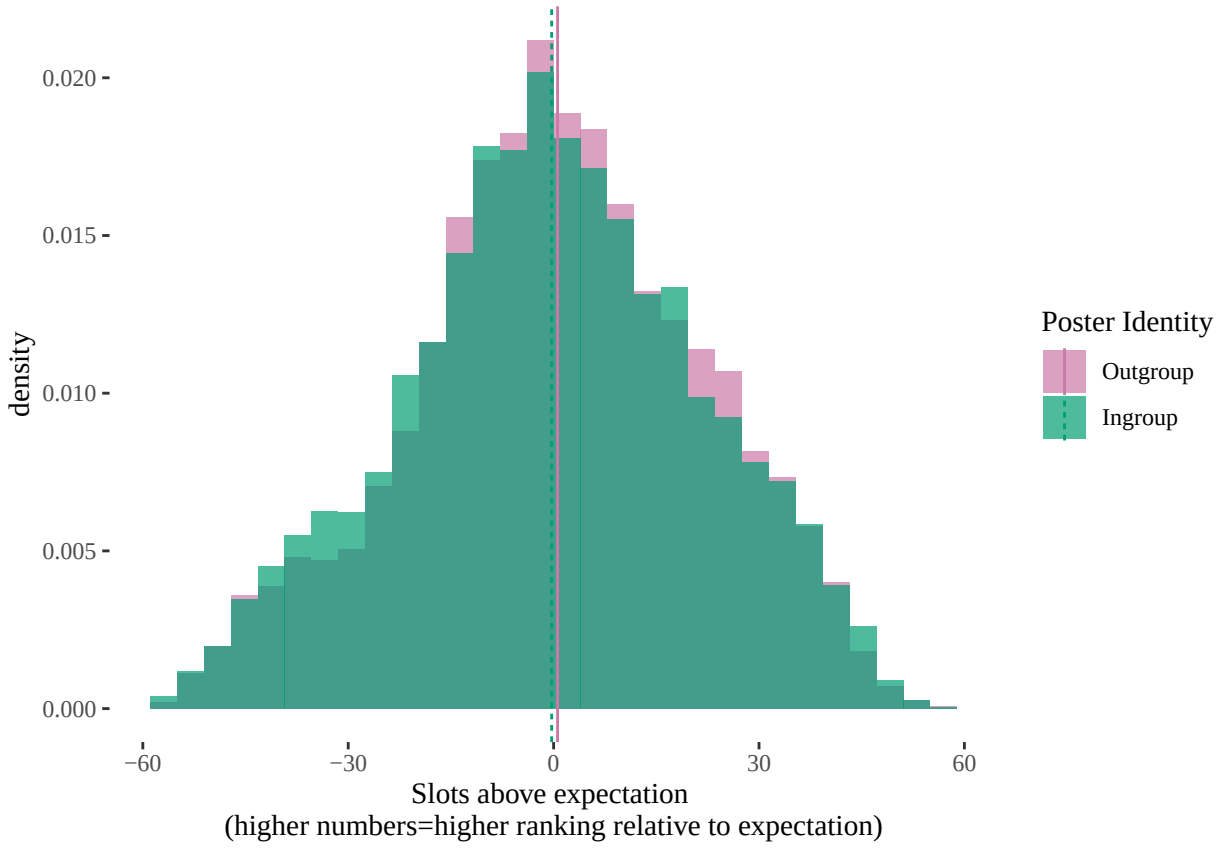

Ranking group errors
Mean ranking boost above expectation
10
0
−10
1
2
3
4
5
6
7
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup


Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup

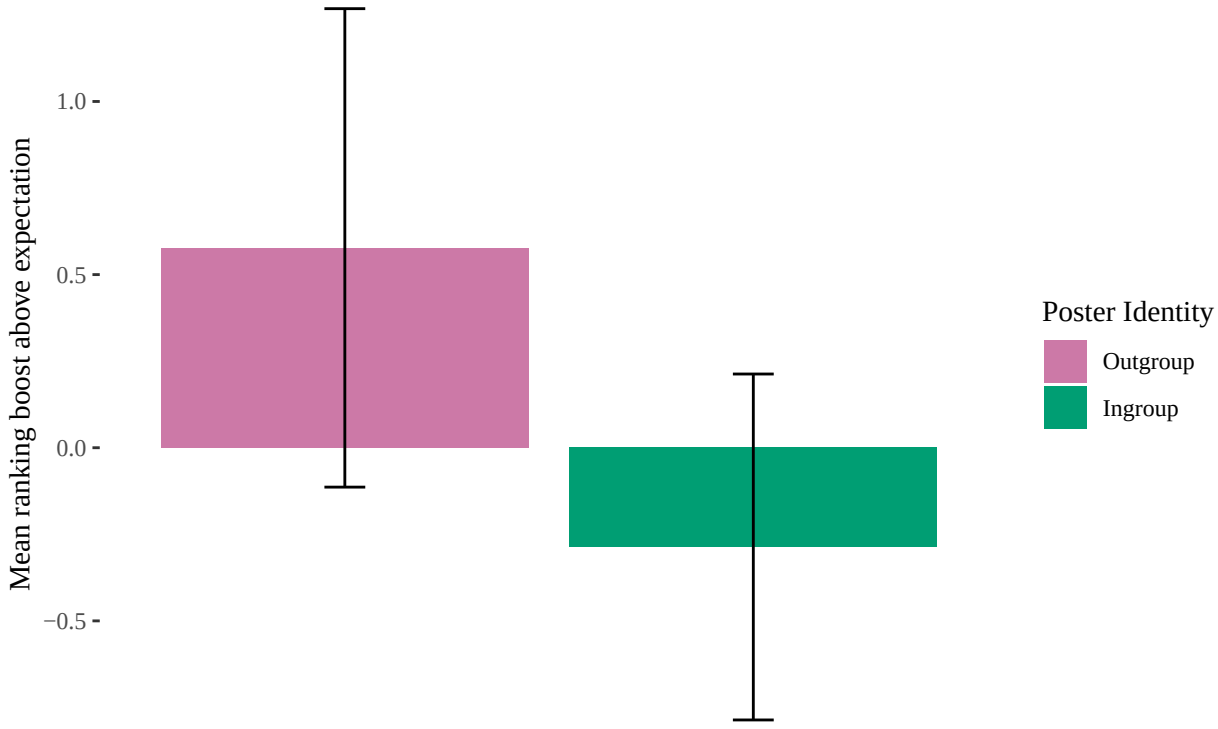

Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

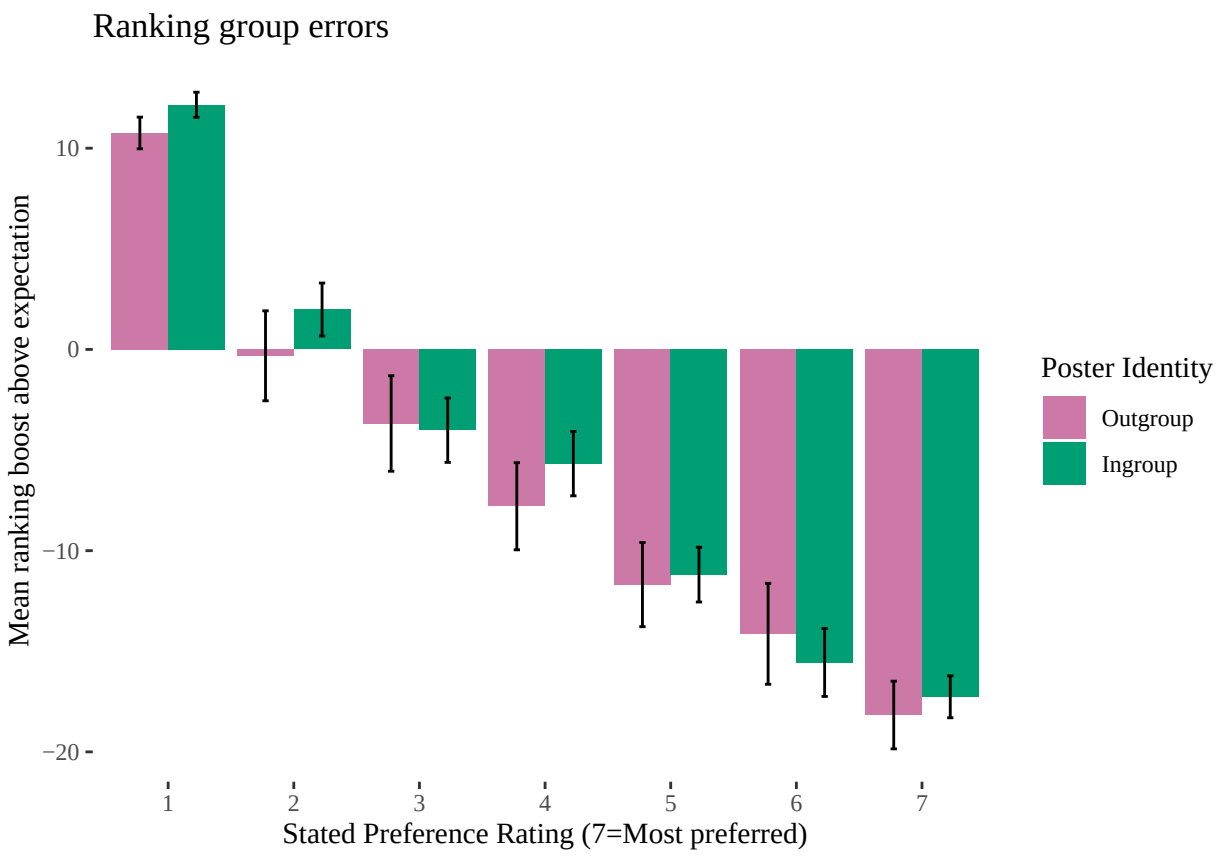

Ranking group errors
Mean ranking boost above expectation
10
0
−10
1
2
3
4
Normed Preference Rating Quartile (4=Most preferred)
Poster Identity
Outgroup
Ingroup

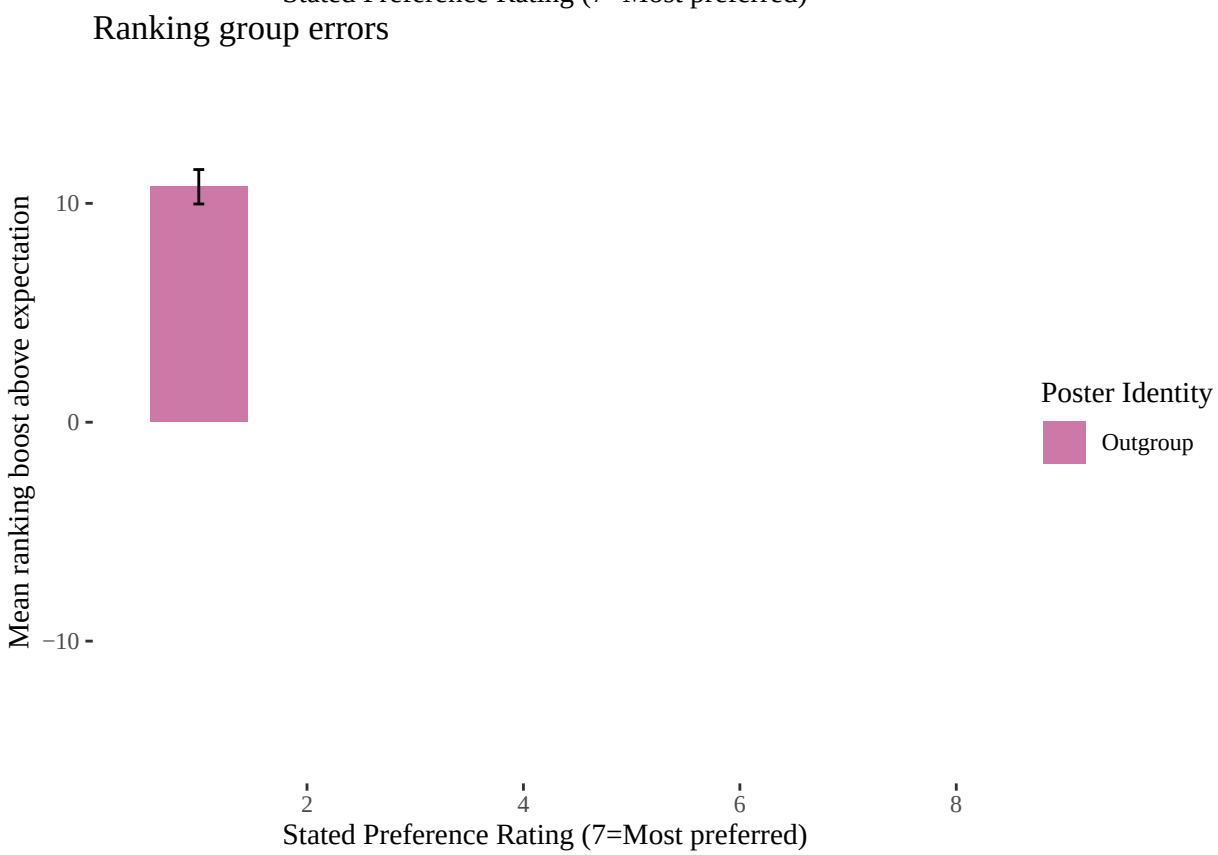
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

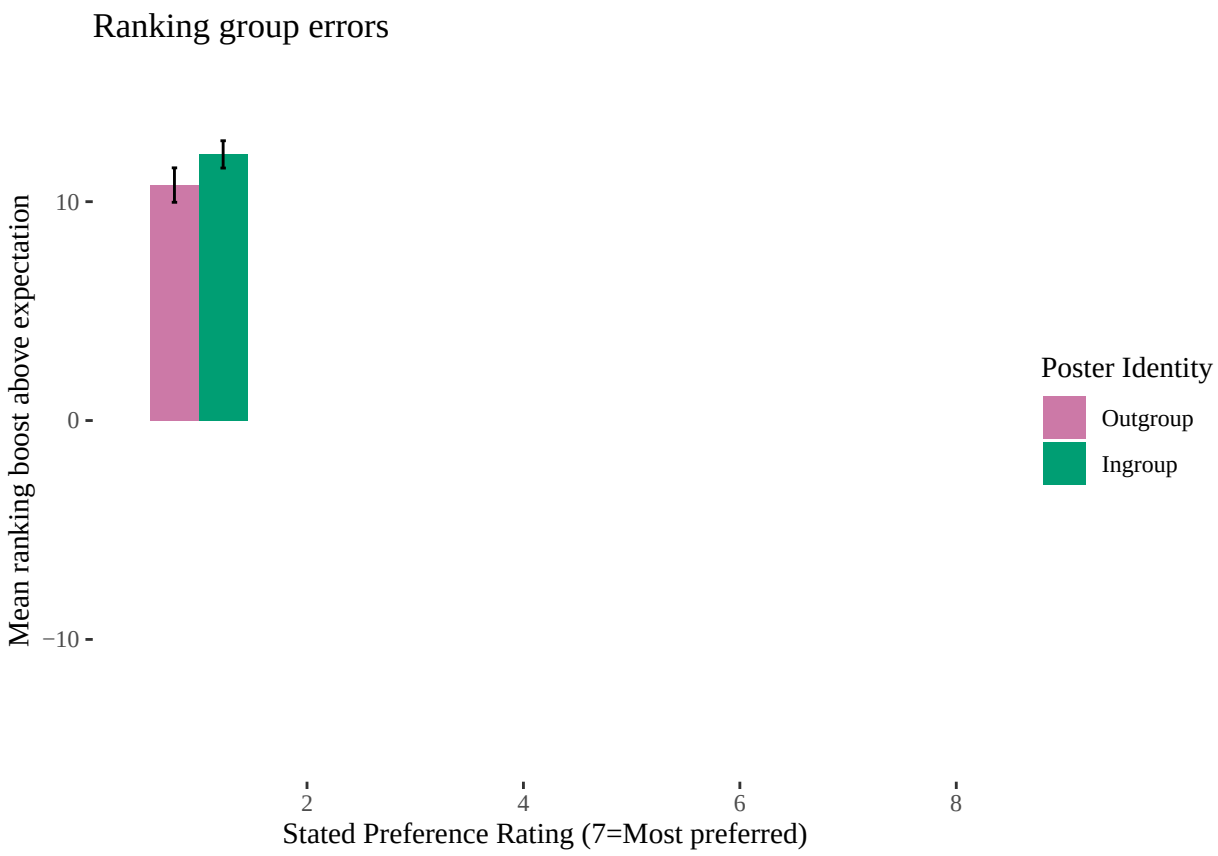


Ranking group errors



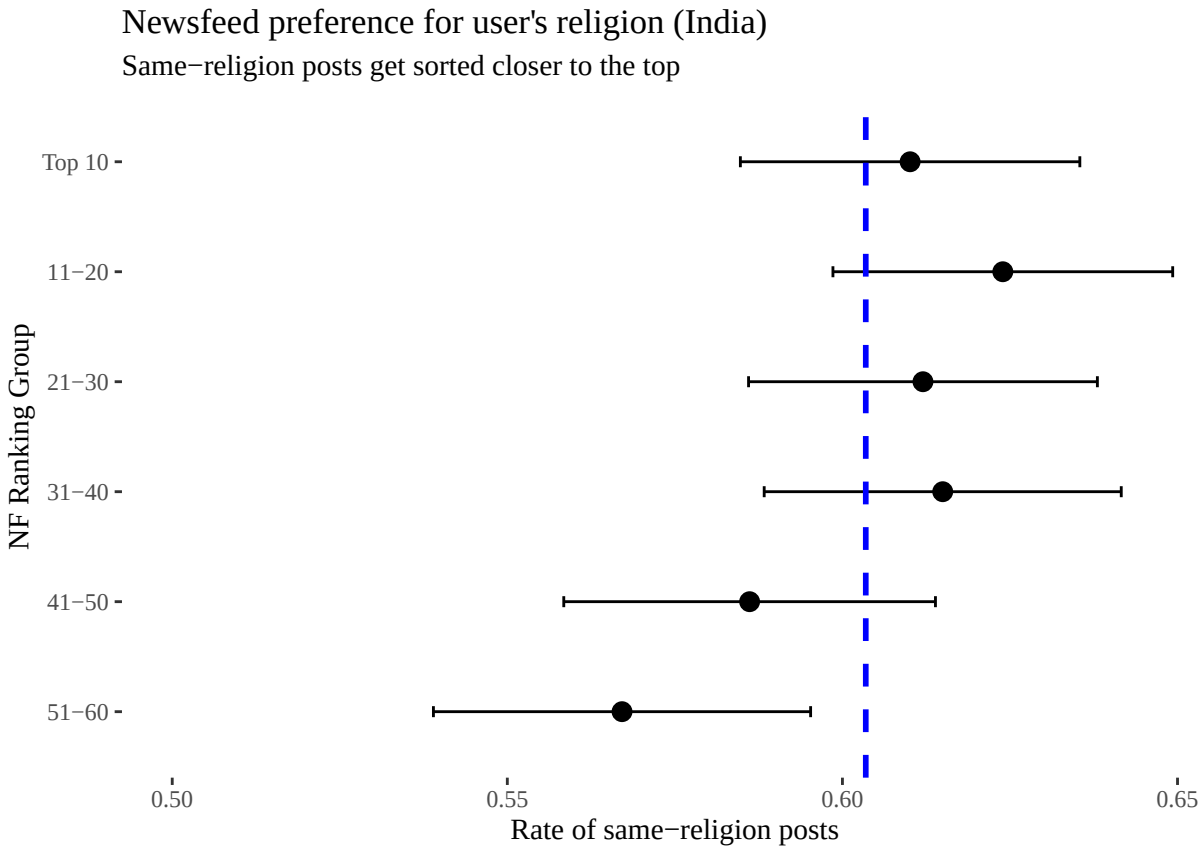

Ranking group errors
Mean ranking boost above expectation
10
0
−10
−20
1
2
3
4
5
6
7
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

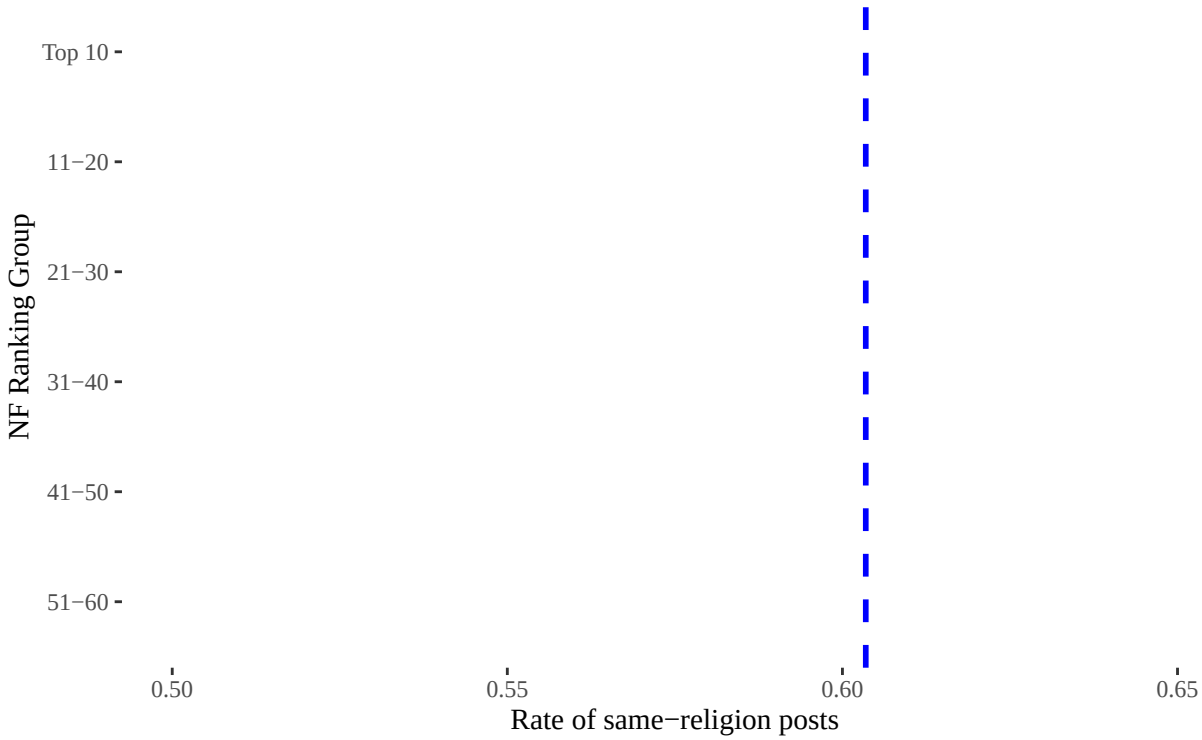

Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup


Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

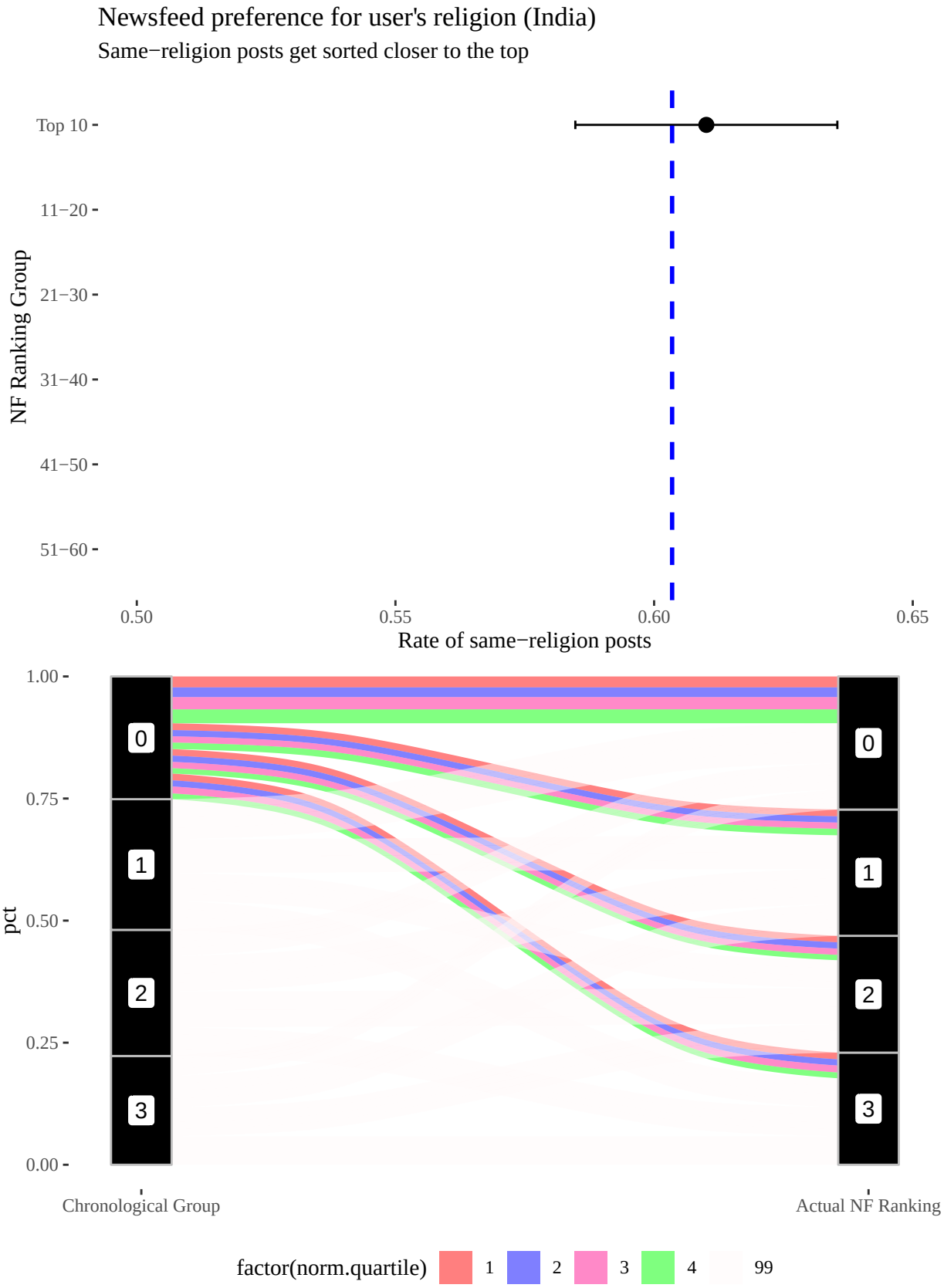

Ranking group errors
Mean ranking boost above expectation
10
0
−10
−20
1
2
3
4
Norm Stated Familiarity Rating Quartile (4=Most familiar)
Poster Identity
Outgroup
Ingroup

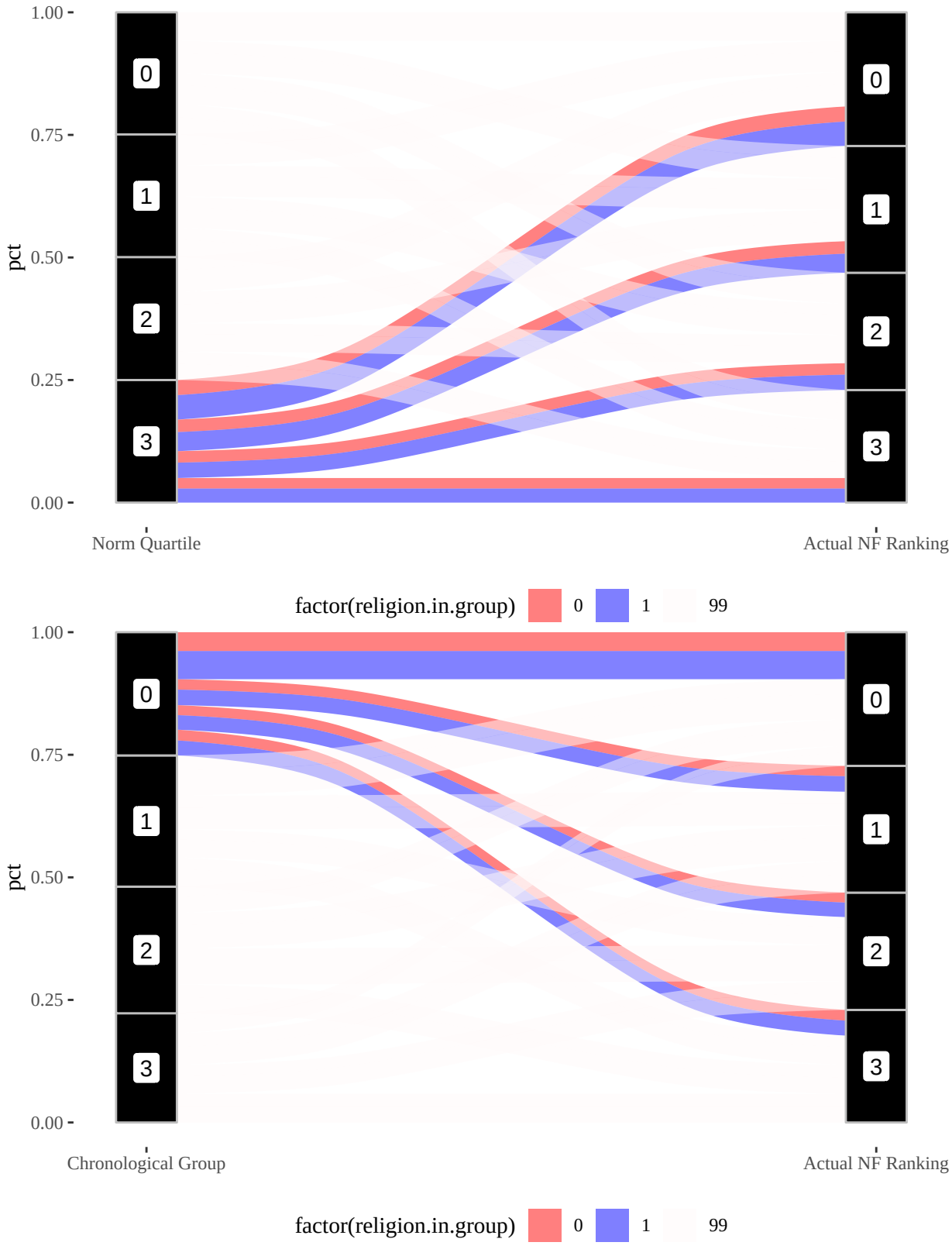
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

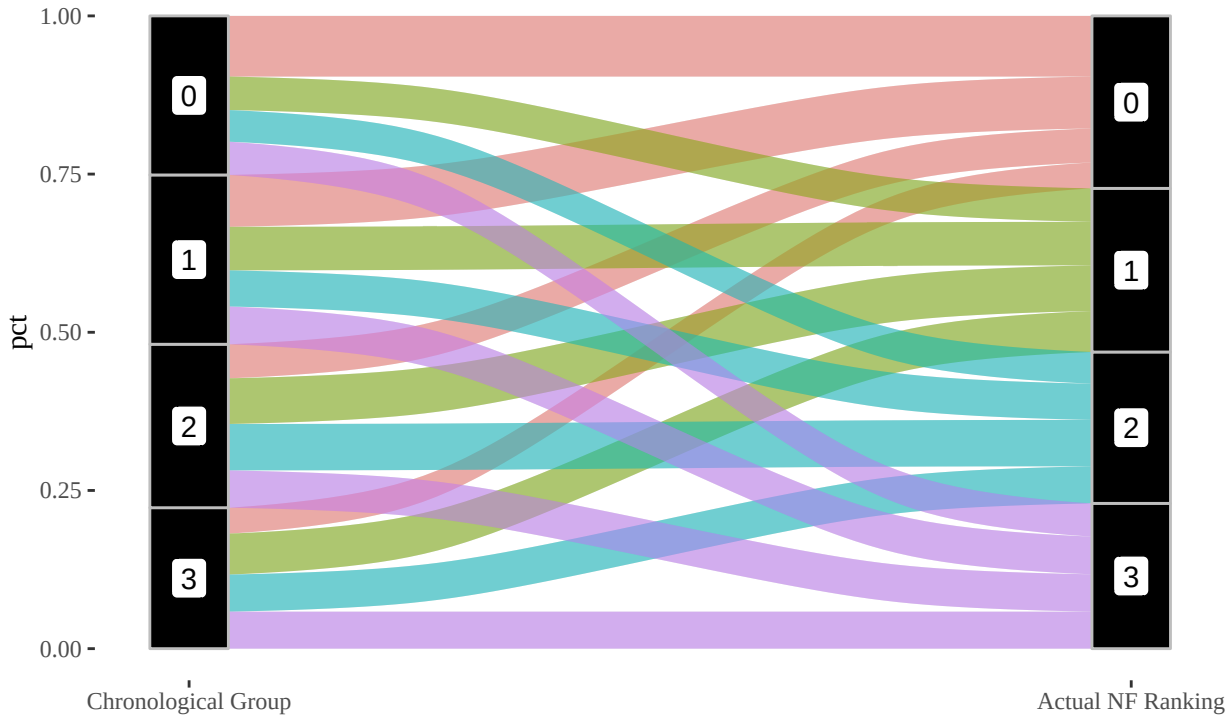




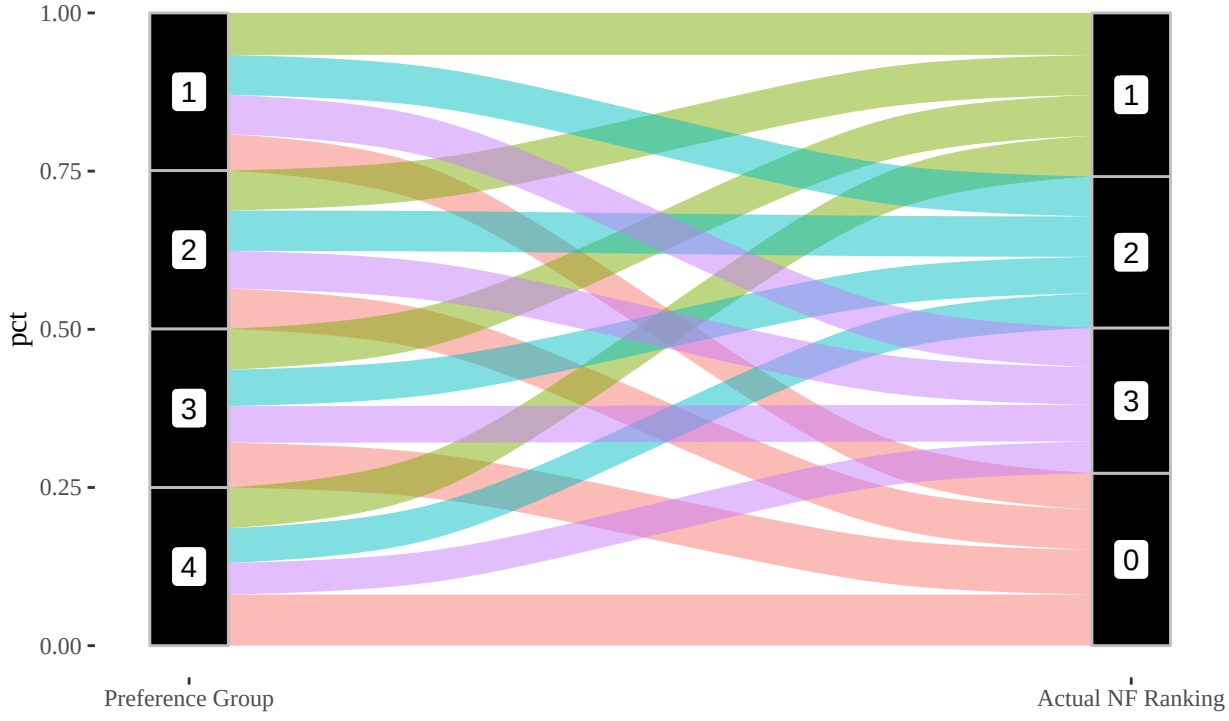

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```


Newsfeed preference for user's religion (India)
Same−religion posts get sorted closer to the top
NF Ranking Group
Top 10
11−20
21−30
31−40
41−50
51−60
0.50
0.55
0.60
0.65
Rate of same−religion posts
pct
1.00
0.75
0.50
0.25
0.00
0
1
2
3
Chronological Group
Actual NF Ranking
factor(norm.quartile)
1
2
3
4
99

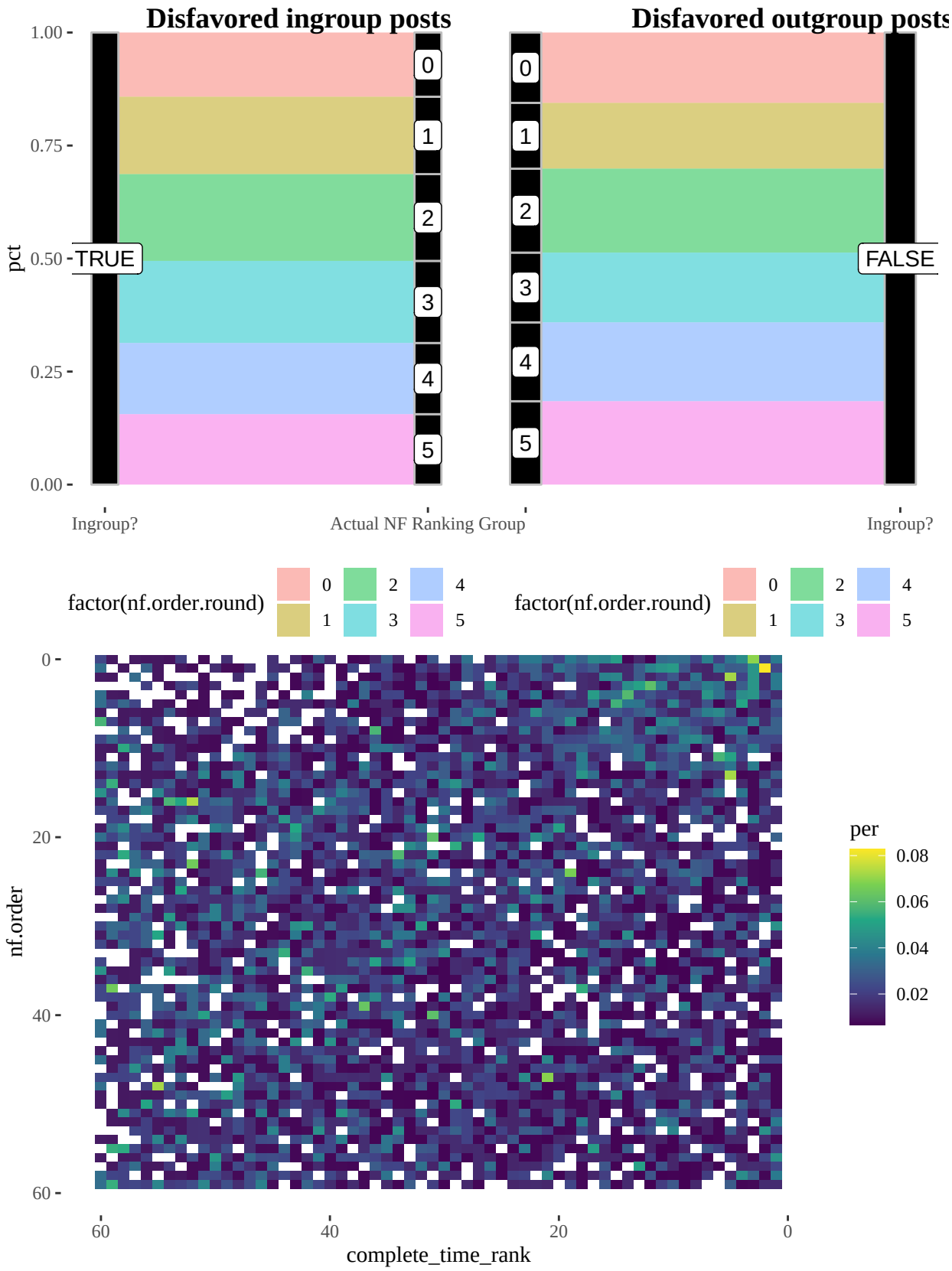

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
Norm Quartile
Actual NF Ranking
factor(religion.in.group)
0
1
99
1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
Chronological Group
Actual NF Ranking
factor(religion.in.group)
0
1
99

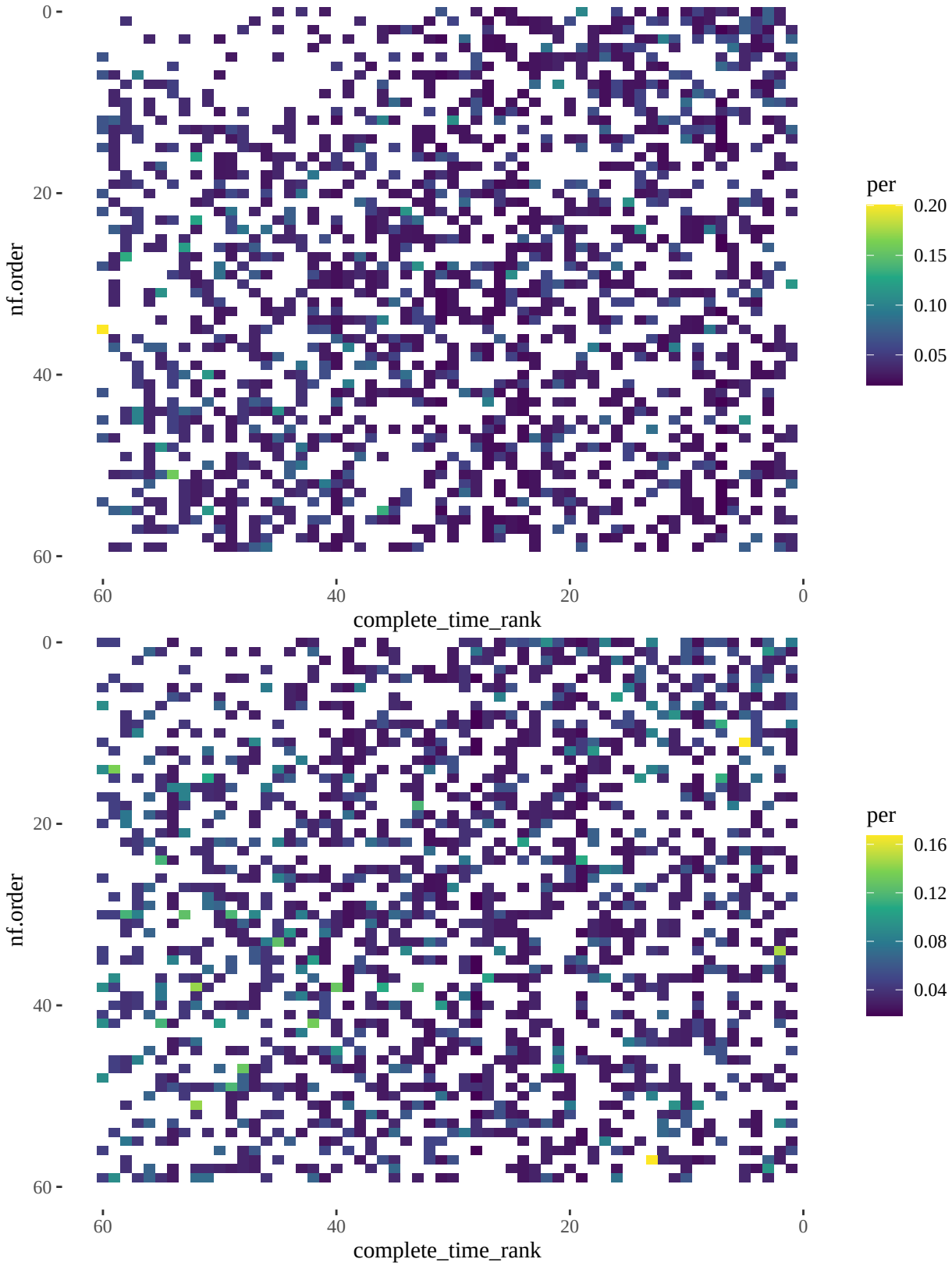

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
Chronological Group
Actual NF Ranking

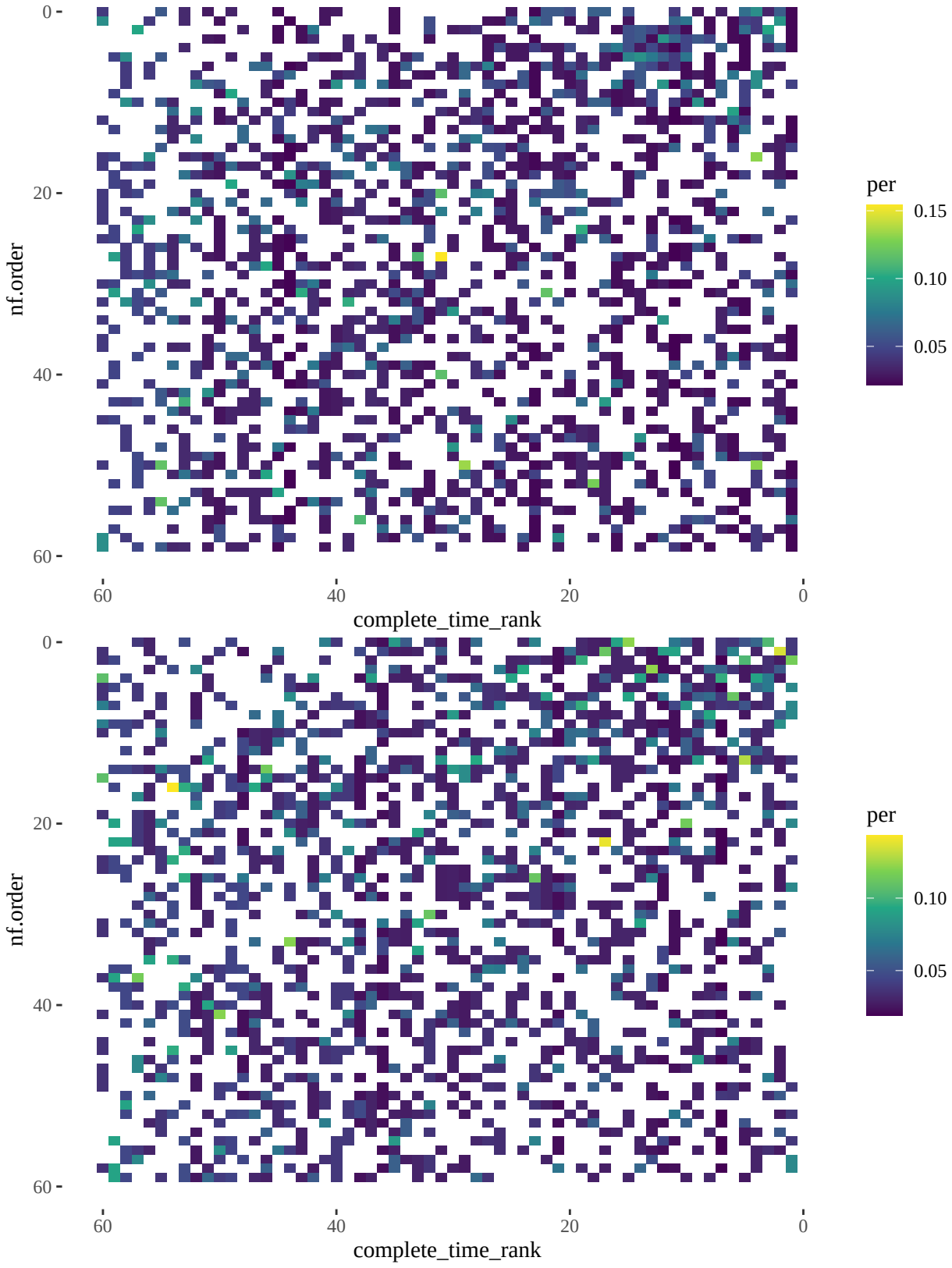

factor(new.order4)
0
1
2
3

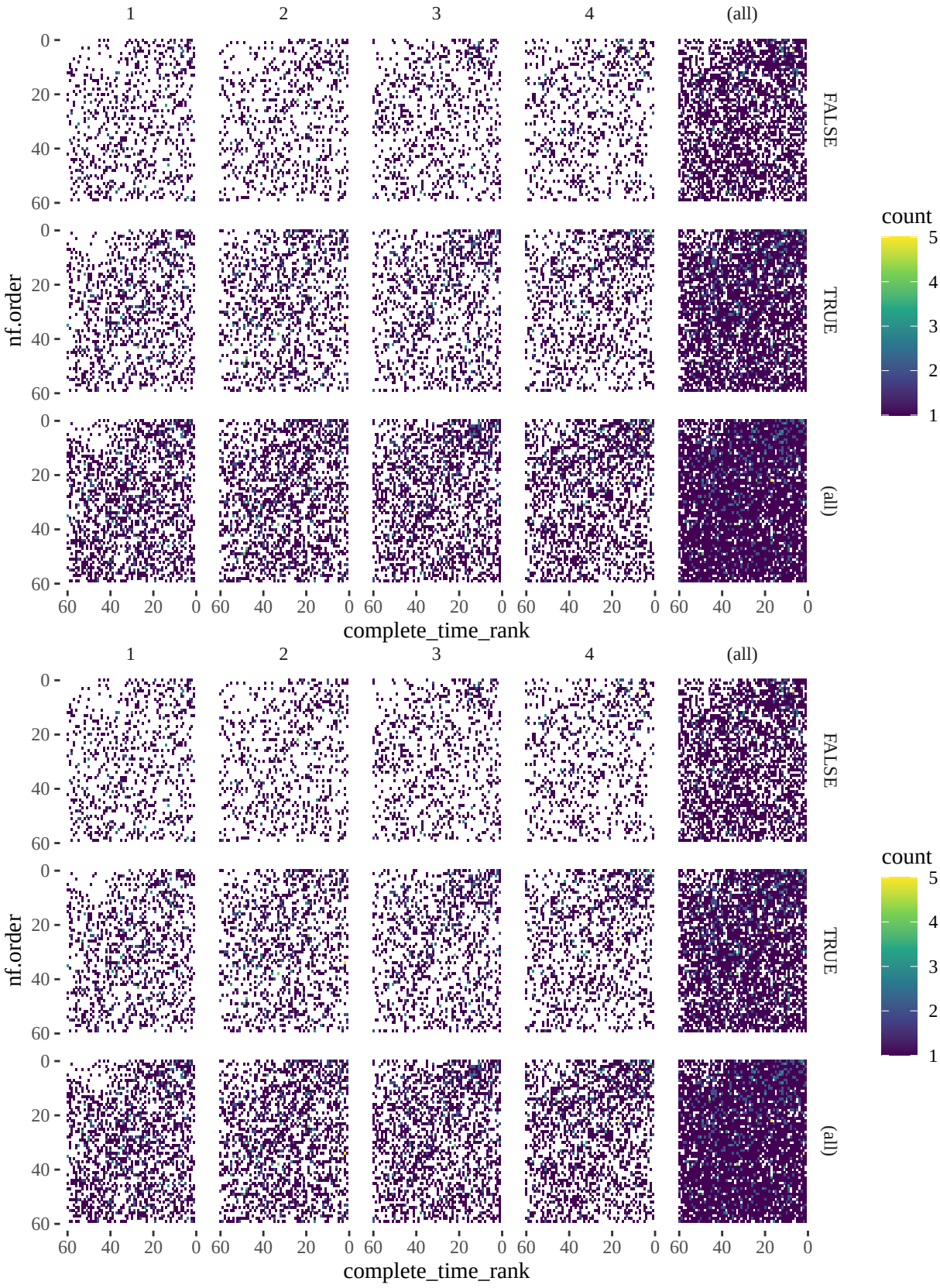

1.00
0.75
0.50
0.25
0.00
pct
1
2
3
4
0
Preference Group
Actual NF Ranking

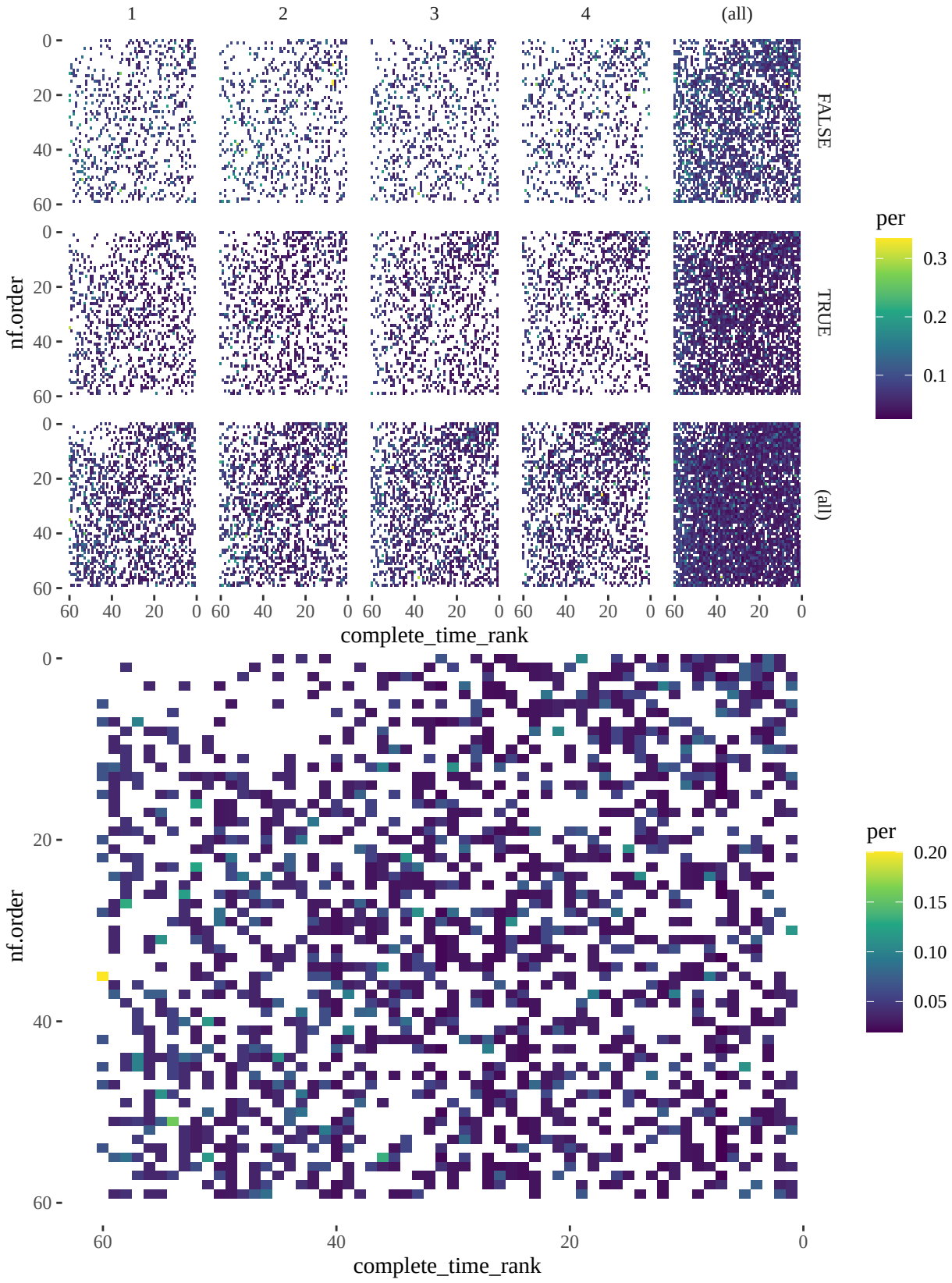

factor(new.order4)
0
1
2
3

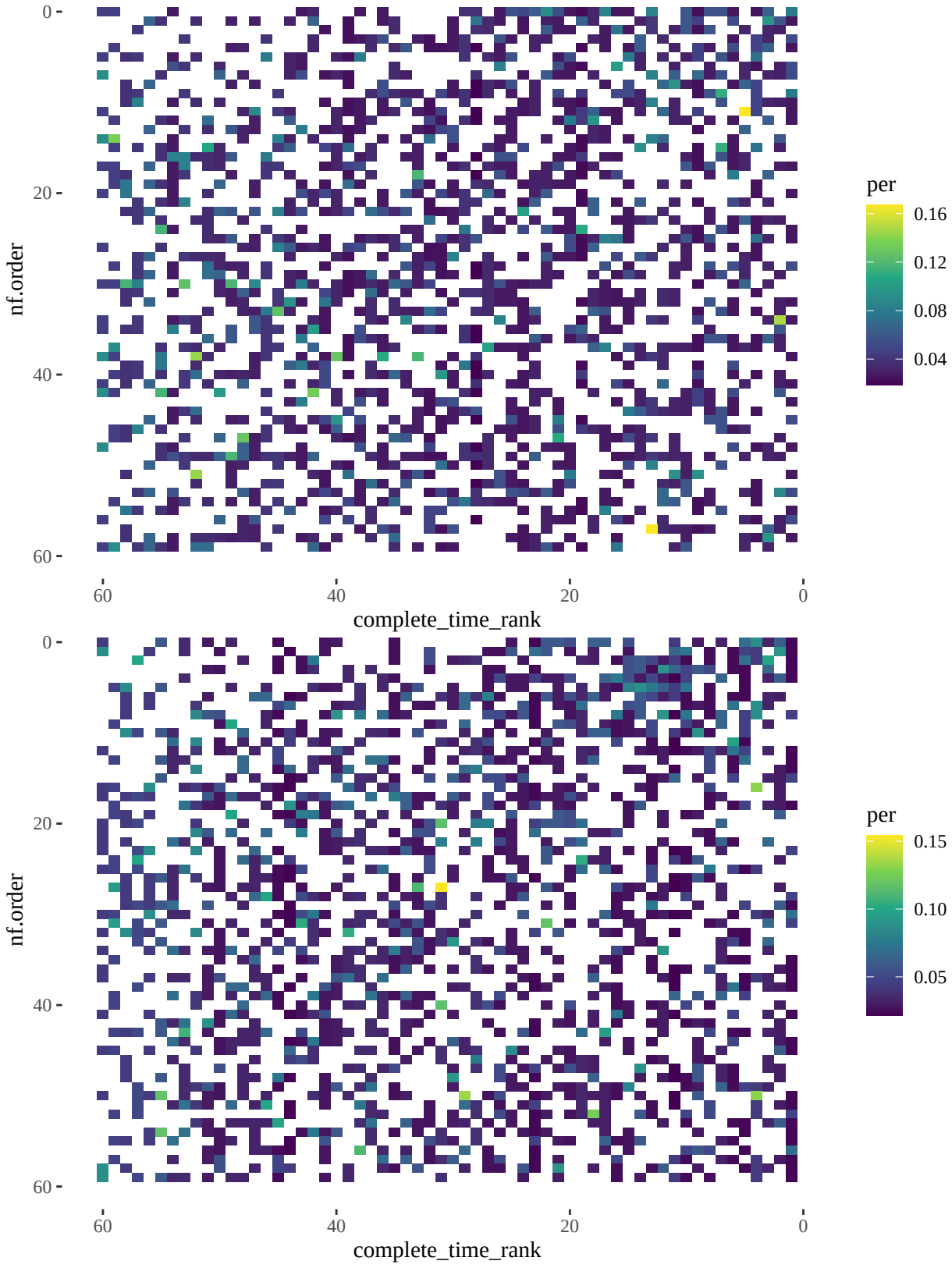

Disfavored ingroup posts
Disfavored outgroup posts
1.00
0.75
0.50
0.25
0.00
pct
TRUE
FALSE
0
1
2
3
4
5
Ingroup?
Actual NF Ranking Group
Ingroup?
factor(nf.order.round)
0
1
2
3
4
5
nf.order
0
20
40
60
complete_time_rank
per
0.08
0.06
0.04
0.02

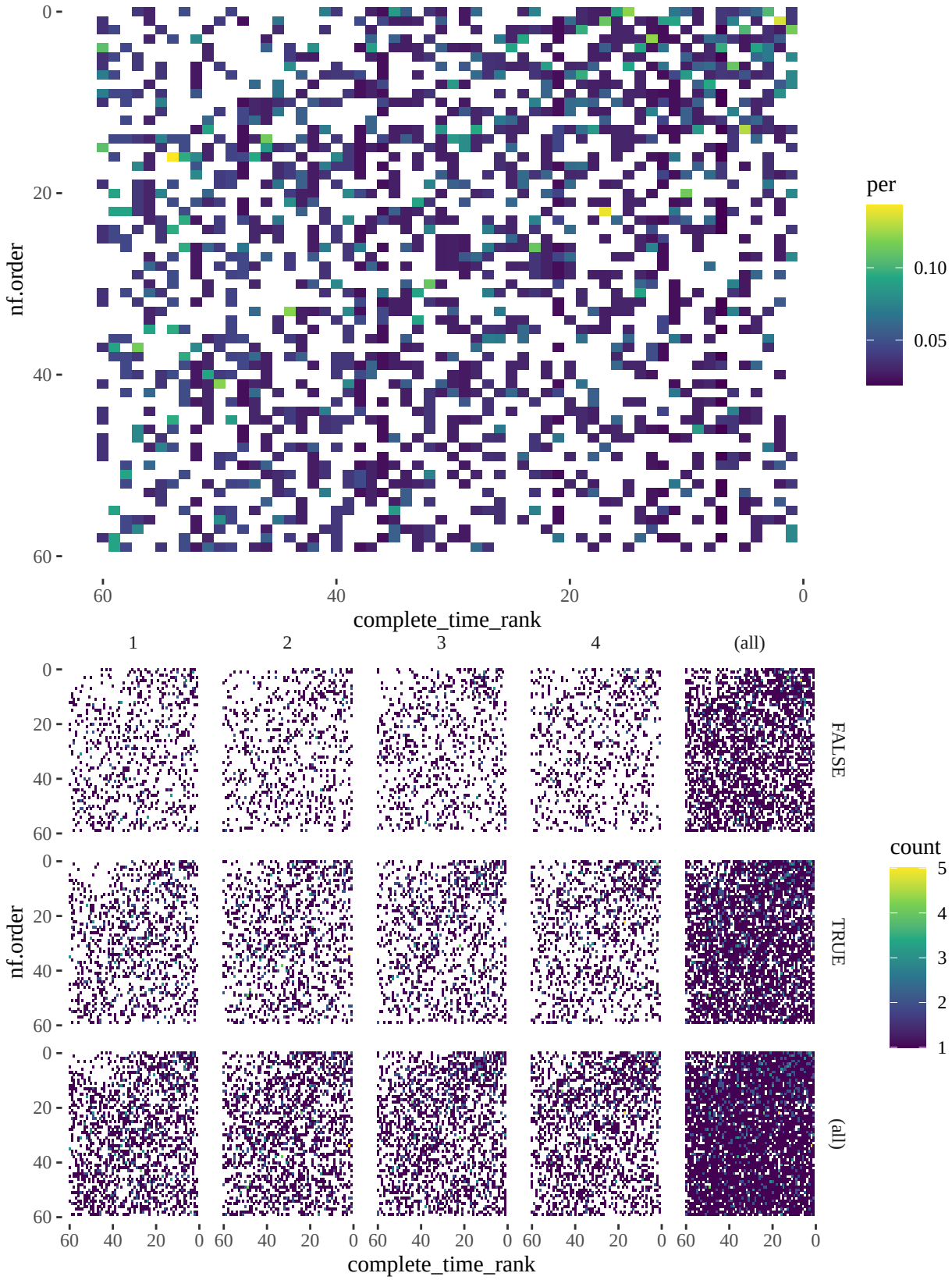

nf.order
0
20
40
60
60
40
20
0
complete_time_rank
per
0.20
0.15
0.10
0.05
nf.order
0
20
40
60
60
40
20
0
complete_time_rank
per
0.16
0.12
0.08
0.04

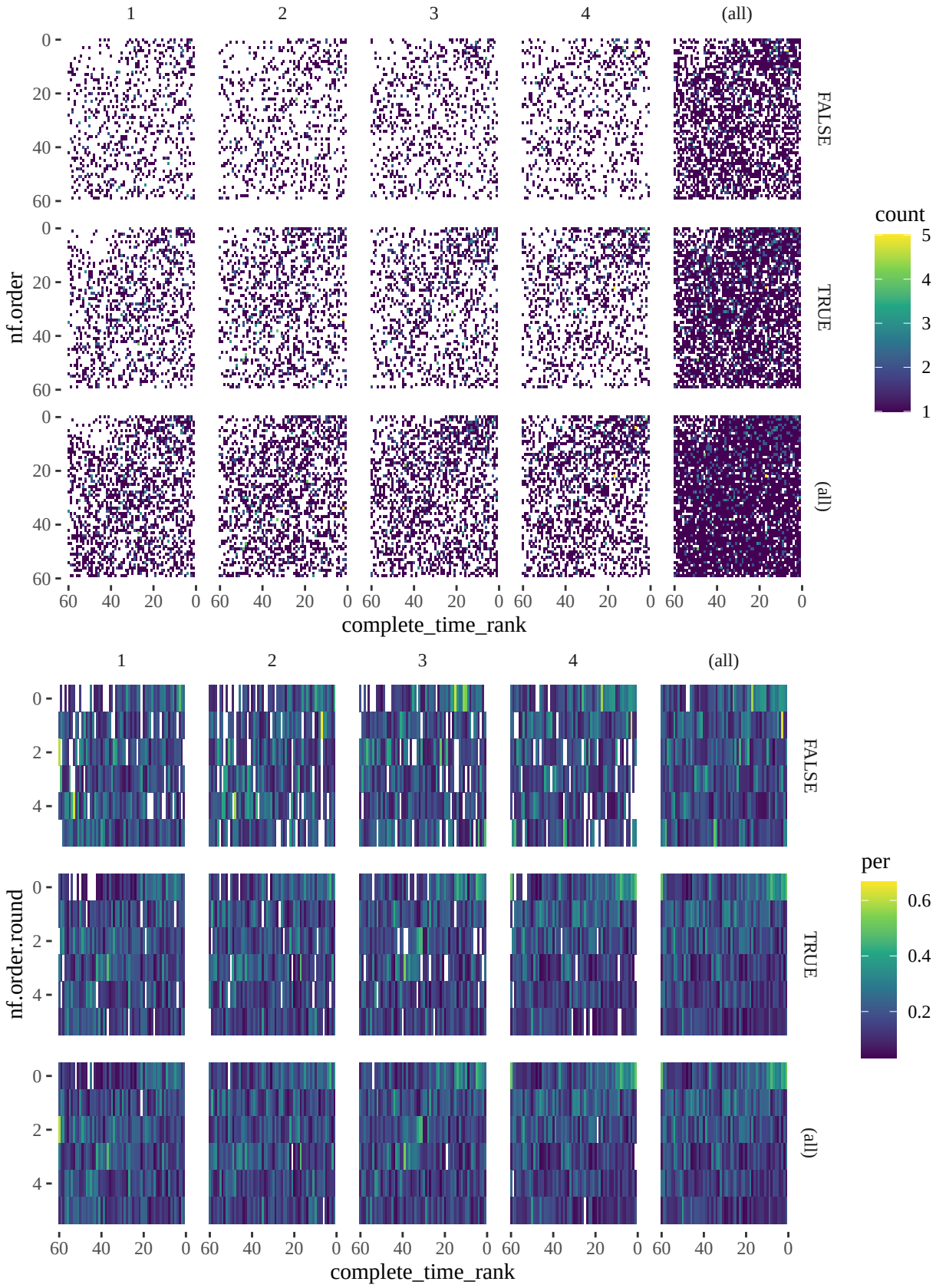

0
20
40
60
nf.order
60
40
20
0
complete_time_rank
per
0.15
0.10
0.05
0
20
40
60
nf.order
60
40
20
0
complete_time_rank
per
0.10
0.05

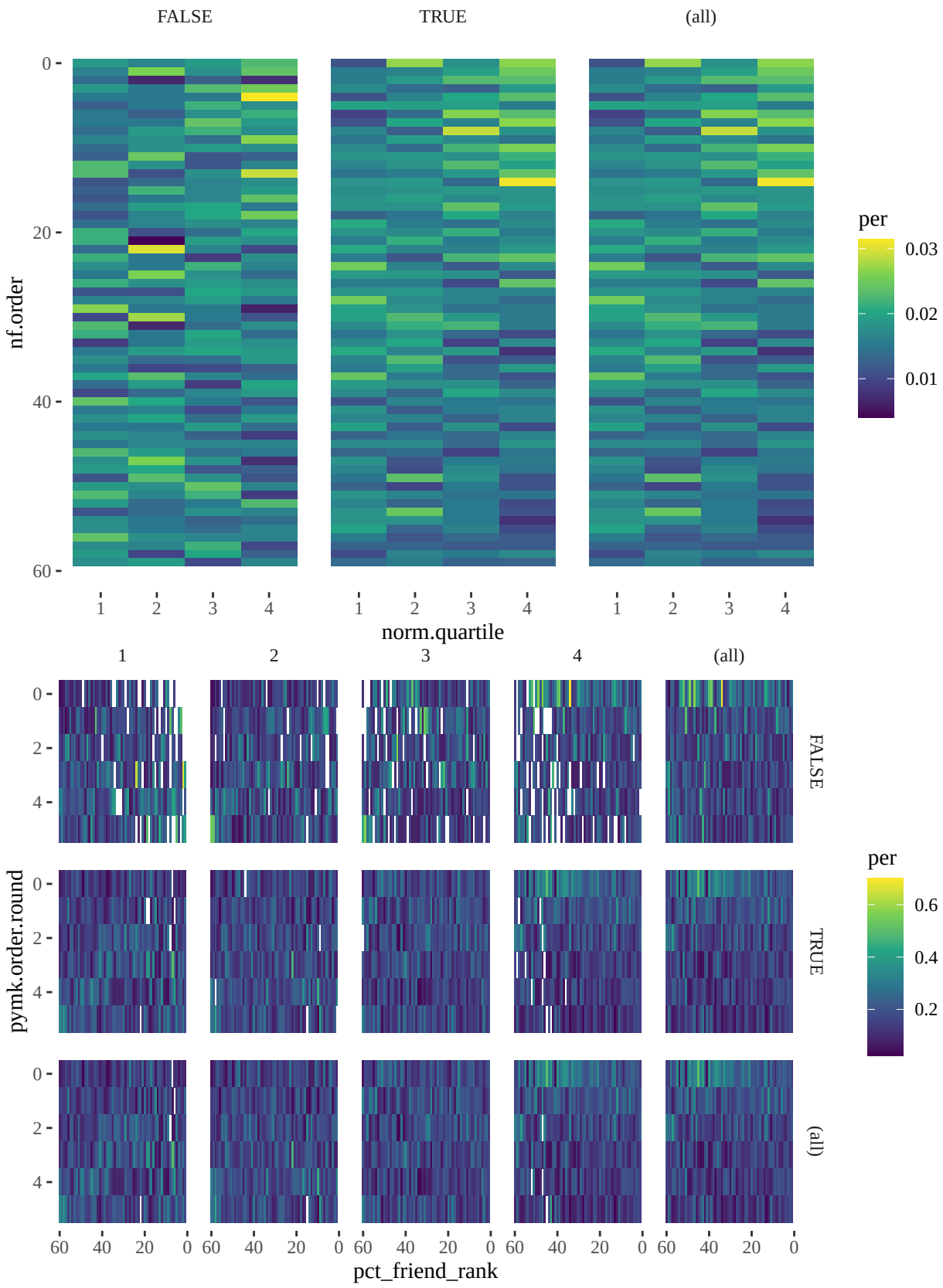

1
2
3
4
(all)
FALSE
TRUE
(all)
nf.order
0
20
40
60
complete_time_rank
count
5
4
3
2
1

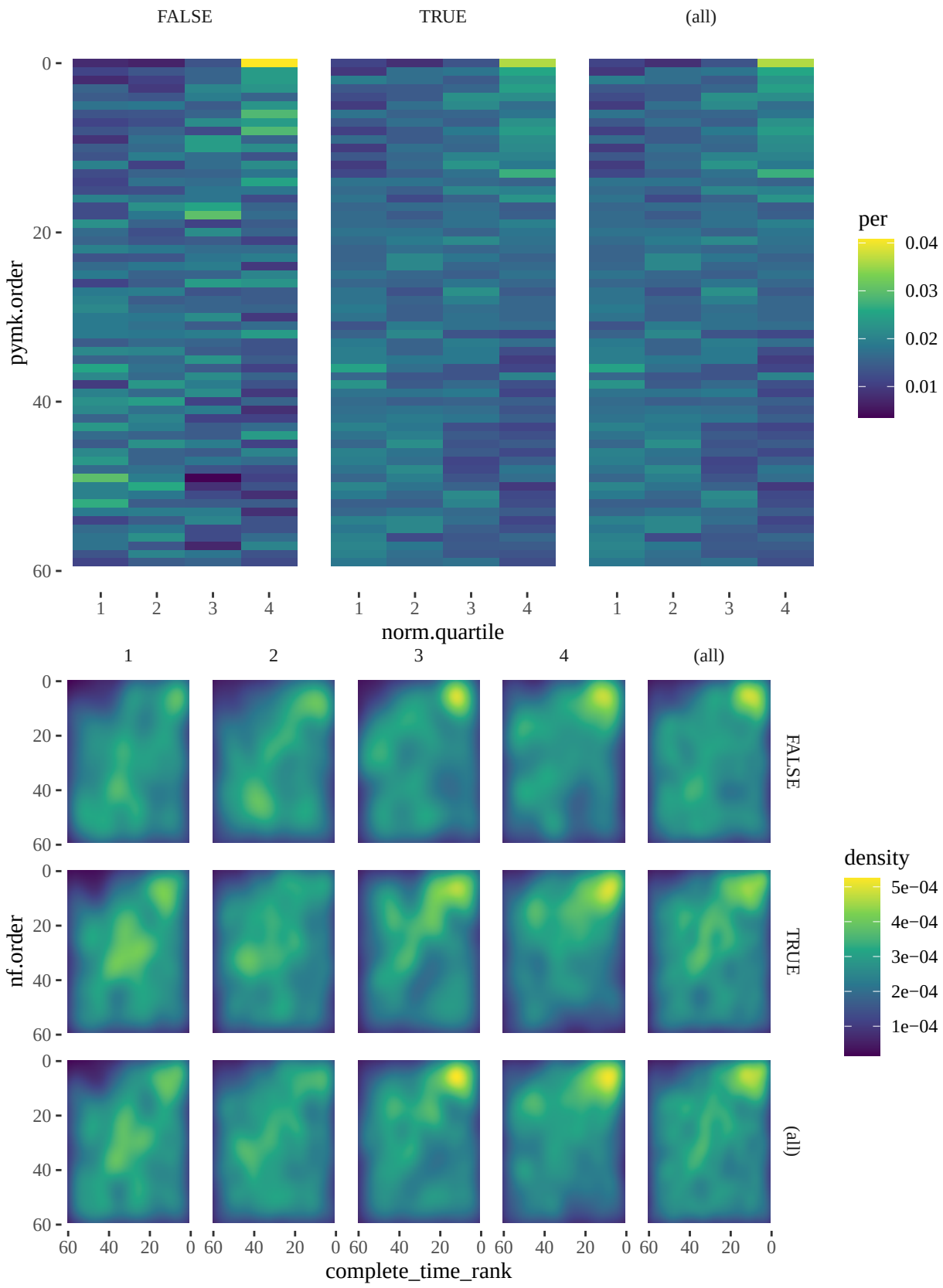

1
2
3
4
(all)
FALSE
TRUE
(all)
nf.order
0
20
40
60
per
0.3
0.2
0.1
complete_time_rank
0.20
0.15
0.10
0.05

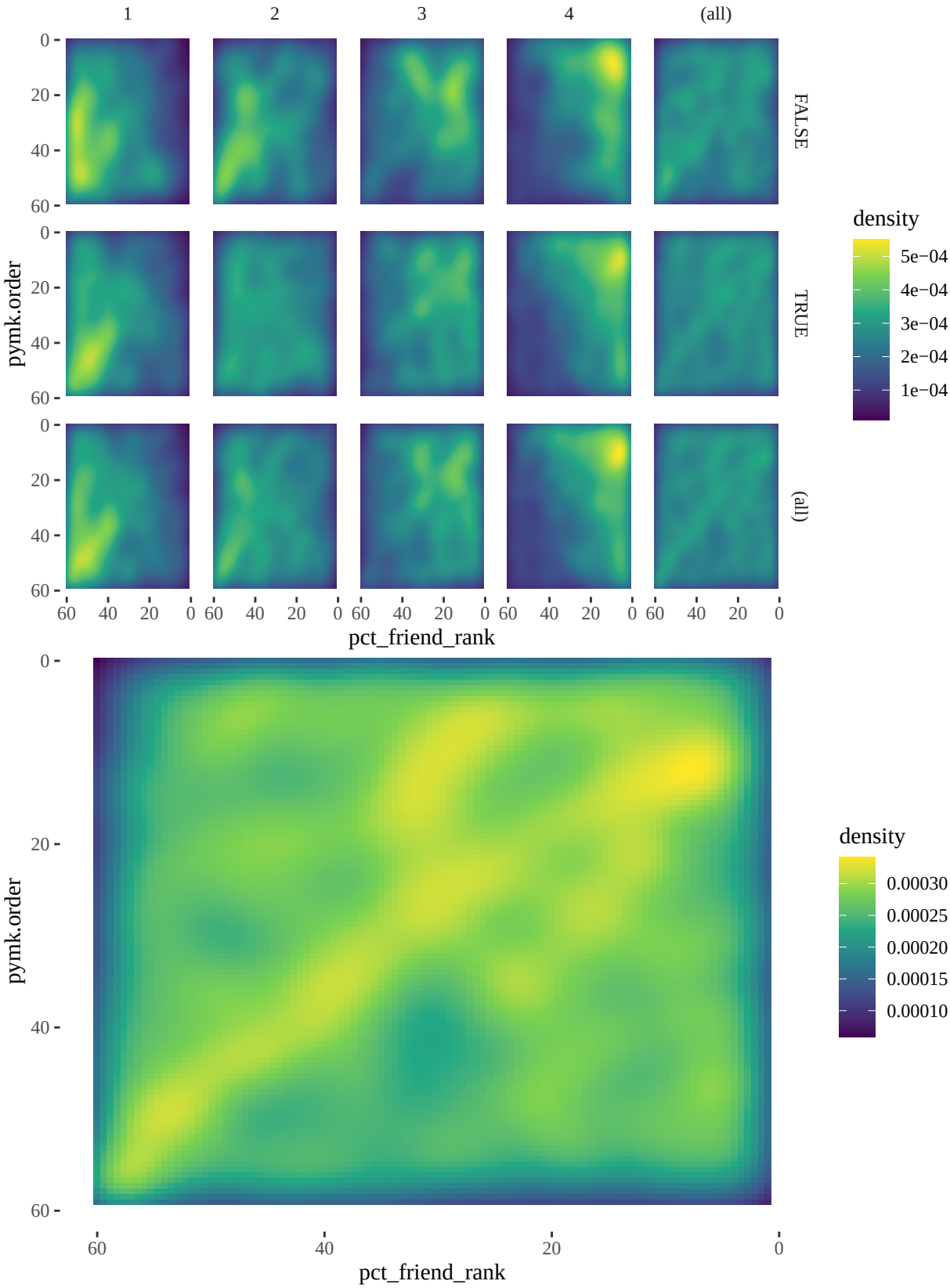

nf.order
0
20
40
60
60
40
20
0
complete_time_rank
per
0.16
0.12
0.08
0.04
nf.order
0
20
40
60
60
40
20
0
complete_time_rank
per
0.15
0.10
0.05


nf.order
0
20
40
60
60
40
20
0
complete_time_rank
per
0.10
0.05
1
2
3
4
(all)
FALSE
TRUE
(all)
count
5
4
3
2
1

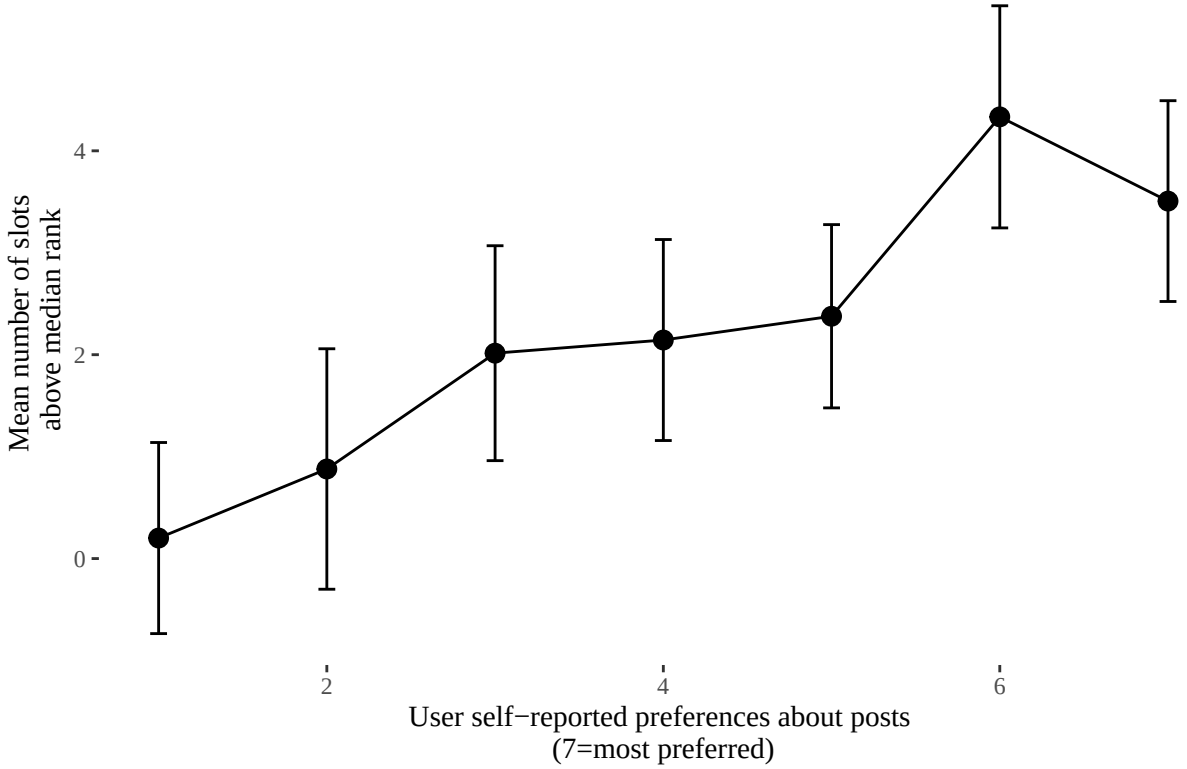

1
2
3
4
(all)
FALSE
TRUE
(all)
nf.order
0
20
40
60
count
5
4
3
2
1
60
40
20
0
complete_time_rank
nf.order.round
0
2
4
per
0.6
0.4
0.2


FALSE
TRUE
(all)
nf.order
0
20
40
60
1
2
3
4
norm.quartile
per
0.03
0.02
0.01
pymk.order.round
0
2
4
pct_friend_rank
60
40
20
0
FALSE
TRUE
(all)
per
0.6
0.4
0.2

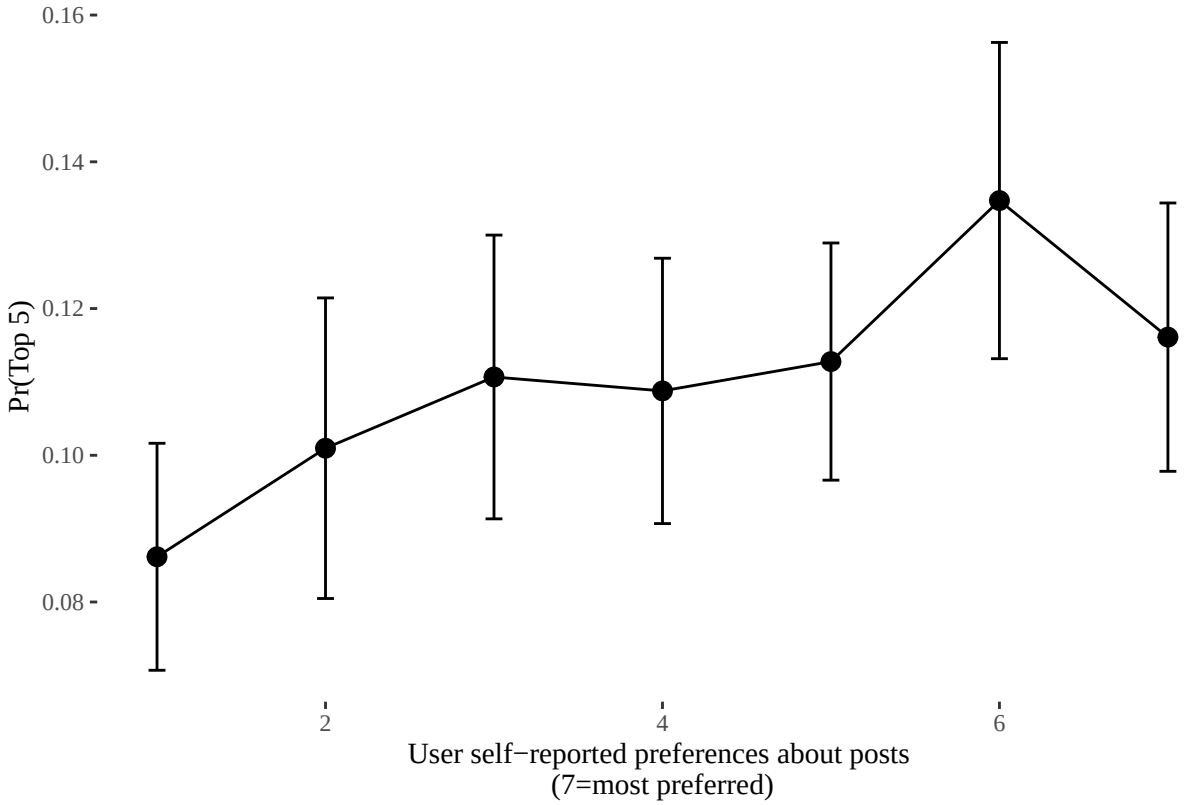

FALSE
TRUE
(all)
pymk.order
0
20
40
60
1
2
3
4
norm.quartile
per
0.04
0.03
0.02
0.01
nf.order
FALSE
TRUE
(all)
complete_time_rank
density
5e−04
4e−04
3e−04
2e−04
1e−04


1
2
3
4
(all)
FALSE
TRUE
(all)
pymk.order
pct_friend_rank
density
5e−04
4e−04
3e−04
2e−04
1e−04
0
20
40
60
density
0.00030
0.00025
0.00020
0.00015
0.00010

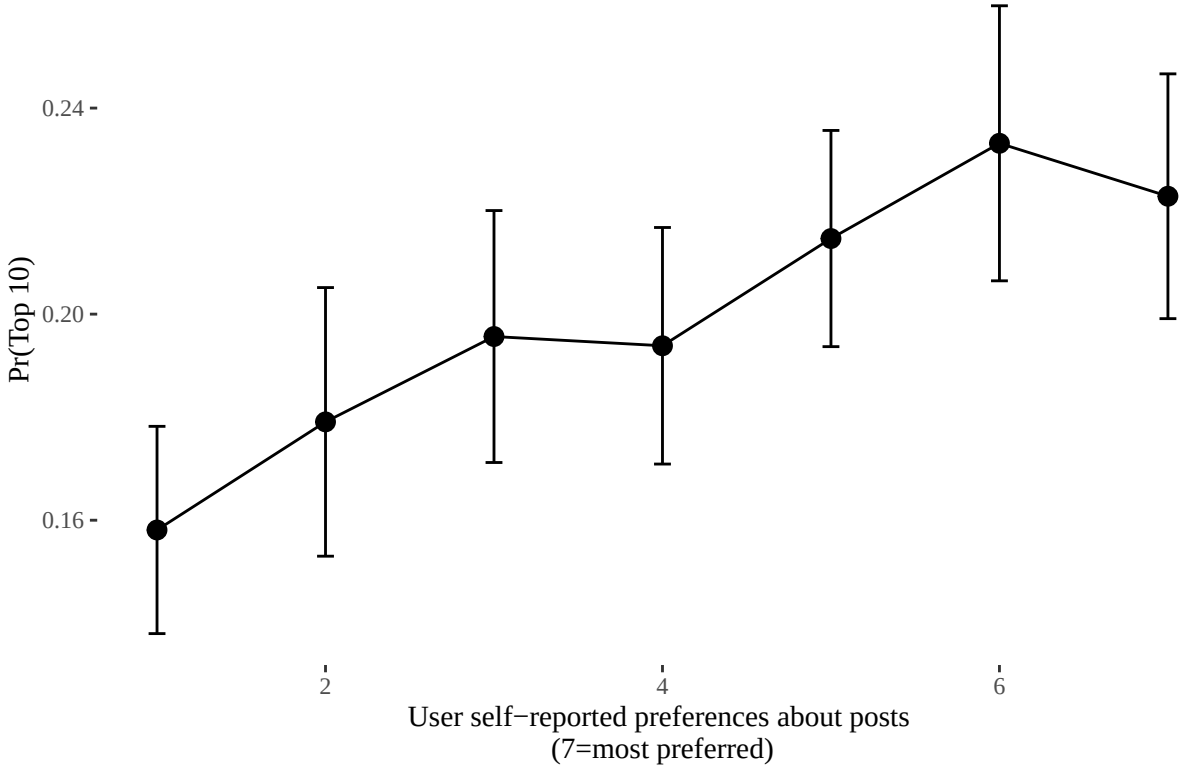
Newsfeed Ranking by Preference (India)



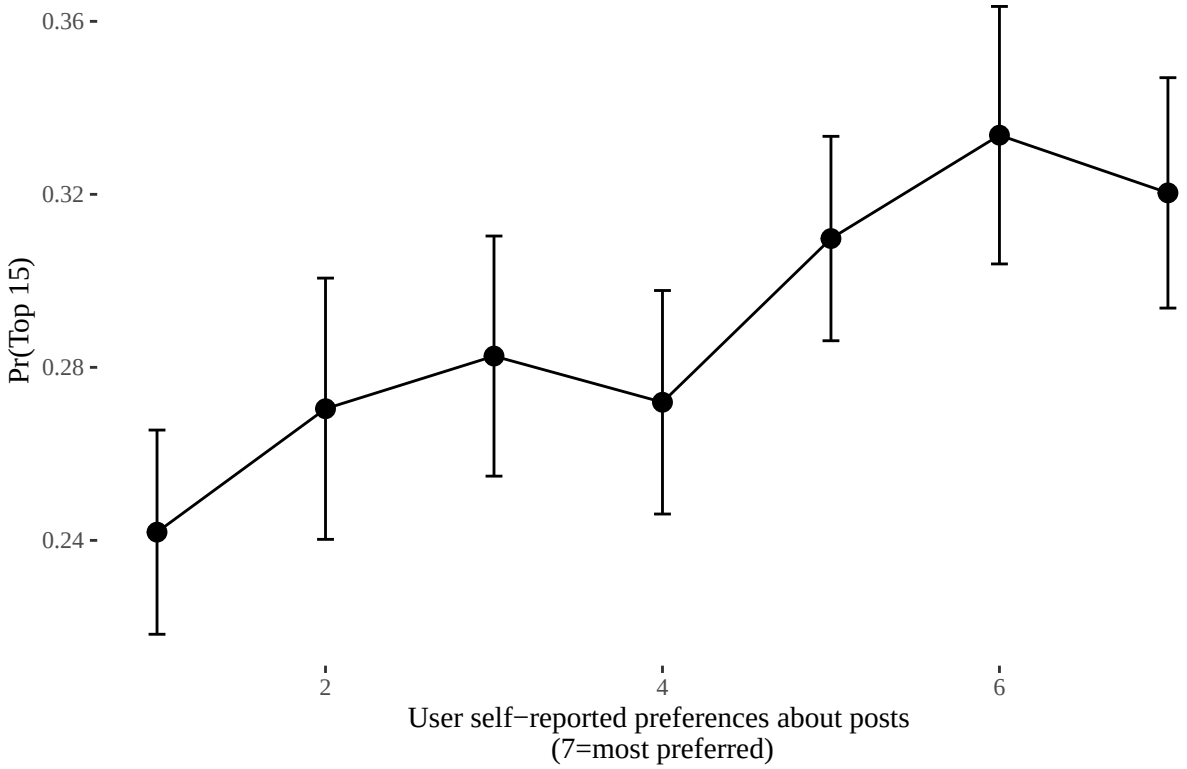
Newsfeed Top 5 by Preference (India)



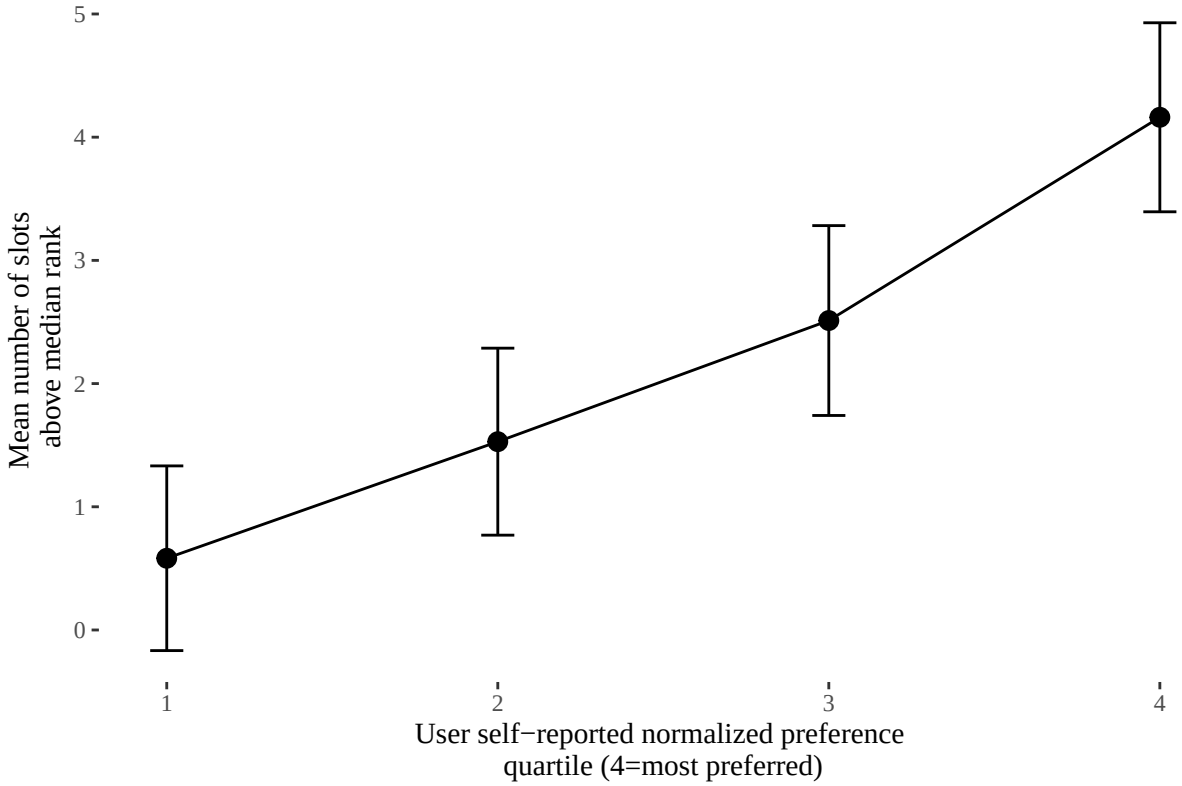
Newsfeed Top 10 by Preference (India)



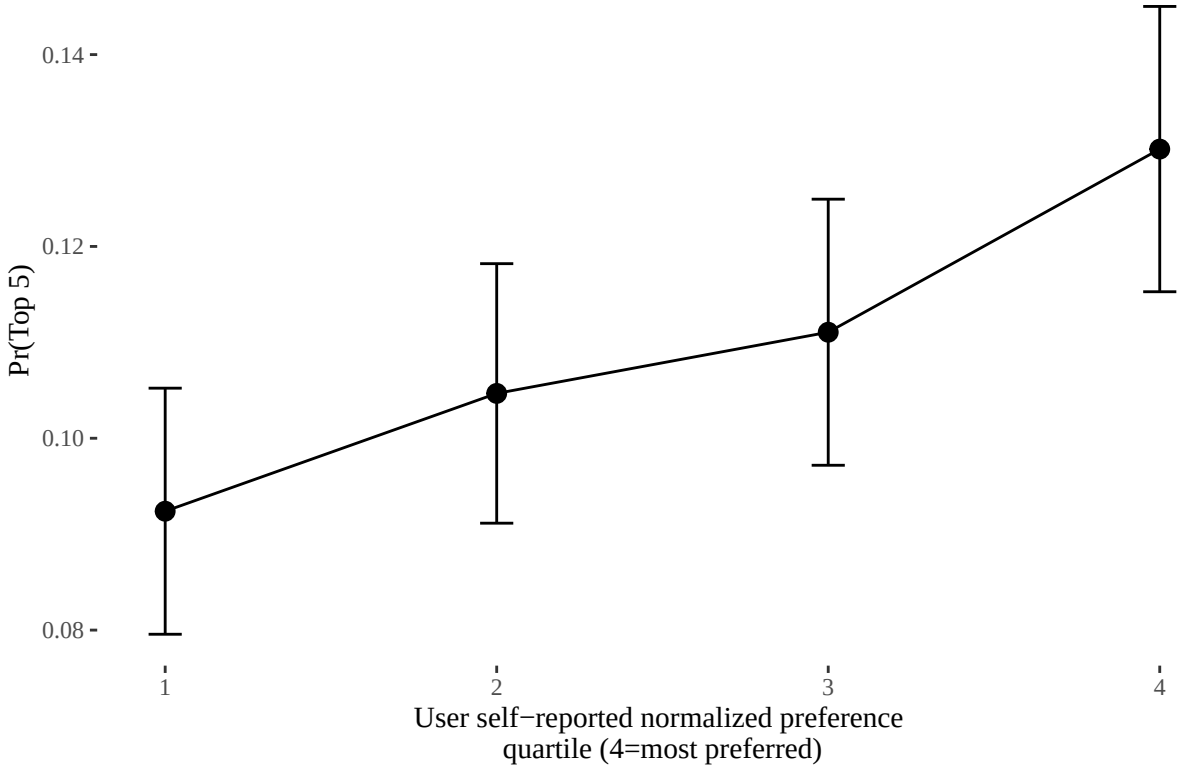
Newsfeed Top 15 by Preference (India)



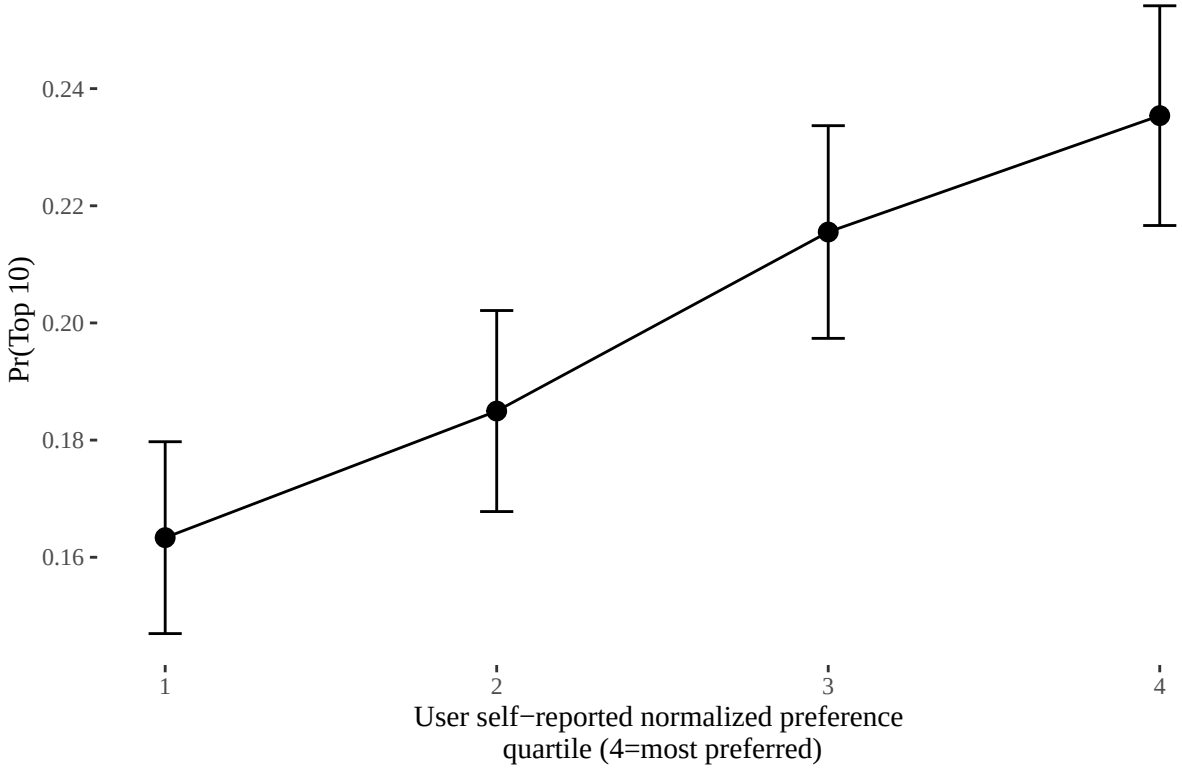
Newsfeed Ranking by Preference (India)



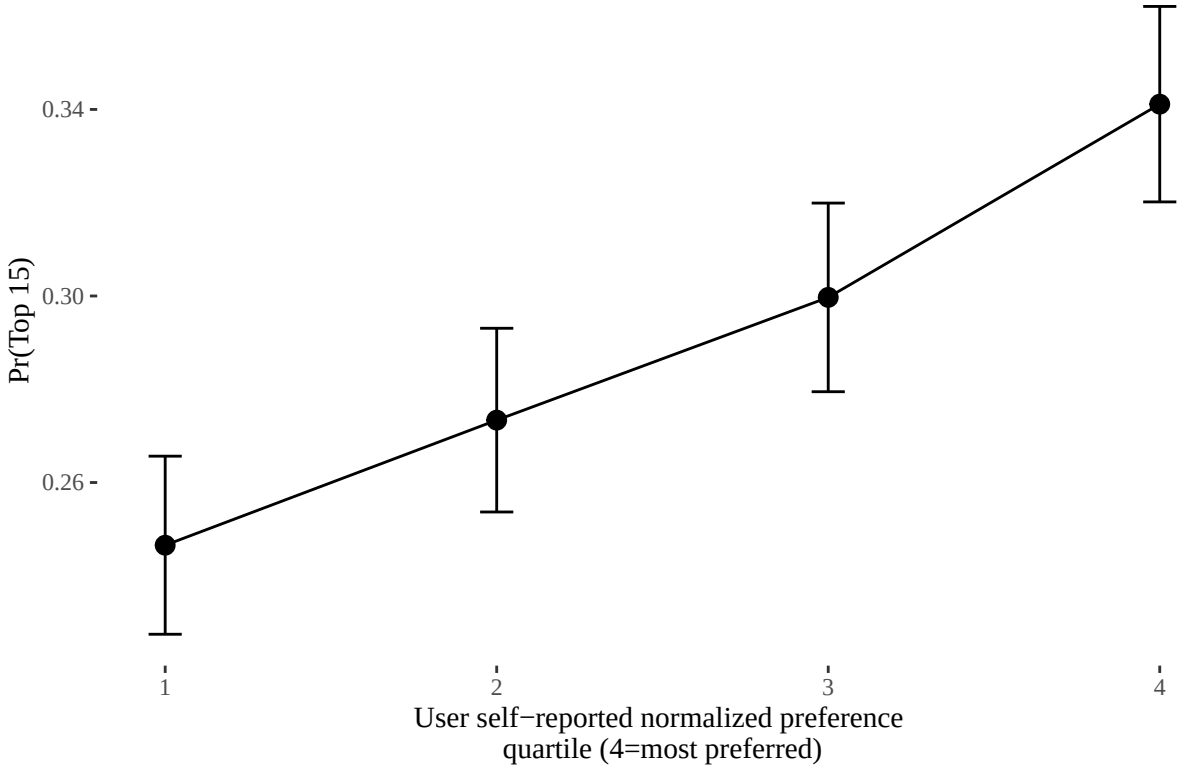
Newsfeed Top 5 by Preference (India)

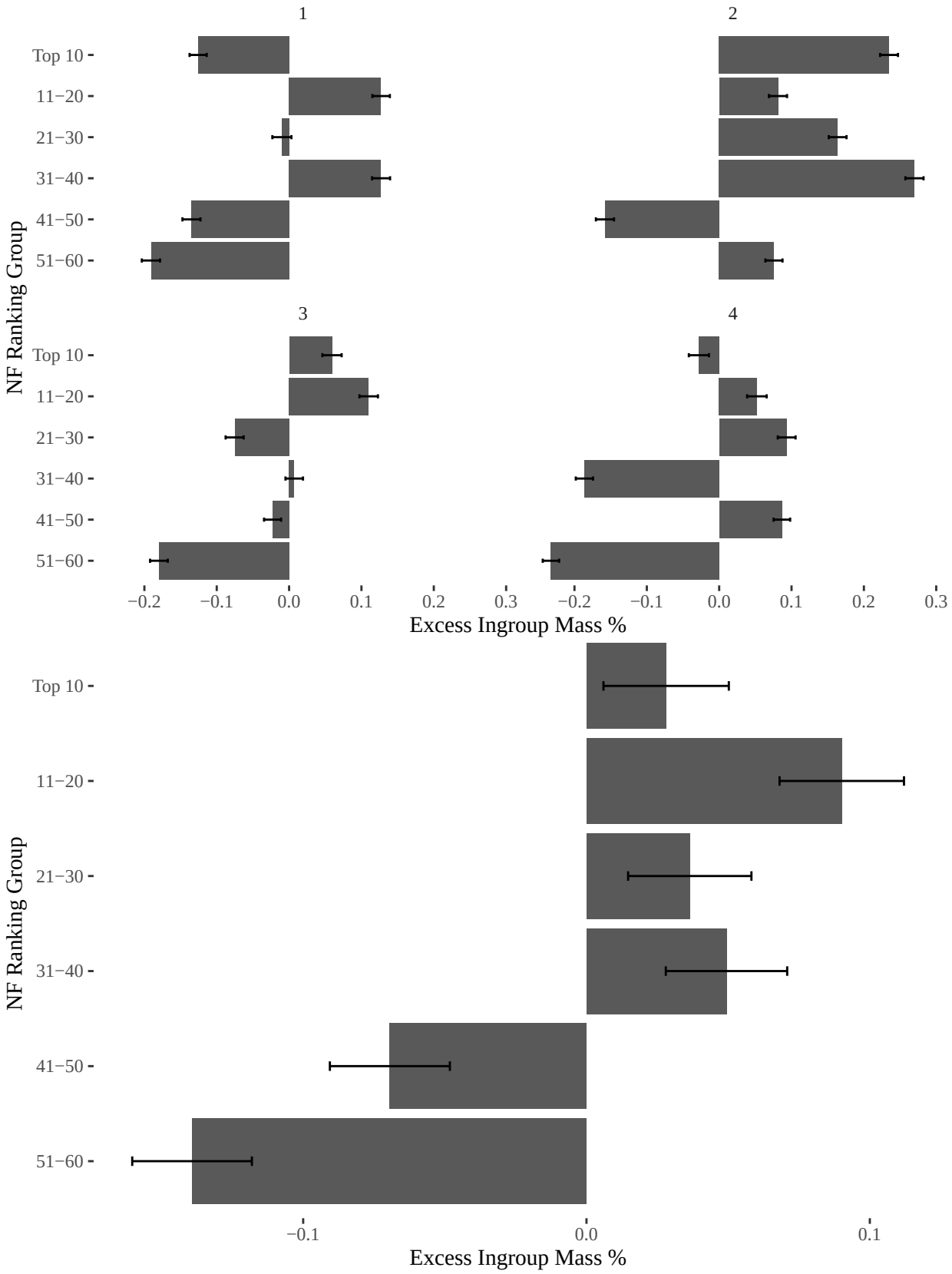


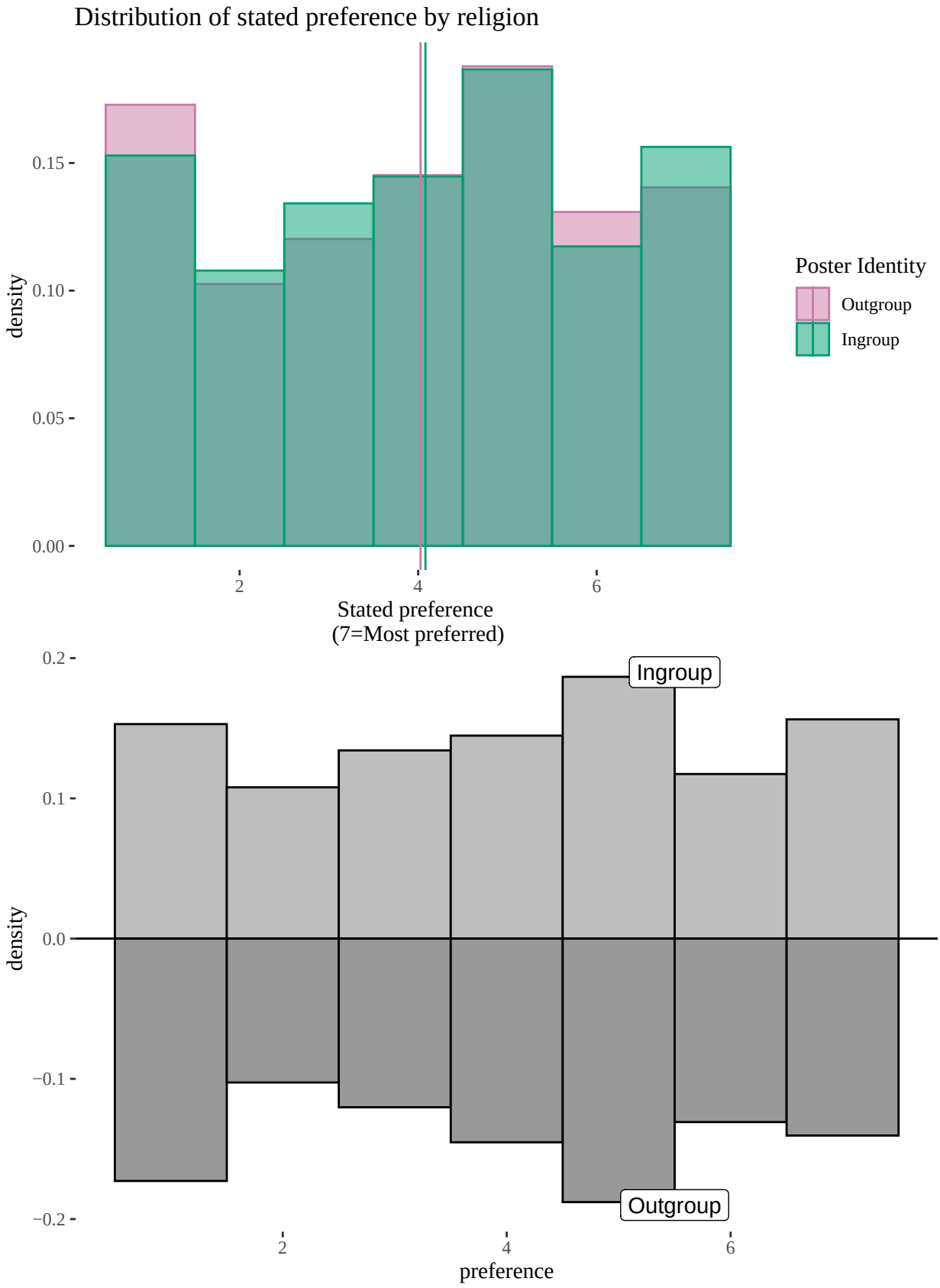
Newsfeed Top 10 by Preference (India)

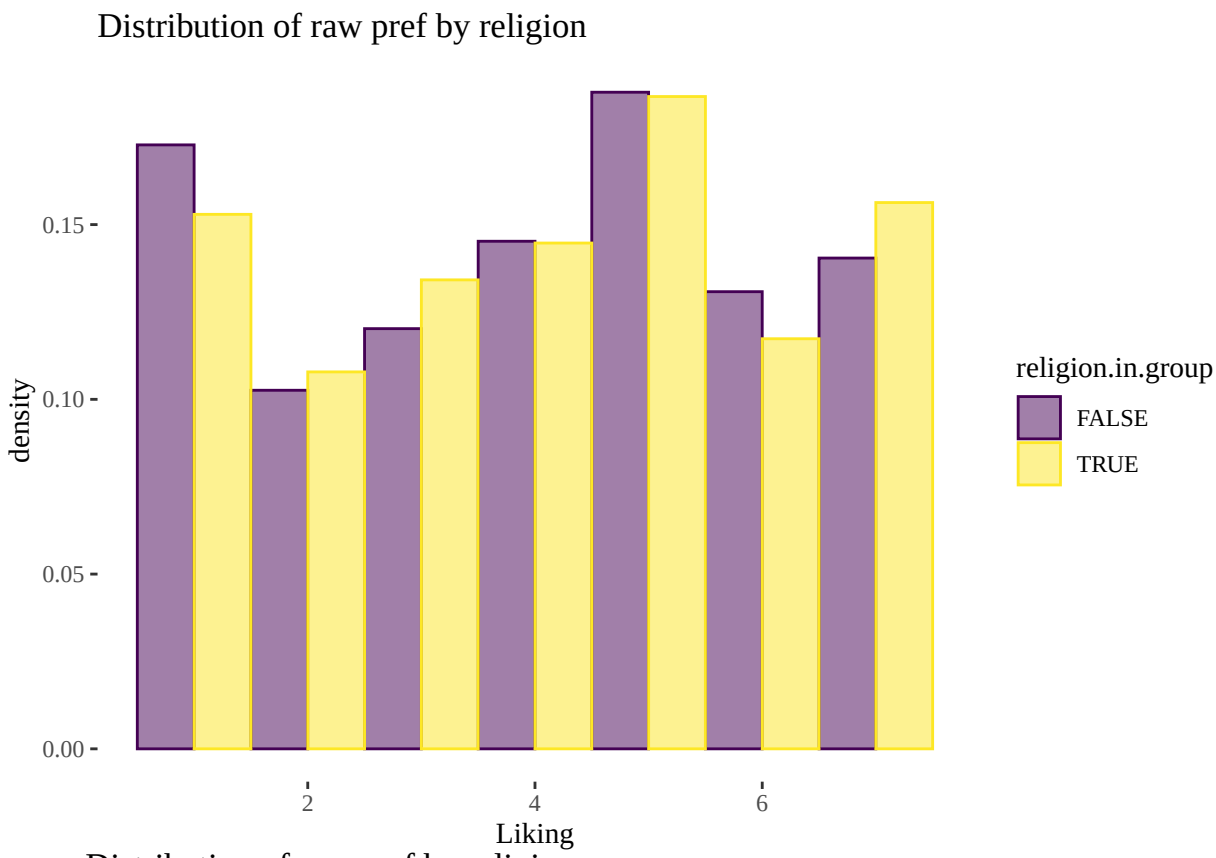


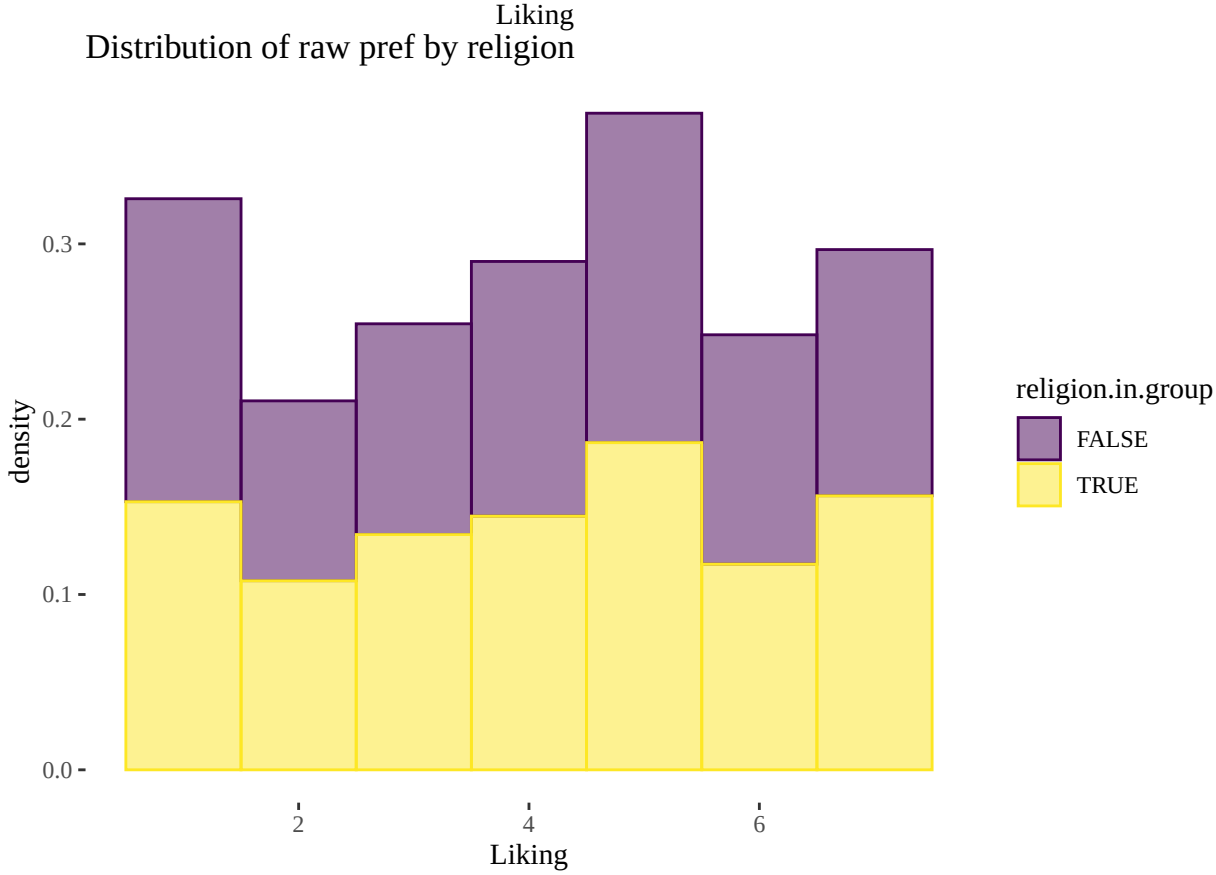
Newsfeed Top 15 by Preference (India)

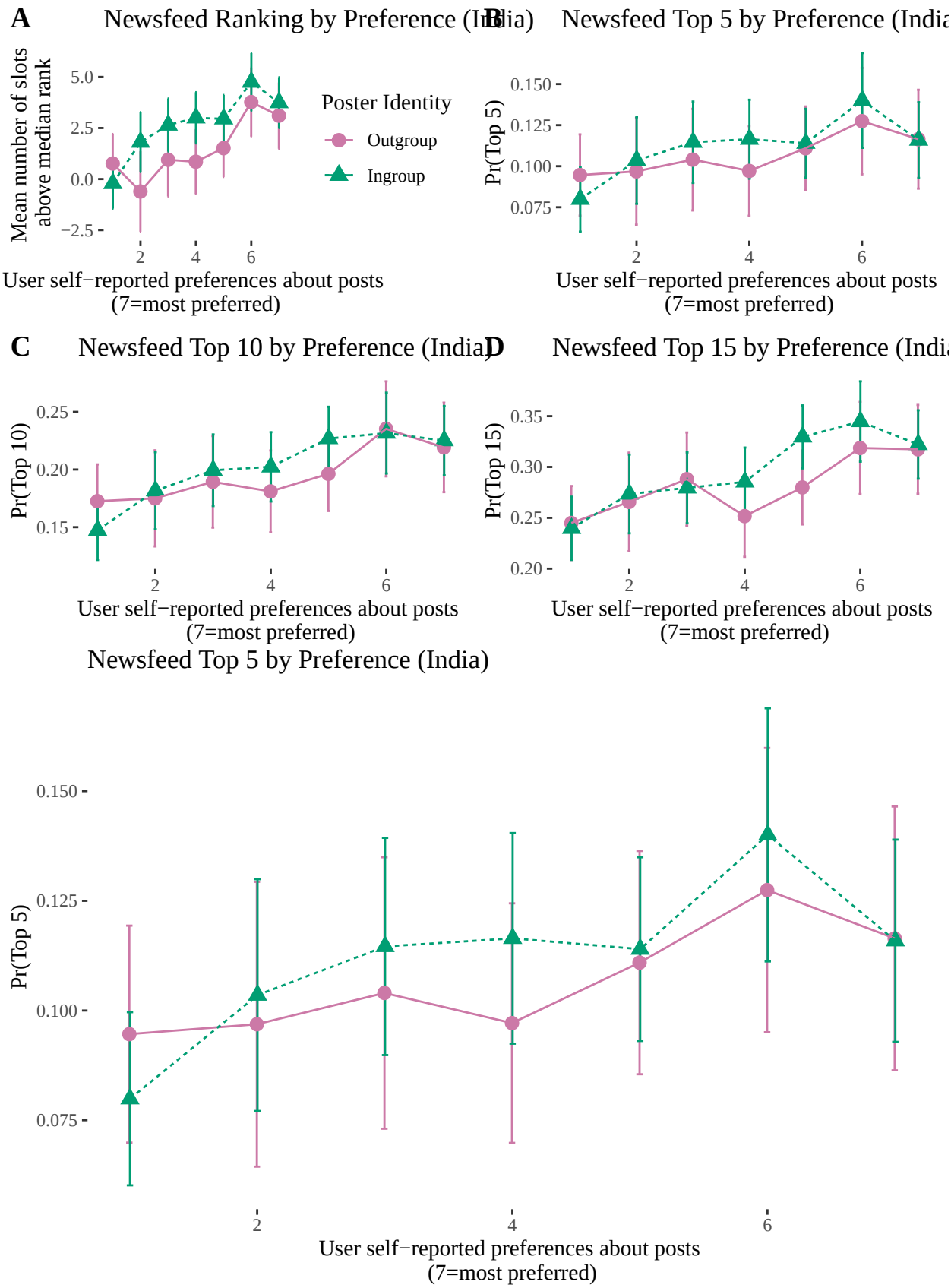


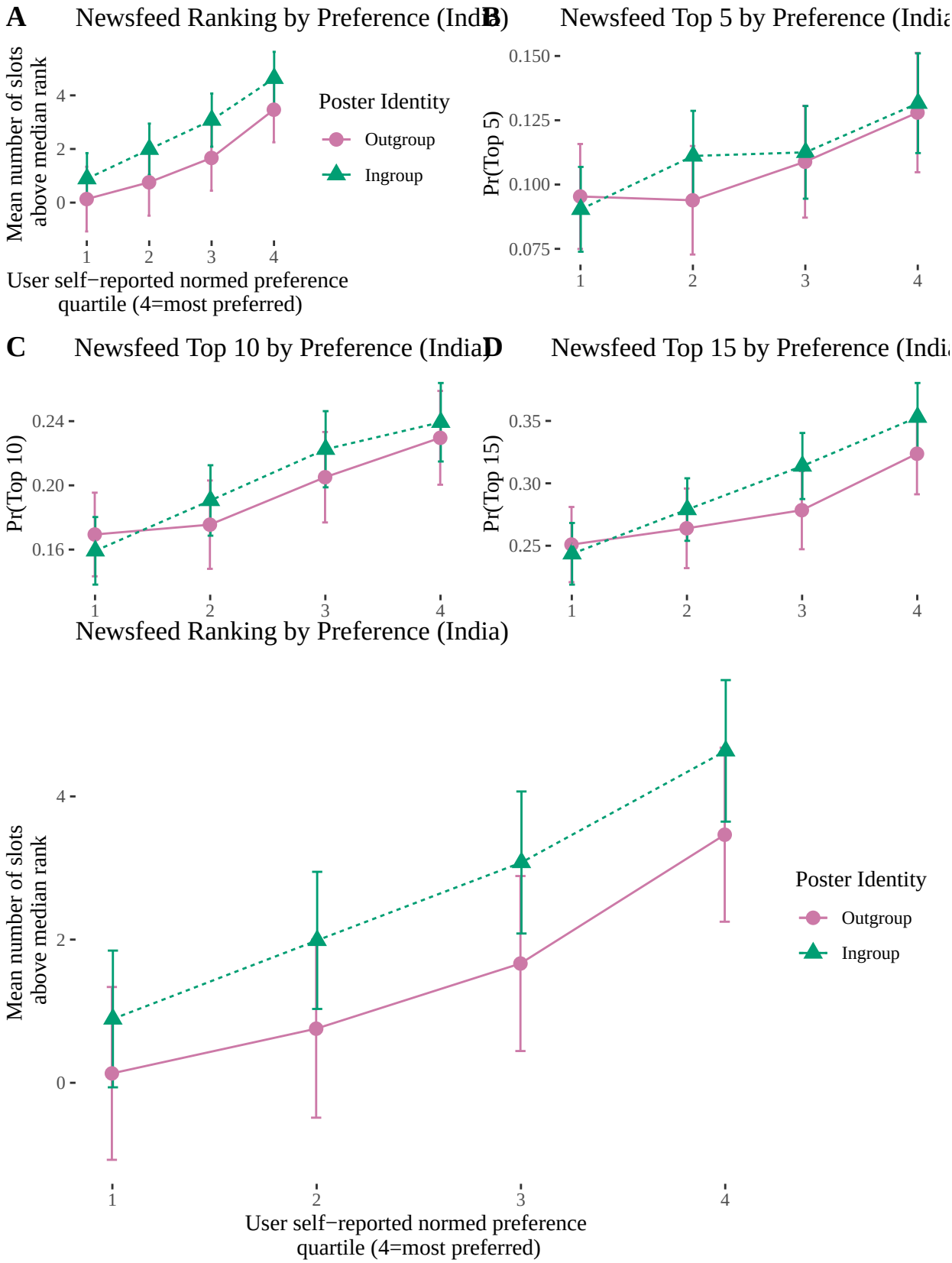

1
2
3
4
Top 10
11−20
21−30
31−40
41−50
51−60
NF Ranking Group
−0.2
−0.1
0.0
0.1
0.2
0.3
Excess Ingroup Mass %

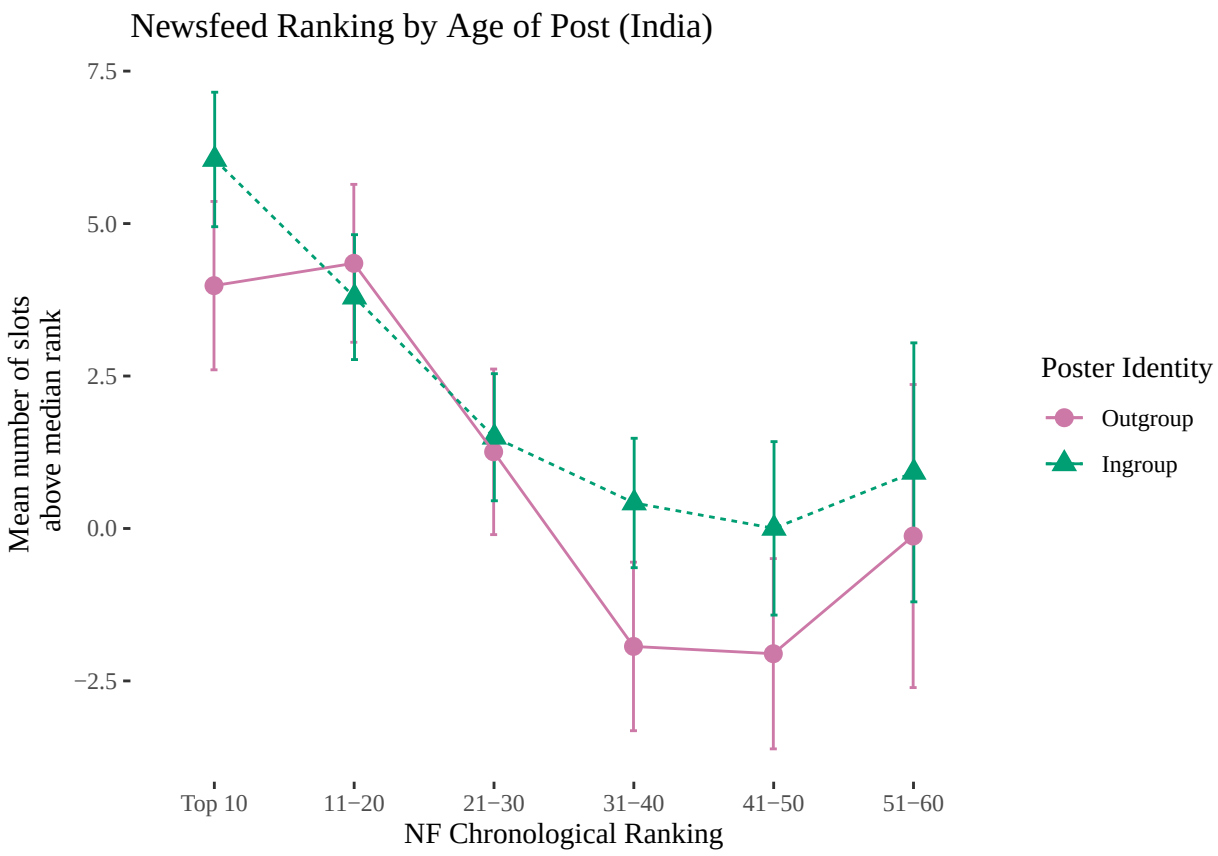

Distribution of stated preference by religion
density
0.15
0.10
0.05
0.00
2
4
6
Stated preference
(7=Most preferred)
Poster Identity
Outgroup
Ingroup
0.2
0.1
0.0
−0.1
−0.2
Ingroup
Outgroup
preference


Distribution of raw pref by religion
density
0.15
0.10
0.05
0.00
2
4
6
Liking
religion.in.group
FALSE
TRUE

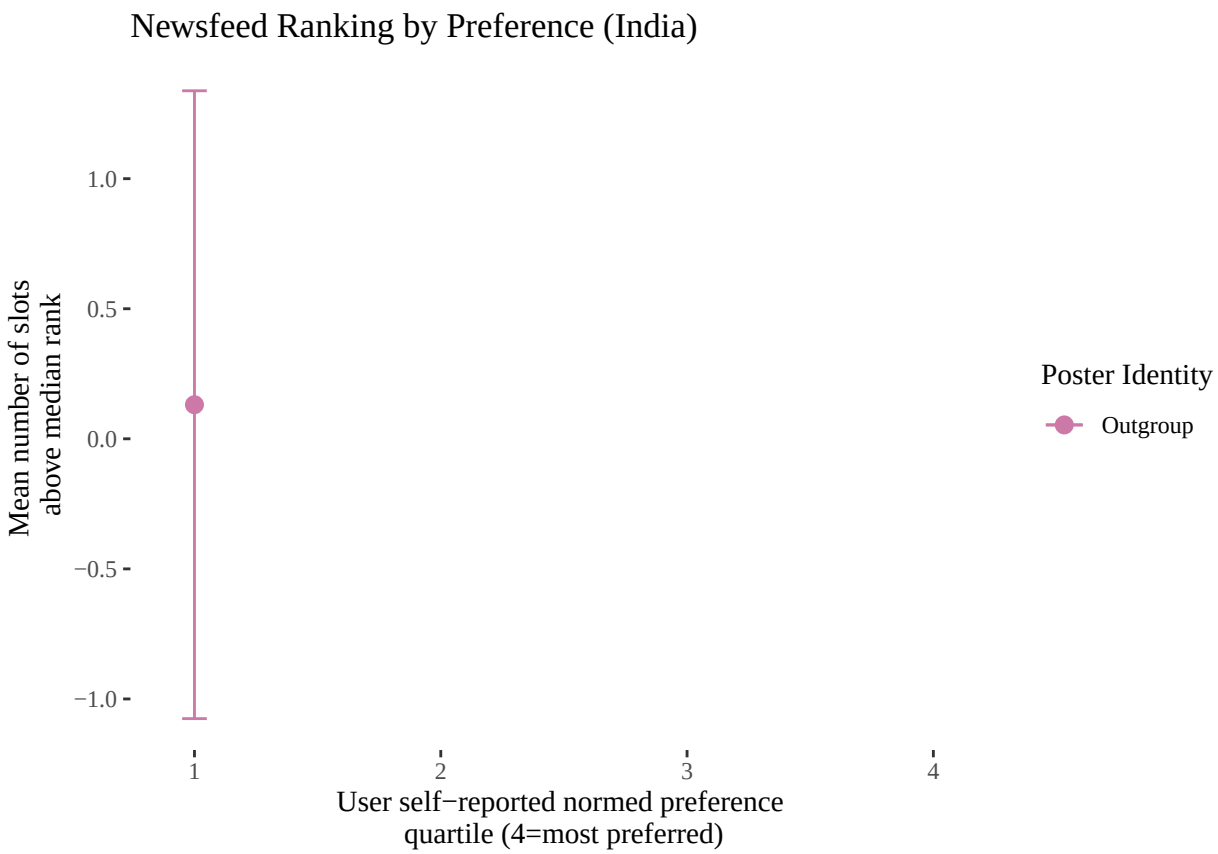

Distribution of raw pref by religion
density
0.3
0.2
0.1
0.0
2
4
6
Liking
religion.in.group
FALSE
TRUE


A
Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
5.0
2.5
0.0
−2.5
2
4
6
User self−reported preferences about posts
(7=most preferred)
Poster Identity
Outgroup
Ingroup
B
Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.150
0.125
0.100
0.075
2
4
6
User self−reported preferences about posts
(7=most preferred)
C
Newsfeed Top 10 by Preference (India)
Pr(Top 10)
0.25
0.20
0.15
2
4
6
User self−reported preferences about posts
(7=most preferred)
D
Newsfeed Top 15 by Preference (India)
Pr(Top 15)
0.35
0.30
0.25
0.20
2
4
6
User self−reported preferences about posts
(7=most preferred)
Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.150
0.125
0.100
0.075
2
4
6
User self−reported preferences about posts
(7=most preferred)

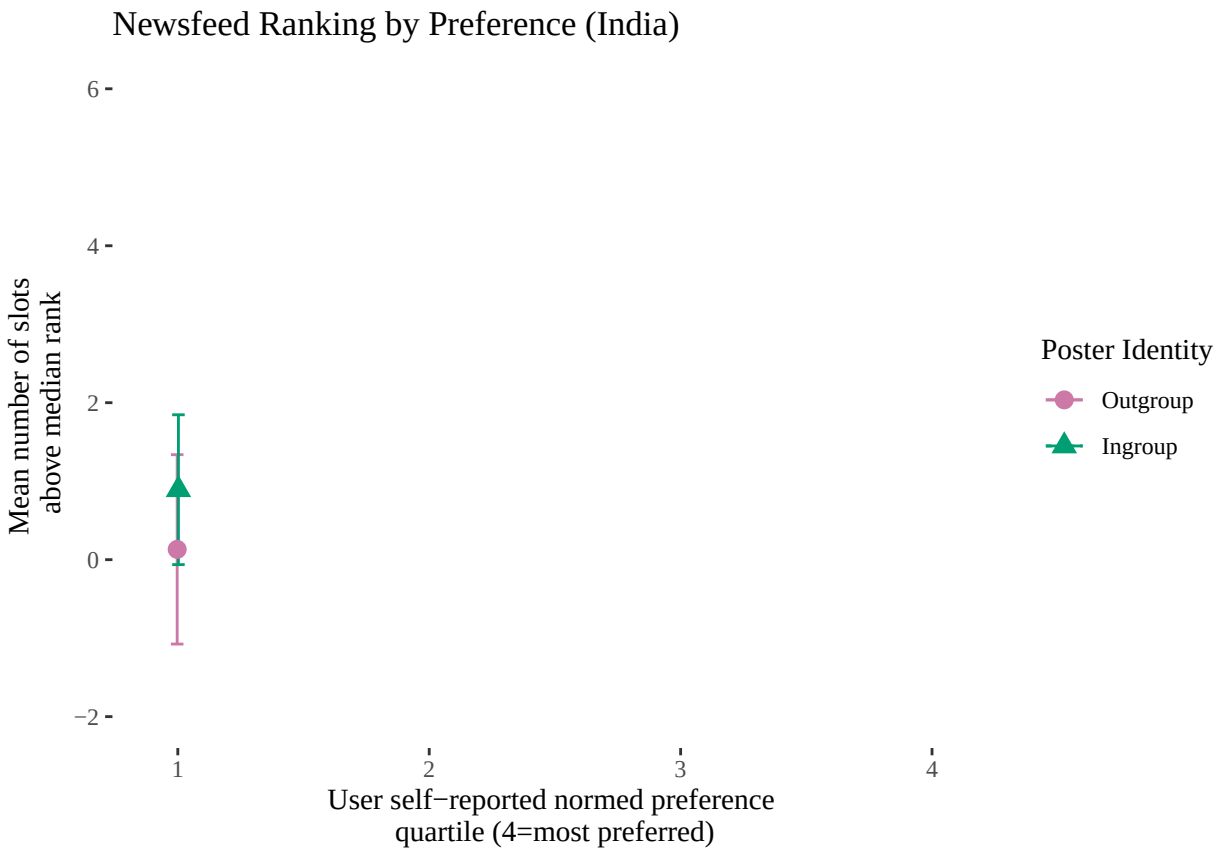

A
Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
0
2
4
1
2
3
4
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup
B
Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.075
0.100
0.125
0.150
C
Newsfeed Top 10 by Preference (India)
Pr(Top 10)
0.16
0.20
0.24
D
Newsfeed Top 15 by Preference (India)
Pr(Top 15)
0.25
0.30
0.35
Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup

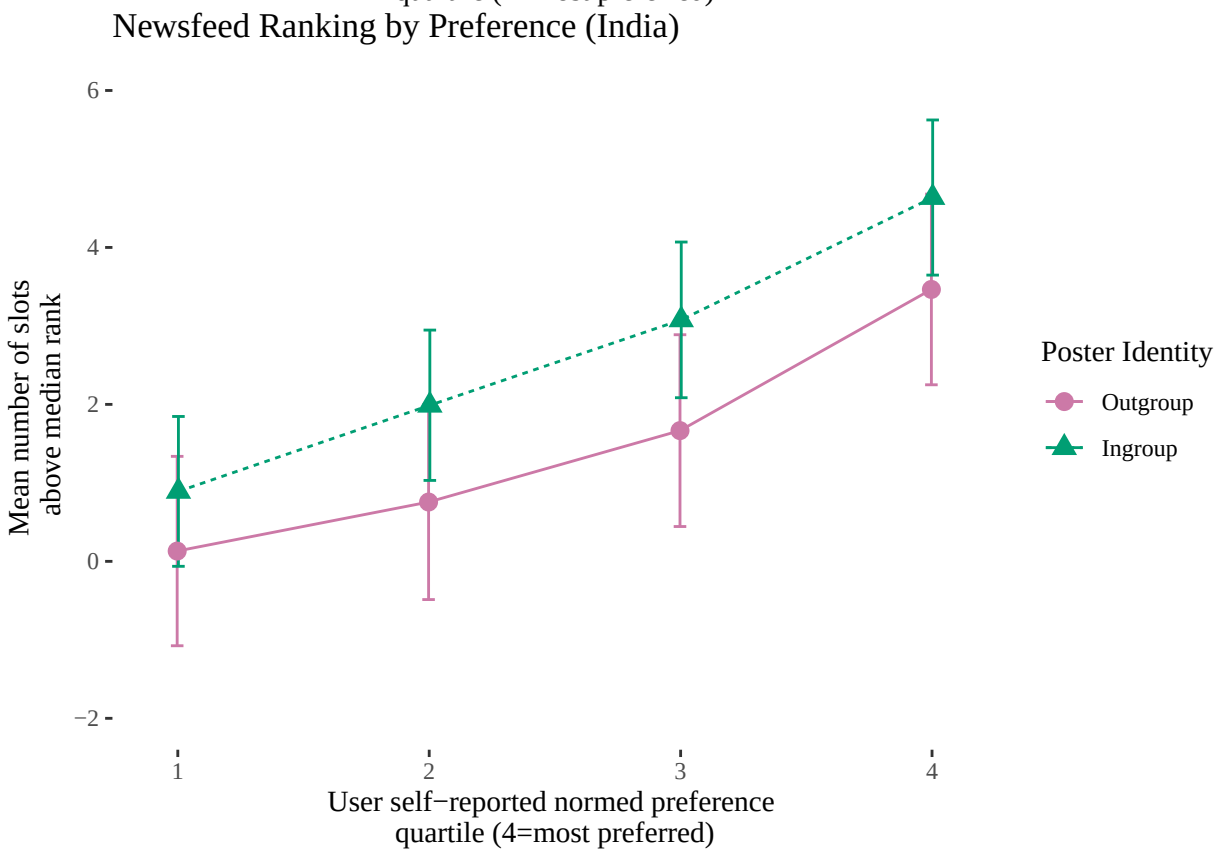


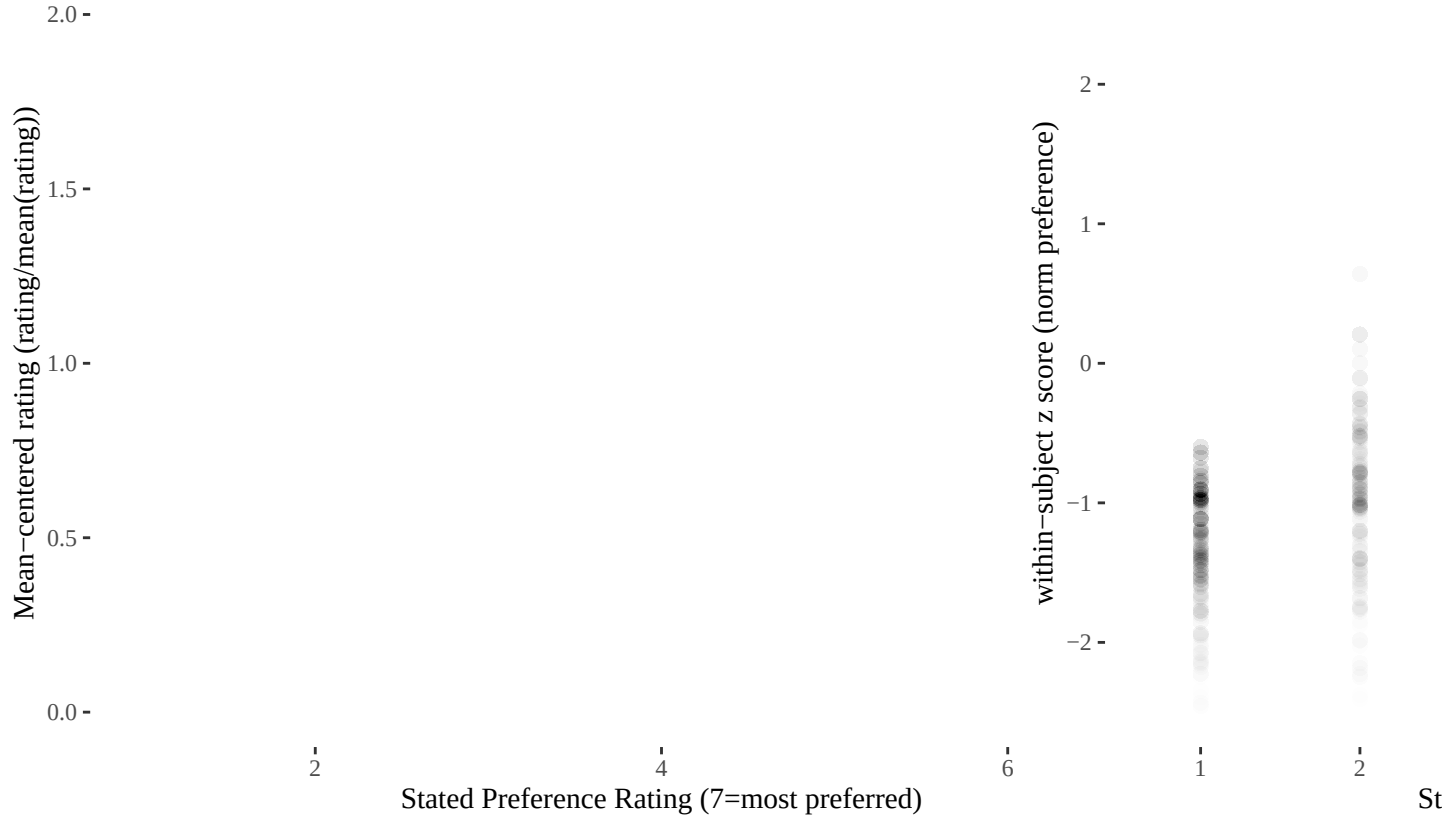

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

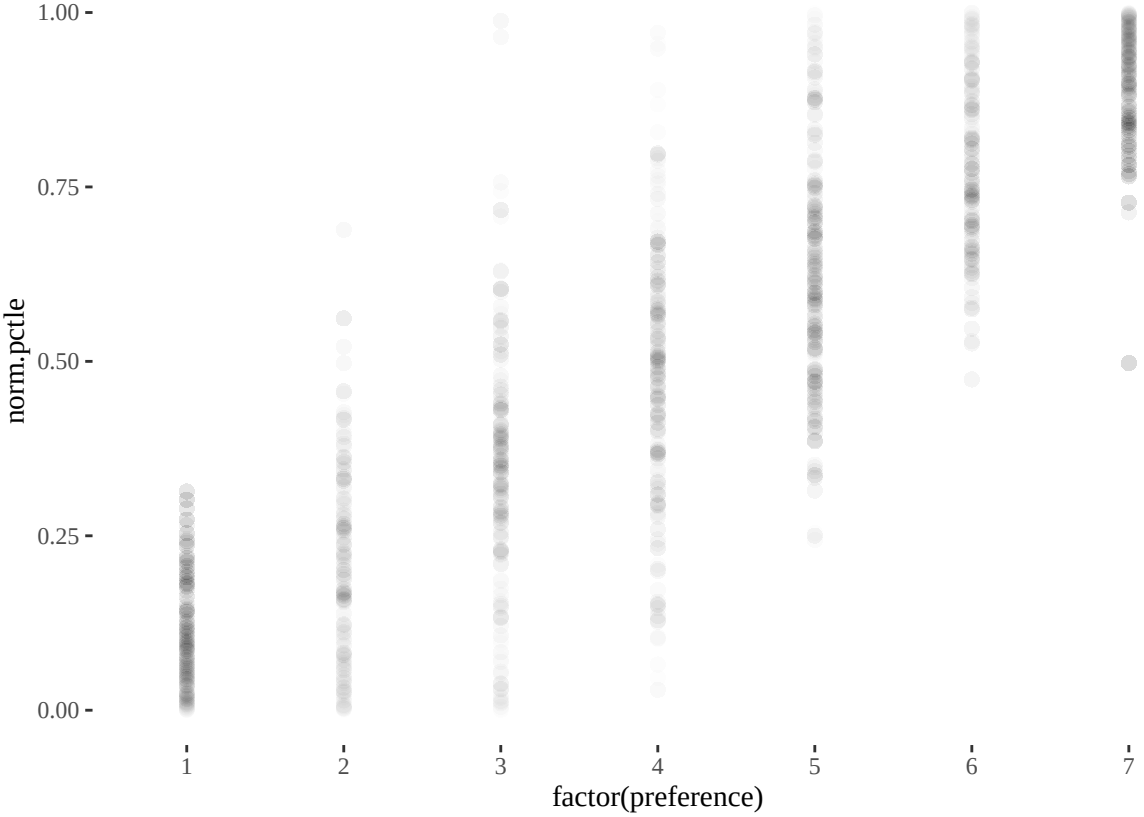


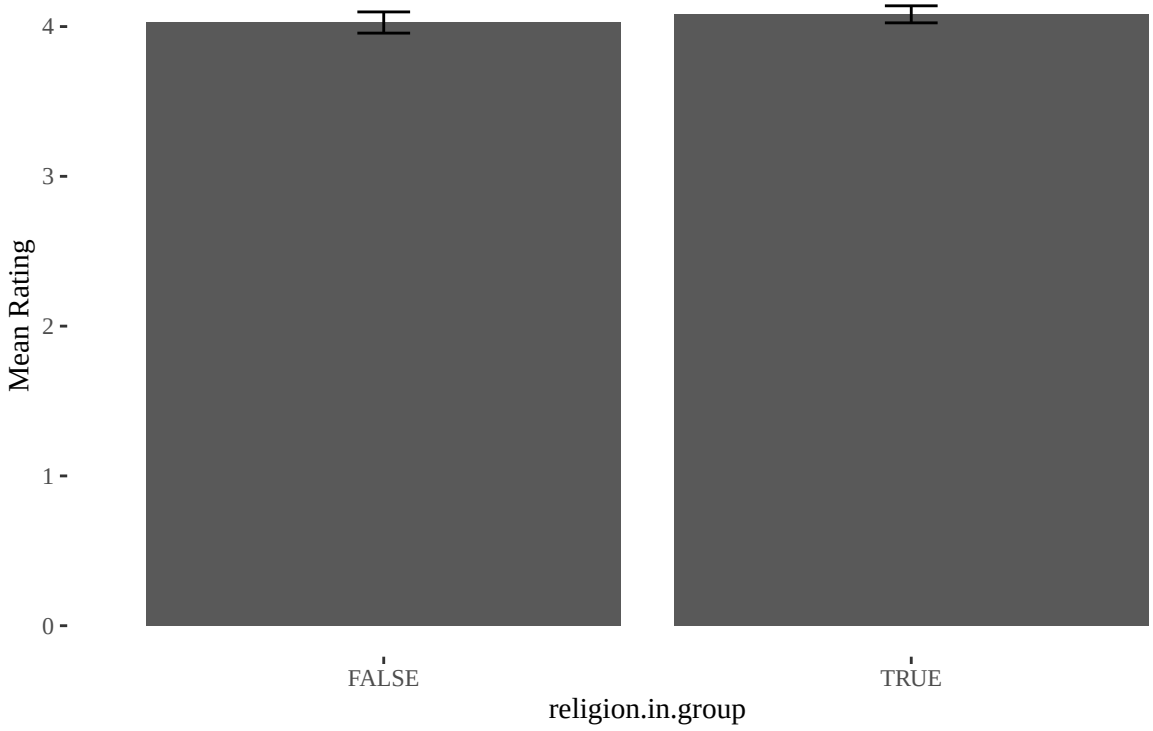

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```


Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup

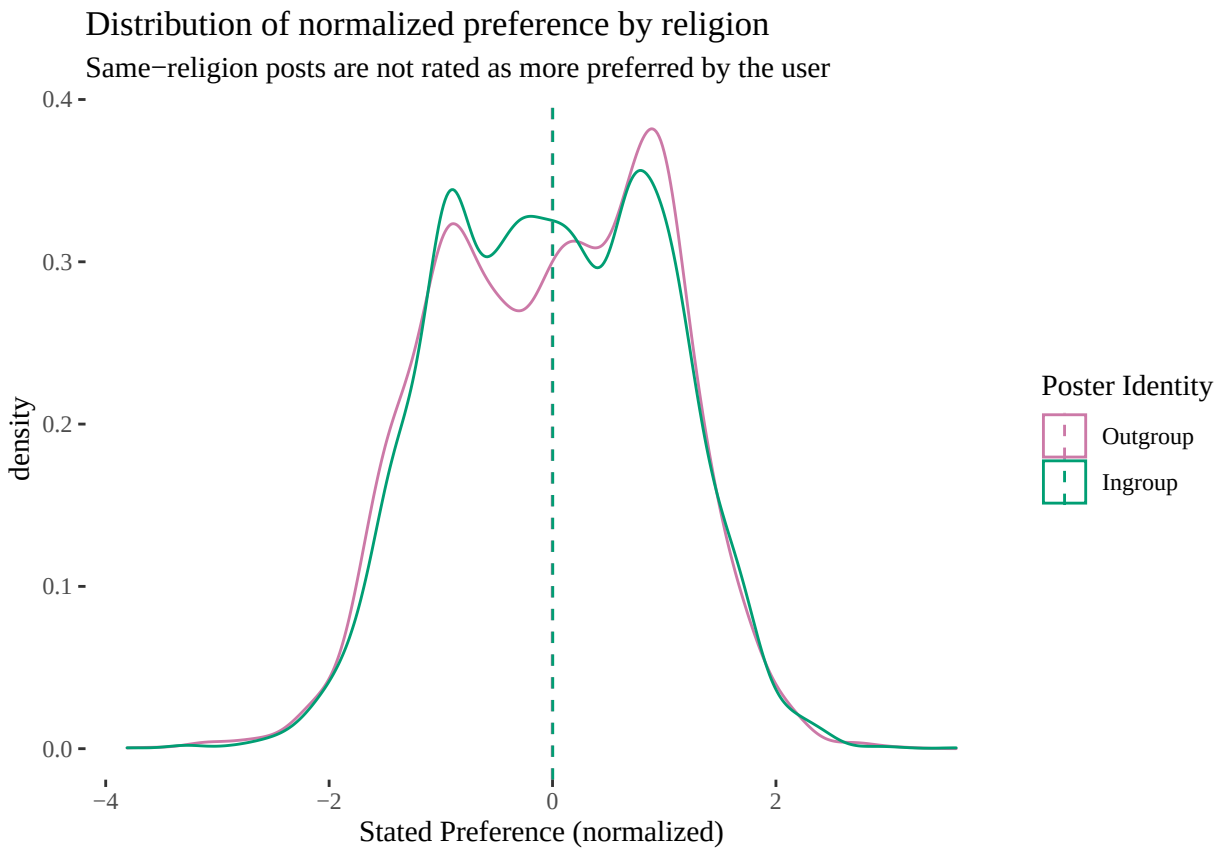

Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup

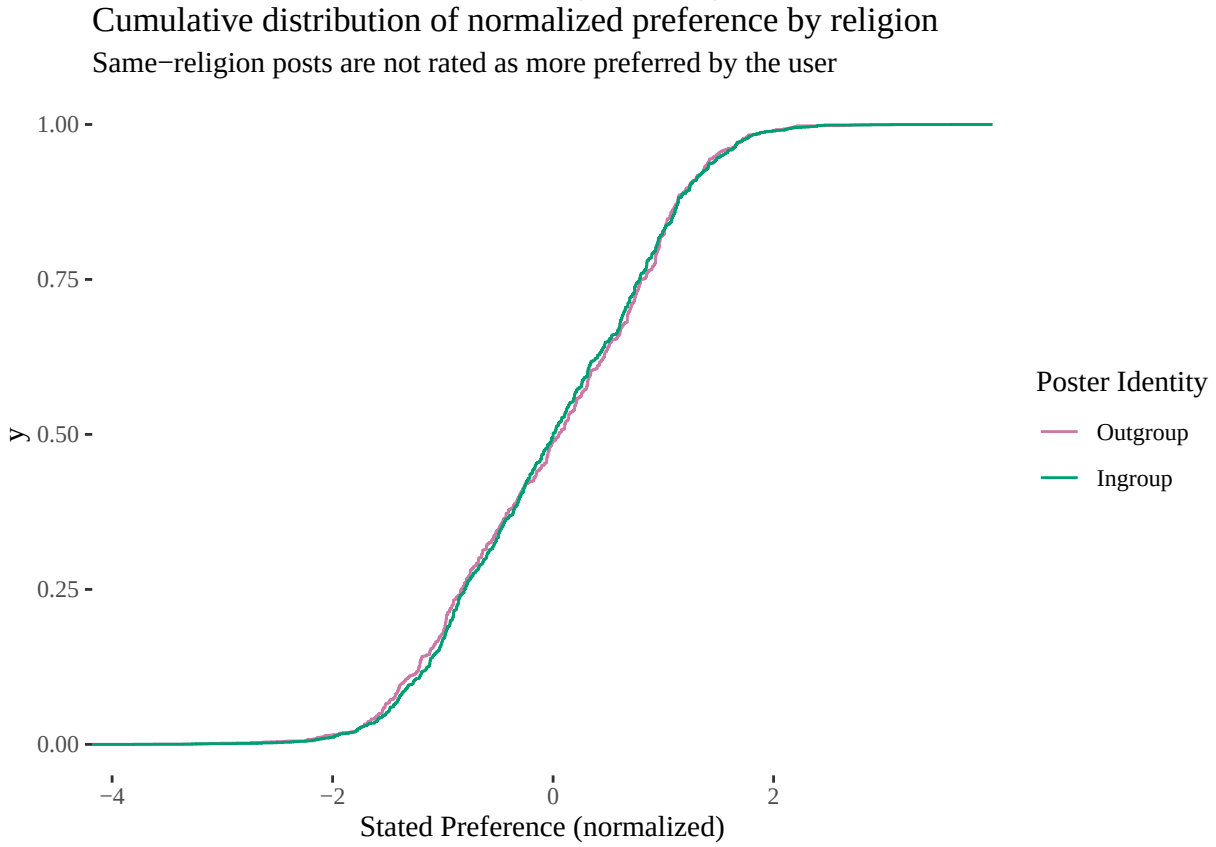

Mean−centered rating (rating/mean(rating))
2.0
1.5
1.0
0.5
0.0
2
4
6
Stated Preference Rating (7=most preferred)
within−subject z score (norm preference)
2
1
0
−1
−2
1
2
St


norm.pctle
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
6
7
factor(preference)




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


Distribution of normalized preference by religion
Same−religion posts are not rated as more preferred by the user
density
0.4
0.3
0.2
0.1
0.0
−4
−2
0
2
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup


Cumulative distribution of normalized preference by religion
Same−religion posts are not rated as more preferred by the user
y
1.00
0.75
0.50
0.25
0.00
−4
−2
0
2
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup

```
## 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: Fri, Jan 08, 2021 - 09:08:35

Table 6: Time Results - Rank

	Dependent variable:		
	nf.order		
	(1)	(2)	(3)
	all	all2	base
I(100 ∗norm.pctle)	−0.048***	−0.048***	−0.047***
	(0.007)	(0.007)	(0.007)
time_rank	0.164***	0.150***	
	(0.021)	(0.013)	
religion.in.group	−0.510	−1.078***	−1.126***
	(0.736)	(0.394)	(0.397)
time_rank:religion.in.group	−0.024		
	(0.027)		
Constant	27.529***	27.864***	31.340***
	(0.657)	(0.545)	(0.457)
Observations	7,866	7,866	7,866
R^2	0.024	0.023	0.007
Adjusted R^2	0.023	0.023	0.007
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: Fri, Jan 08, 2021 - 09:08:35

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Fri, Jan 08, 2021 - 09:08:35

Table 7: Time Results - Top 10

	Dependent variable:			
	nf.order			
	(1)	(2)	(3)	(4)
	all	days	hours	mins
religion.in.group	−1.078***	−1.106***	−0.520	0.061
	(0.394)	(0.397)	(0.617)	(1.635)
I(100 ∗norm.pctle)	−0.048***	−0.049***	−0.039***	−0.005
	(0.007)	(0.007)	(0.011)	(0.028)
time_rank	0.150***	0.147***	0.147***	0.168
	(0.013)	(0.013)	(0.034)	(0.225)
Constant	27.864***	28.015***	27.484***	27.718***
	(0.545)	(0.550)	(0.830)	(2.090)
Observations	7,866	7,758	3,512	542
R^2	0.023	0.023	0.010	0.001
Adjusted R^2	0.023	0.023	0.009	−0.004
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 8: Time Results - Top 10

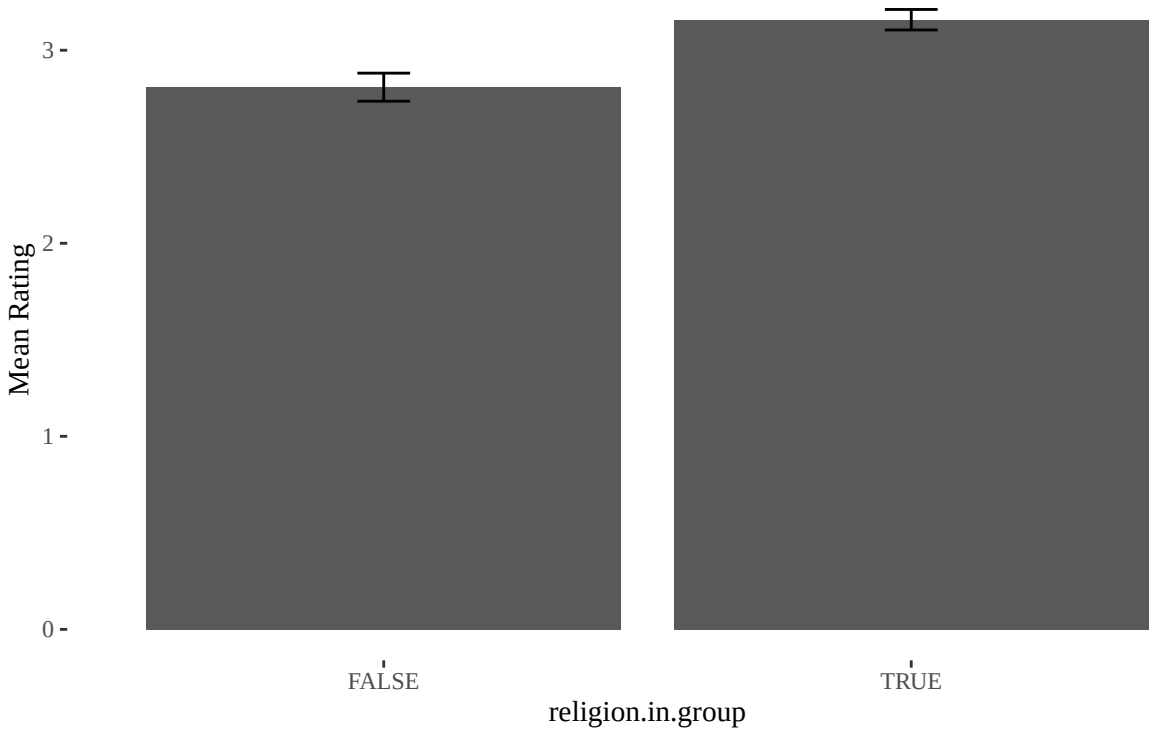
	Dependent variable:			
	nf.order			
	(1)	(2)	(3)	(4)
	all	recent10	recent20	recent30
religion.in.group	−1.078***	−1.476*	−0.605	−0.615
	(0.394)	(0.847)	(0.598)	(0.491)
I(100 ∗norm.pctle)	−0.048***	−0.047***	−0.043***	−0.044***
	(0.007)	(0.014)	(0.010)	(0.008)
time_rank	0.150***	0.096	0.176***	0.187***
	(0.013)	(0.144)	(0.051)	(0.028)
Constant	27.864***	27.974***	26.779***	26.796***
	(0.545)	(1.246)	(0.863)	(0.704)
Observations	7,866	1,922	3,721	5,317
R^2	0.023	0.008	0.008	0.014
Adjusted R^2	0.023	0.006	0.008	0.014
Note:				*p<0.1; **p<0.05; ***p<0.01

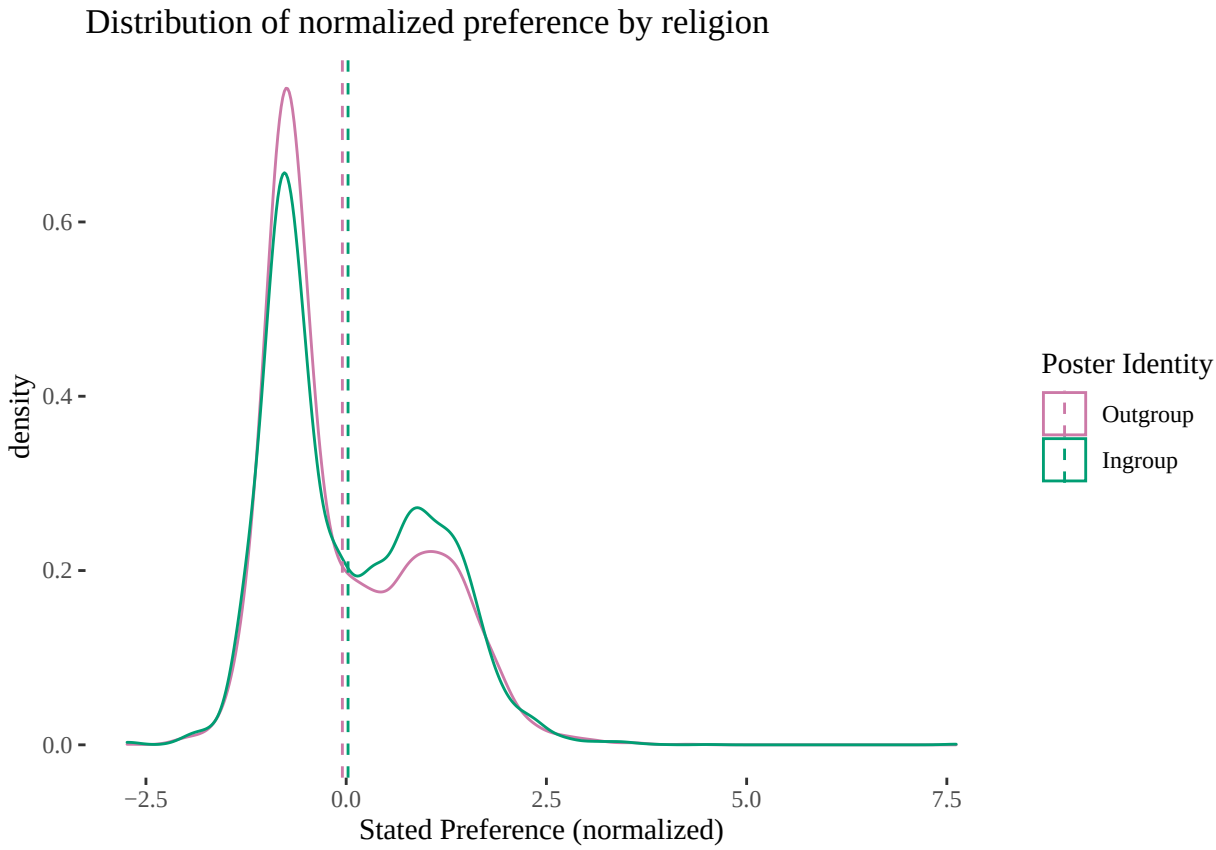
PYMK preference for user's religion (India)

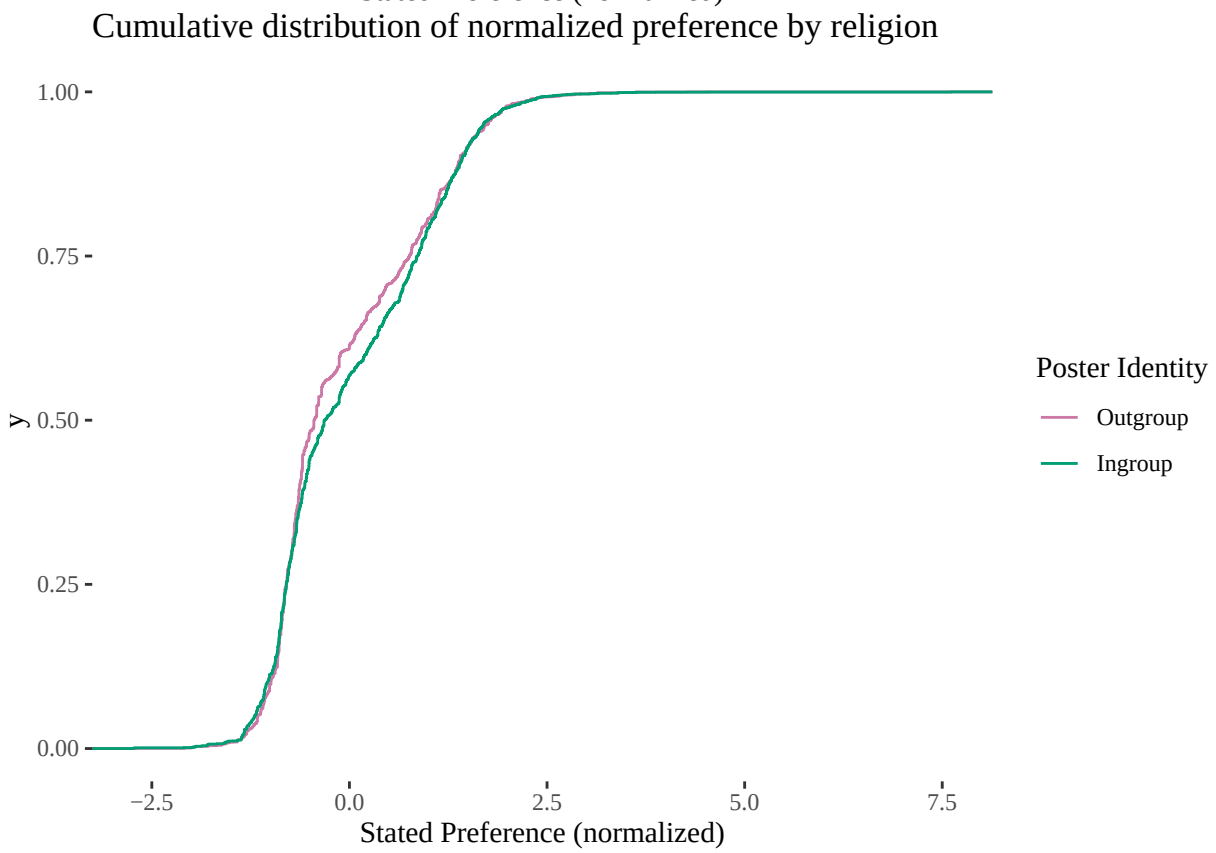
Same−religion recommendations are not sorted closer to the top

Raw Reported Preference by Race Group

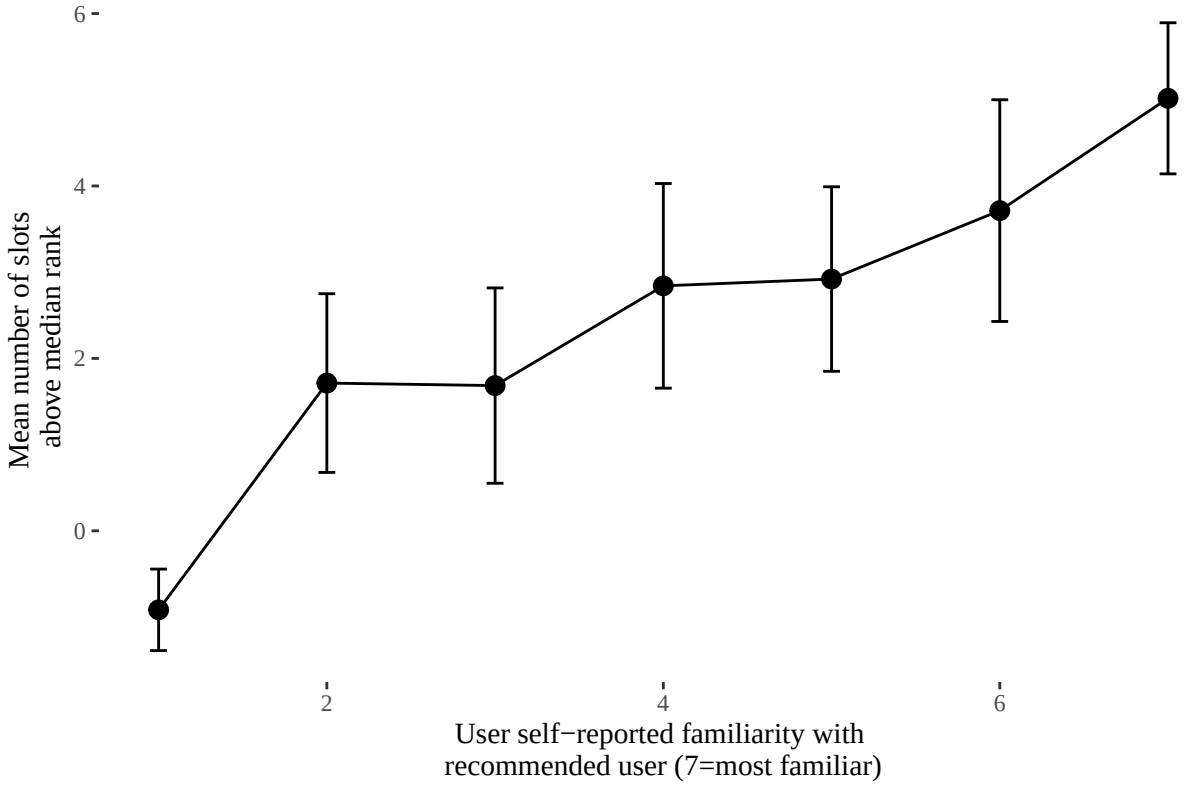
Same−religion posts are slightly more preferred



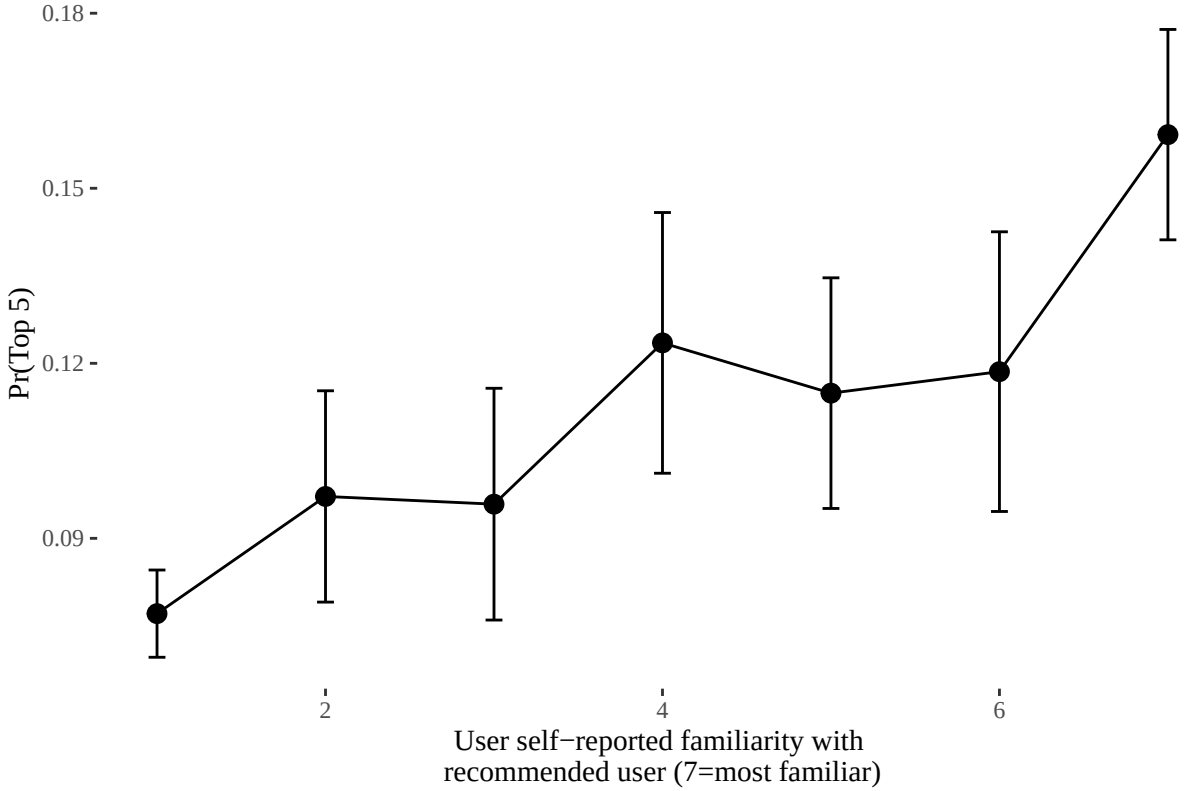

Distribution of normalized preference by religion
density
0.6
0.4
0.2
0.0
−2.5
0.0
2.5
5.0
7.5
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup

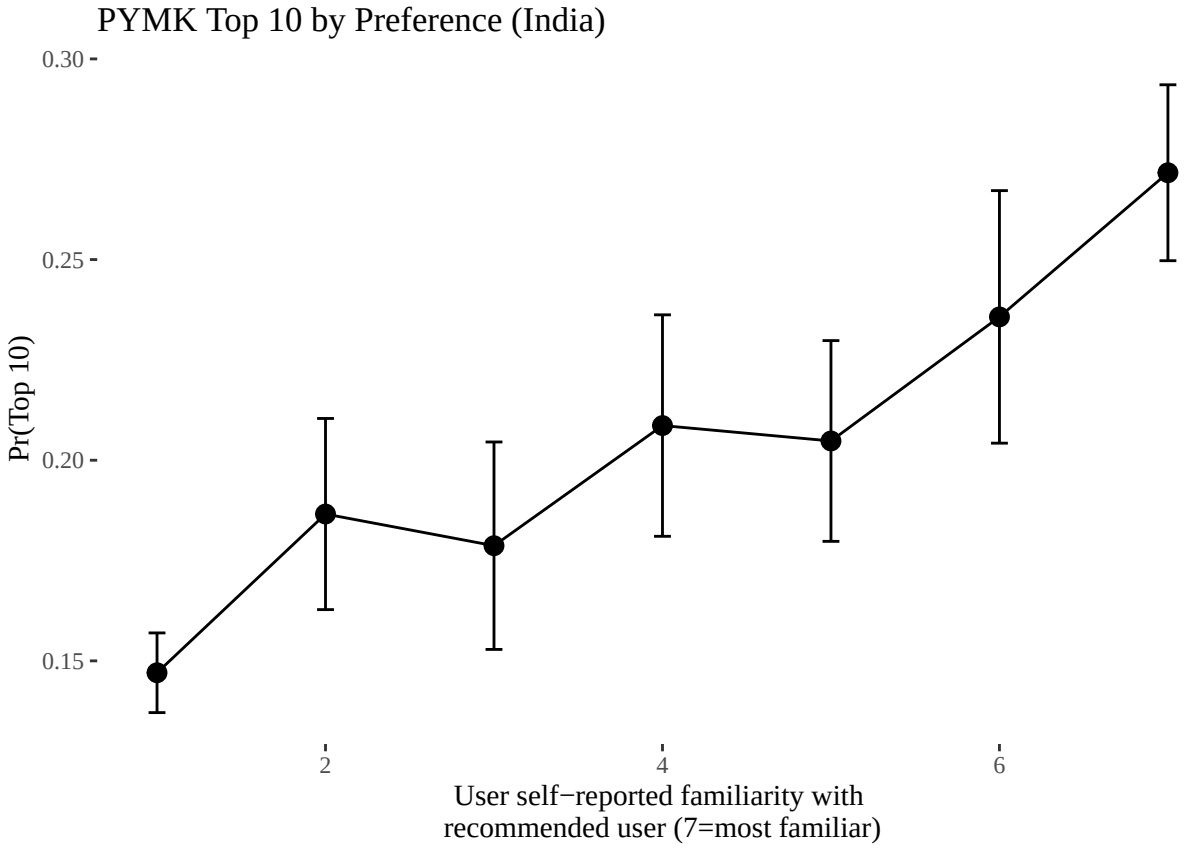

Cumulative distribution of normalized preference by religion
y
1.00
0.75
0.50
0.25
0.00
−2.5
0.0
2.5
5.0
7.5
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup

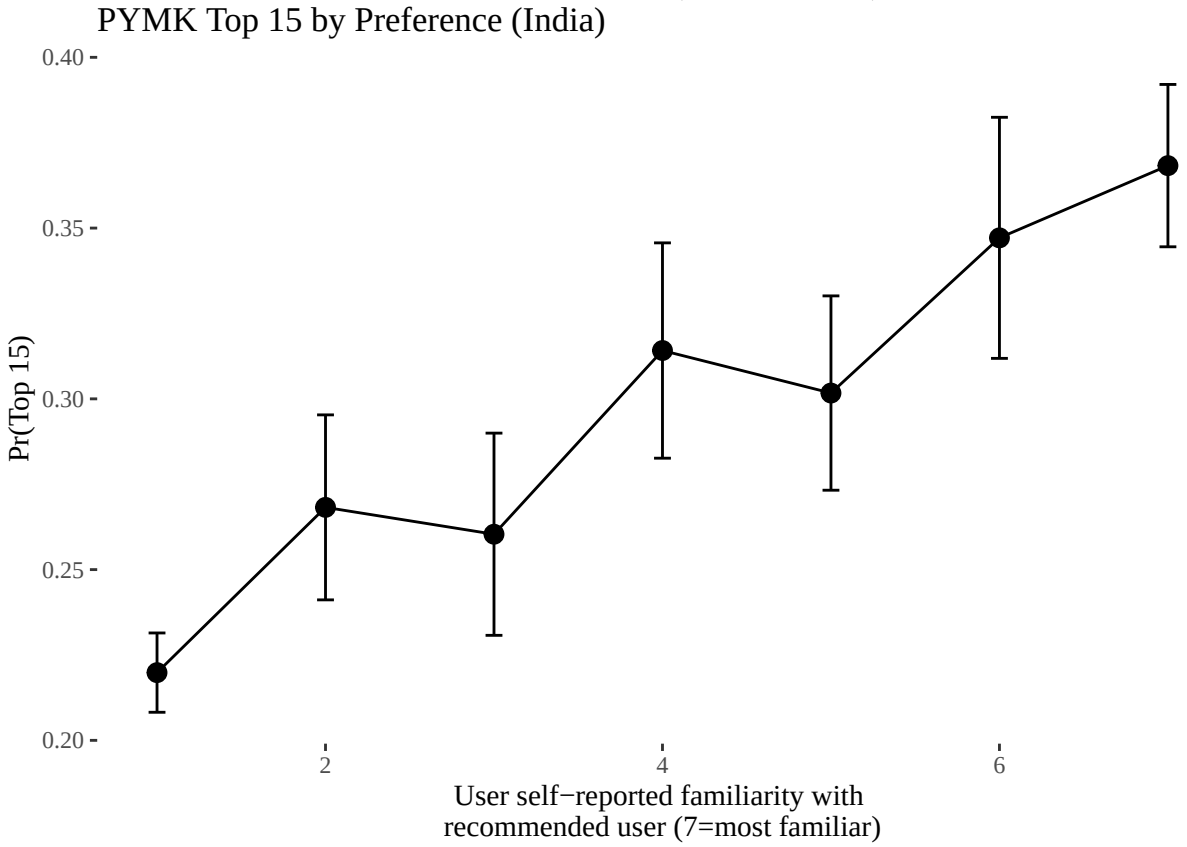
PYMK Ranking by Preference (India)



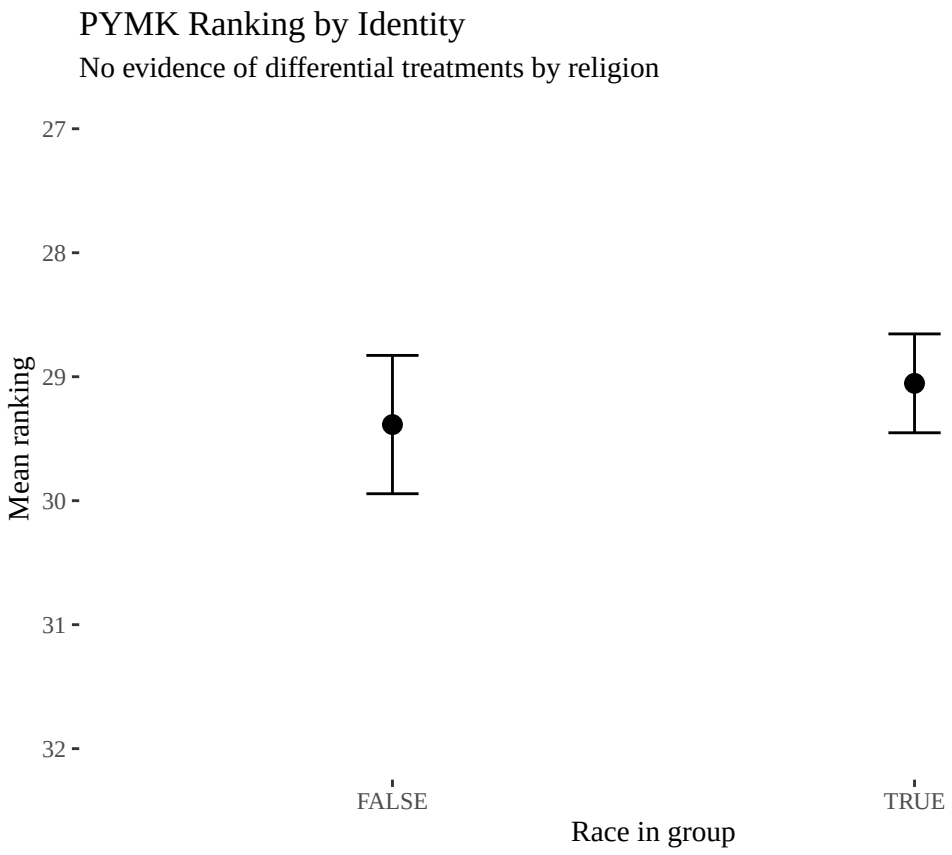
PYMK Top 5 by Preference (India)

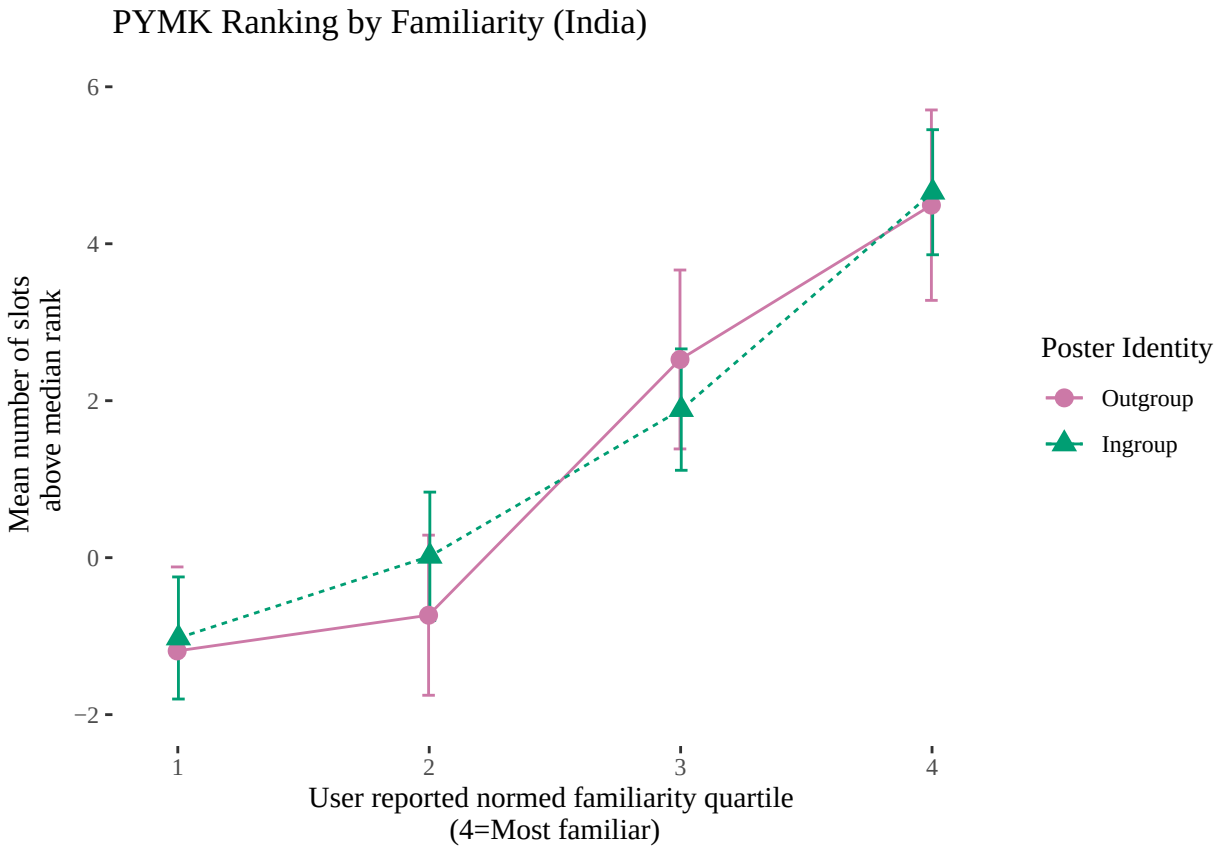


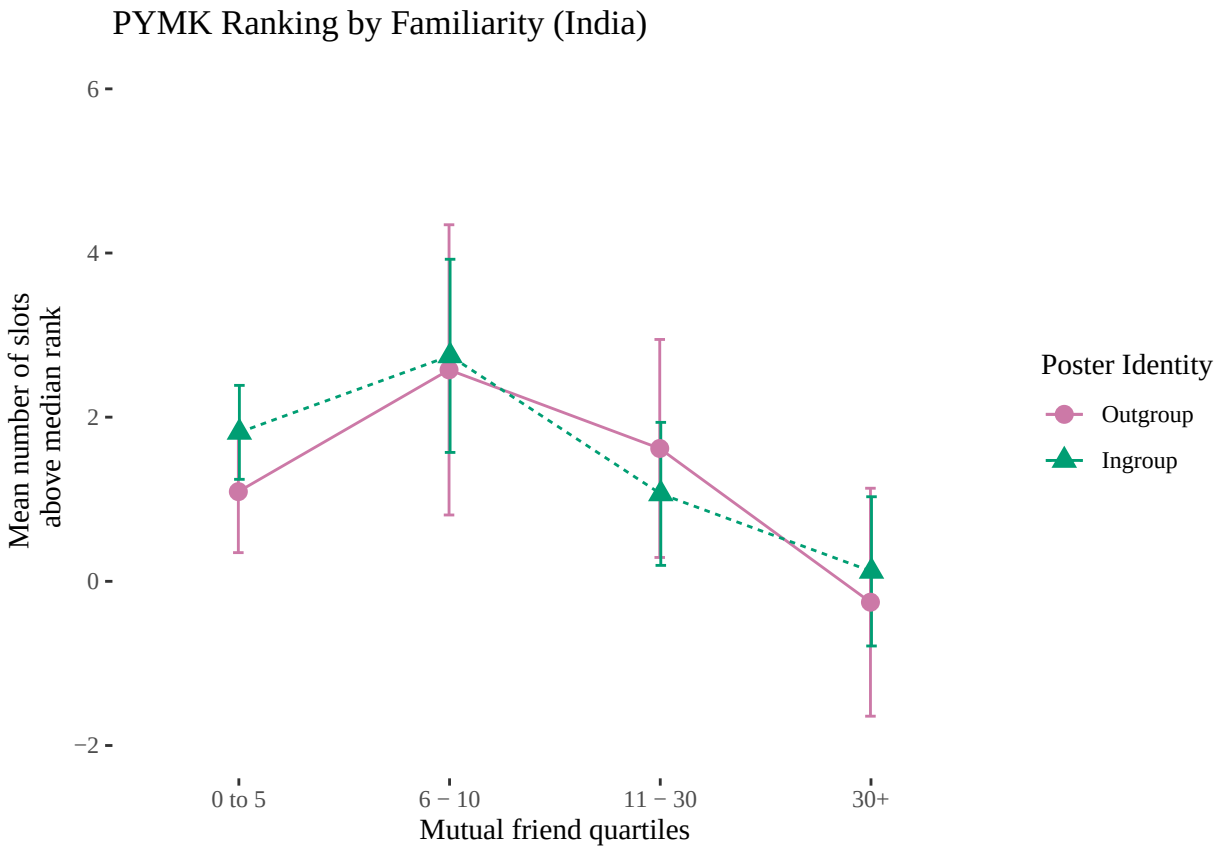

PYMK Top 10 by Preference (India)
0.30
0.25
0.20
0.15
Pr(Top 10)
2
4
6
User self−reported familiarity with
recommended user (7=most familiar)


PYMK Top 15 by Preference (India)
0.40
0.35
0.30
0.25
0.20
Pr(Top 15)
2
4
6
User self−reported familiarity with
recommended user (7=most familiar)

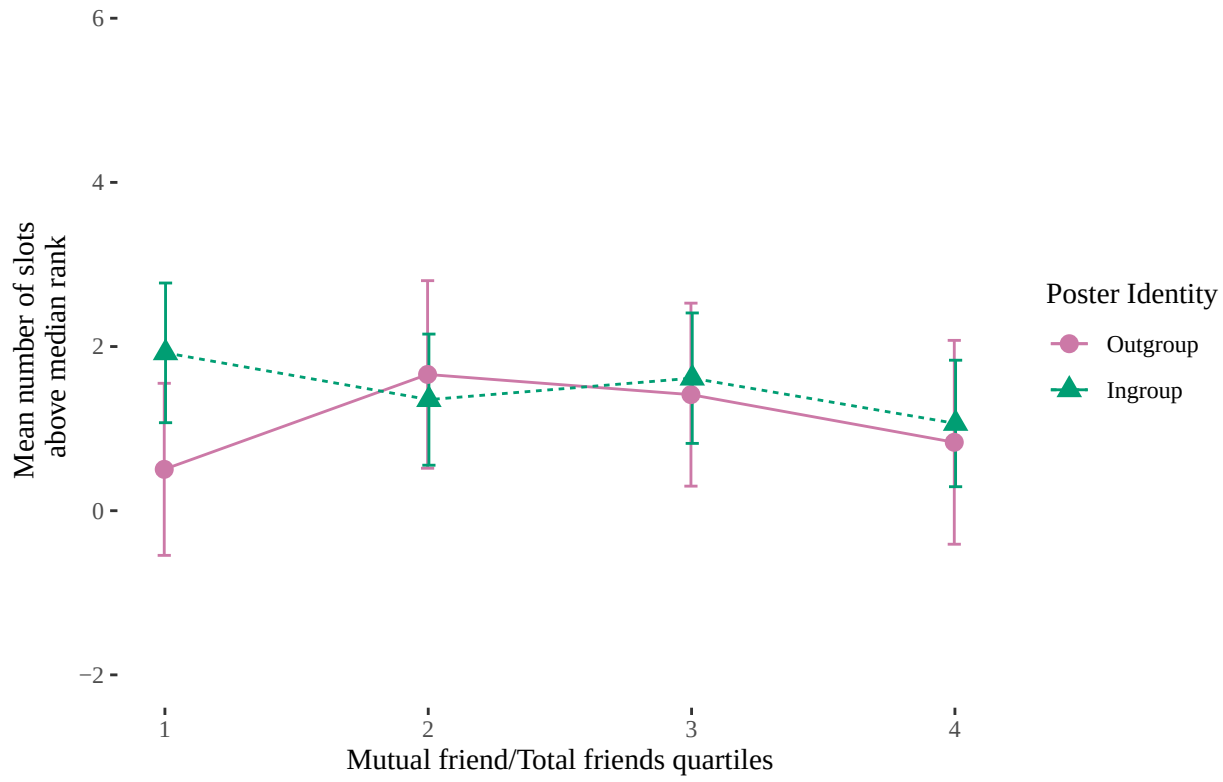
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



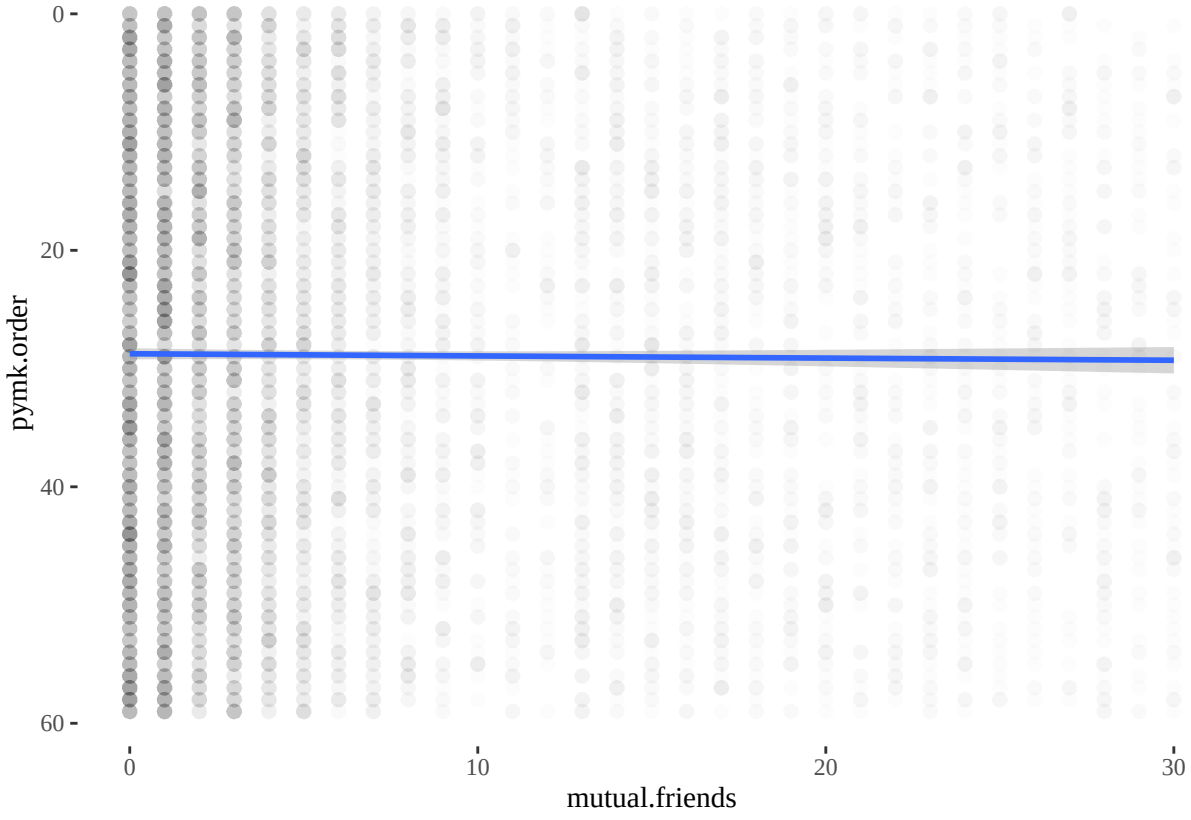

PYMK Ranking by Familiarity (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User reported normed familiarity quartile
(4=Most familiar)
Poster Identity
Outgroup
Ingroup

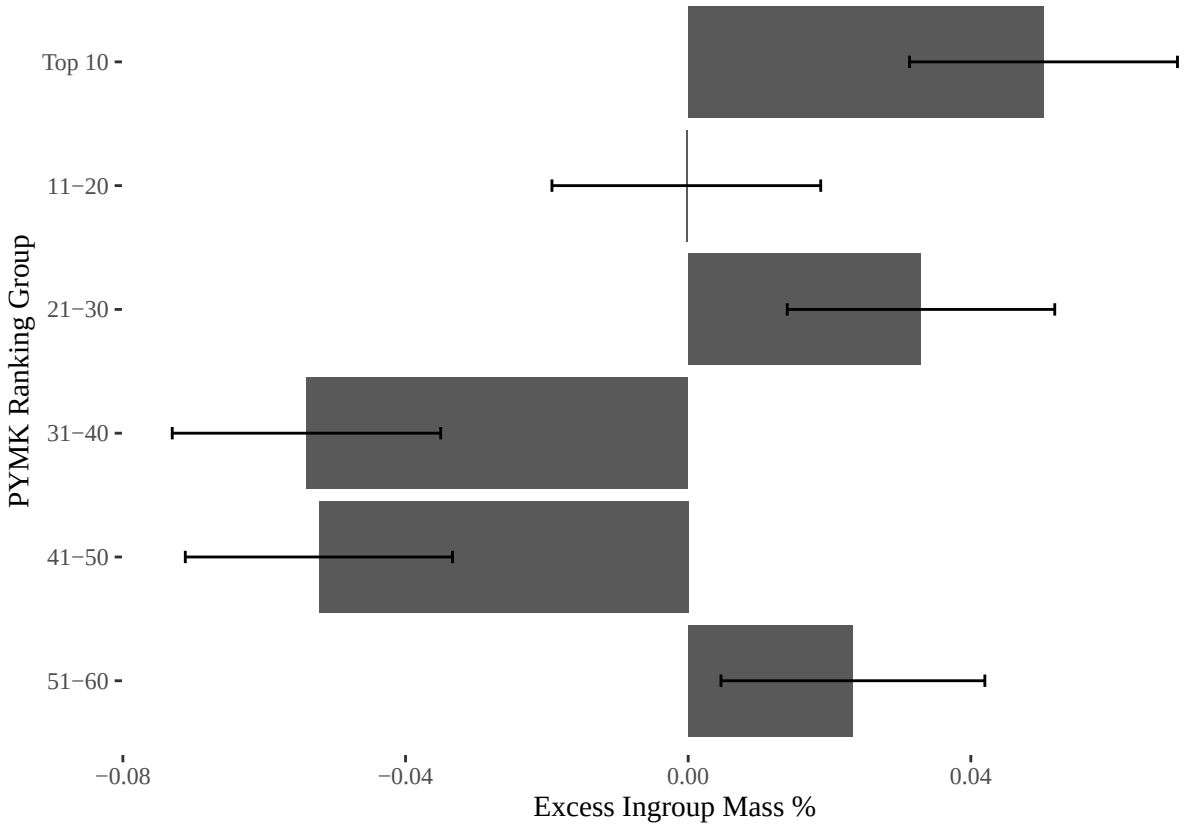

PYMK Ranking by Familiarity (India)
Mean number of slots above median rank
6
4
2
0
−2
0 to 5
6 − 10
11 − 30
30+
Mutual friend quartiles
Poster Identity
Outgroup
Ingroup

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: Fri, Jan 08, 2021 - 09:08:49

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% Date and time: Fri, Jan 08, 2021 - 09:08:50

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% Date and time: Fri, Jan 08, 2021 - 09:08:50

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% Date and time: Fri, Jan 08, 2021 - 09:08:51

Table 9: Primary NF Rank Results

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

Table 10: Primary NF Top 10 Results

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

Table 11: Primary PYMK Rank Results

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

Table 12: Primary PYMK Top 10 Results

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