

# Facebook Results Memo

ddd

8/27/2020

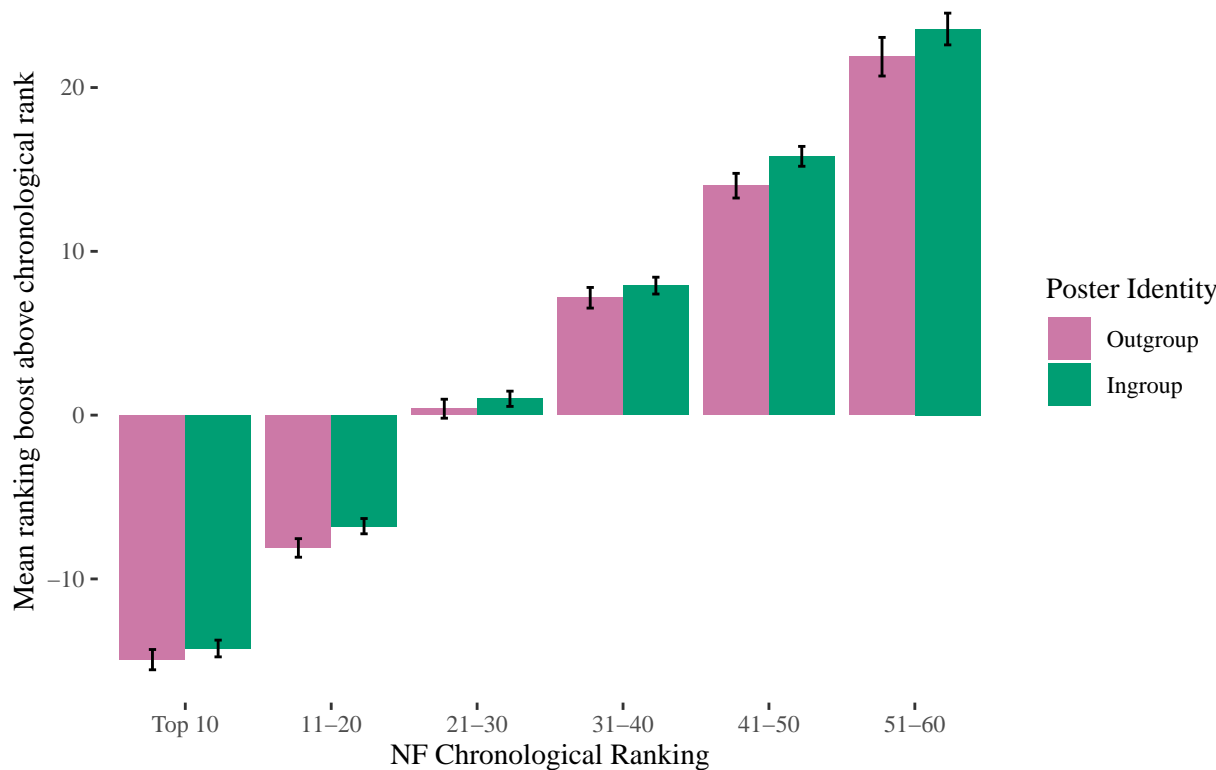
## Executive Summary

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).

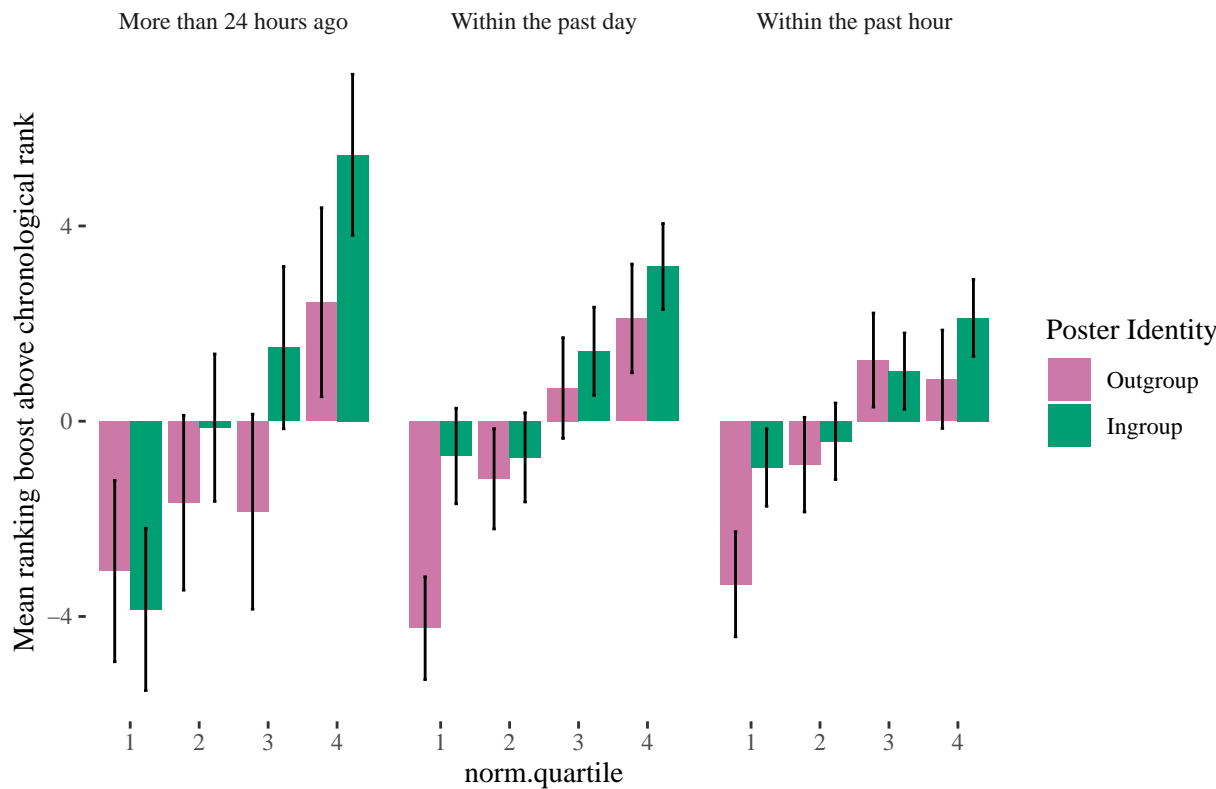
We find evidence of significant discrimination in the NF sorting. When the author and subject are of the same race, the post receives a boost equivalent to 20 percentile points of stated preference; a same-race post in the 50th percentile of stated preference is ranked the same on average as an opposite-race 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).

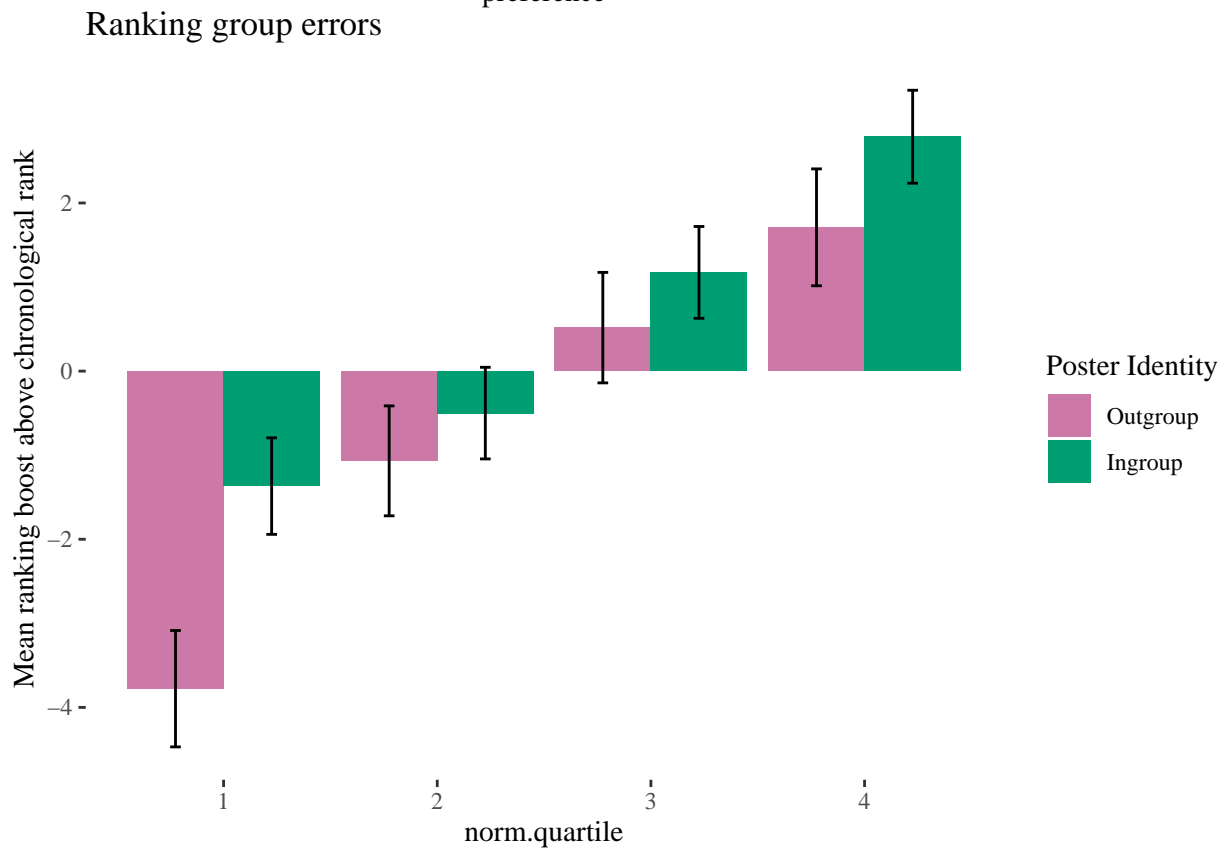
Paper Figures

Ranking group errors



Ranking group errors





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

% Date and time: Tue, Jan 26, 2021 - 14:10:12

Table 1:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
race.in.group	−0.924533*** (0.181622)			−0.897882*** (0.180885)	−0.994101*** (0.176421)	
I(100 *norm.pctle)		−0.047141*** (0.003068)		−0.046995*** (0.003066)		−0.051191*** (0.002978)
time_rank			0.237119*** (0.005768)		0.237430*** (0.005765)	0.240324*** (0.005741)
Constant	24.534850*** (0.141024)	26.333440*** (0.177040)	18.278960*** (0.163313)	26.867460*** (0.207102)	18.870830*** (0.194101)	20.760330*** (0.217346)
Observations	28,288	28,288	28,288	28,288	28,288	28,288
R <sup>2</sup>	0.000915	0.008280	0.056385	0.009143	0.057443	0.066138
Adjusted R <sup>2</sup>	0.000880	0.008245	0.056352	0.009073	0.057377	0.066072

*Note:*

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

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% Date and time: Tue, Jan 26, 2021 - 14:10:13

Table 2:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
race.in.group	0.055384 (0.219362)			0.227486 (0.216976)	0.018597 (0.219569)	
I(100 *norm.pctle)		−0.090238*** (0.003704)		−0.090365*** (0.003706)		−0.097824*** (0.003790)
friend_rank			−0.019711*** (0.005651)		−0.019688*** (0.005658)	−0.052120*** (0.005719)
Constant	30.301490*** (0.167764)	34.851030*** (0.213997)	30.954010*** (0.208068)	34.724300*** (0.245773)	30.942410*** (0.249121)	36.870530*** (0.307819)
Observations	25,593	25,593	25,593	25,593	25,593	25,593
R <sup>2</sup>	0.000002	0.022669	0.000475	0.022711	0.000475	0.025830
Adjusted R <sup>2</sup>	−0.000037	0.022630	0.000436	0.022634	0.000397	0.025754

*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: Tue, Jan 26, 2021 - 14:10:14

Table 3:

	<i>Dependent variable:</i>					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
race.in.group	0.055384 (0.219362)			0.227486 (0.216976)	0.116784 (0.218006)	
I(100 *norm.pctle)		-0.090238*** (0.003704)		-0.090365*** (0.003706)		-0.088493*** (0.003683)
pct_friend_rank			0.101516*** (0.005617)		0.101563*** (0.005618)	0.097926*** (0.005557)
Constant	30.301490*** (0.167764)	34.851030*** (0.213997)	27.140020*** (0.206802)	34.724300*** (0.245773)	27.070240*** (0.244410)	31.682750*** (0.278514)
Observations	25,593	25,593	25,593	25,593	25,593	25,593
R <sup>2</sup>	0.000002	0.022669	0.012602	0.022711	0.012613	0.034387
Adjusted R <sup>2</sup>	-0.000037	0.022630	0.012564	0.022634	0.012536	0.034312

*Note:*

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

### control 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 4: Correlations 1

	Pearson	Spearman	Kendall
NF Rank, Time	0.237	0.243	0.169
PYMK Rank, Pct Friends	0.112	0.125	0.086

Correlation matrix for benchmarks

### preference correlations

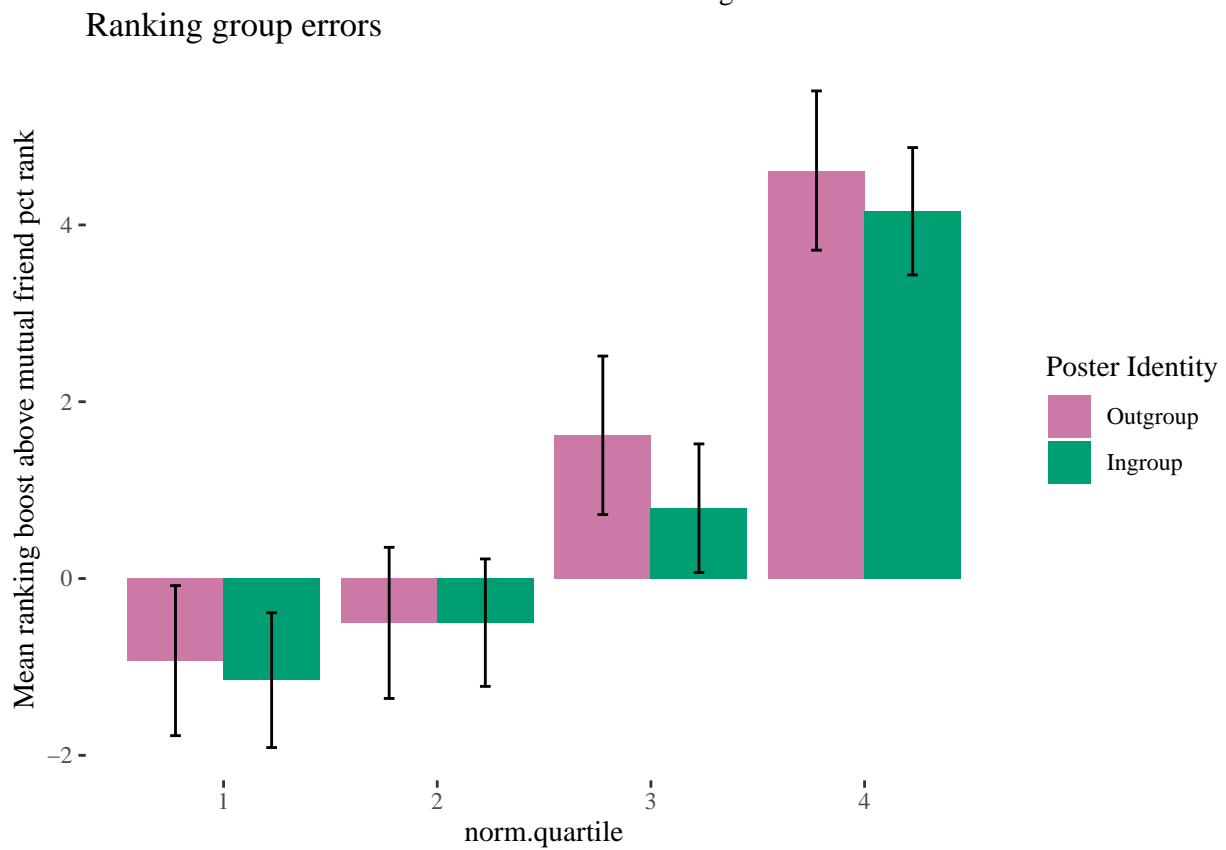
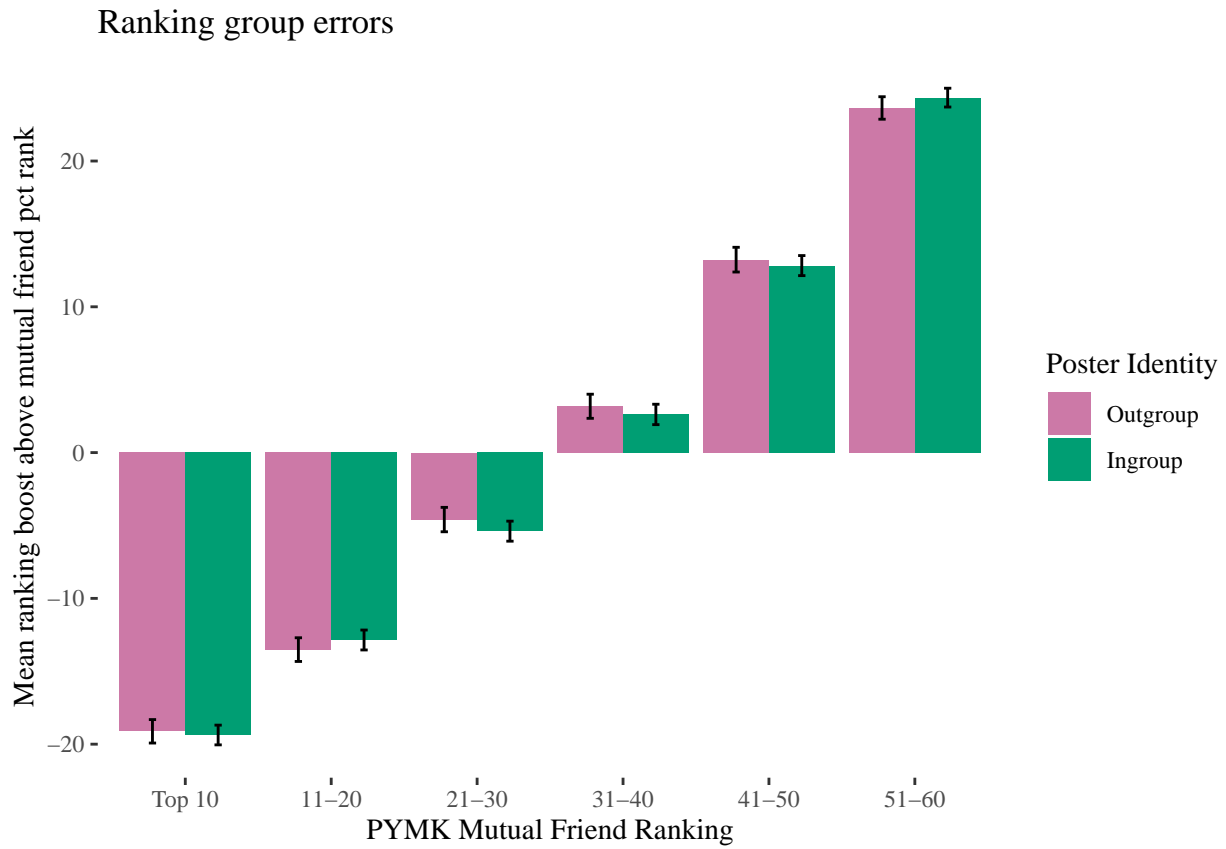
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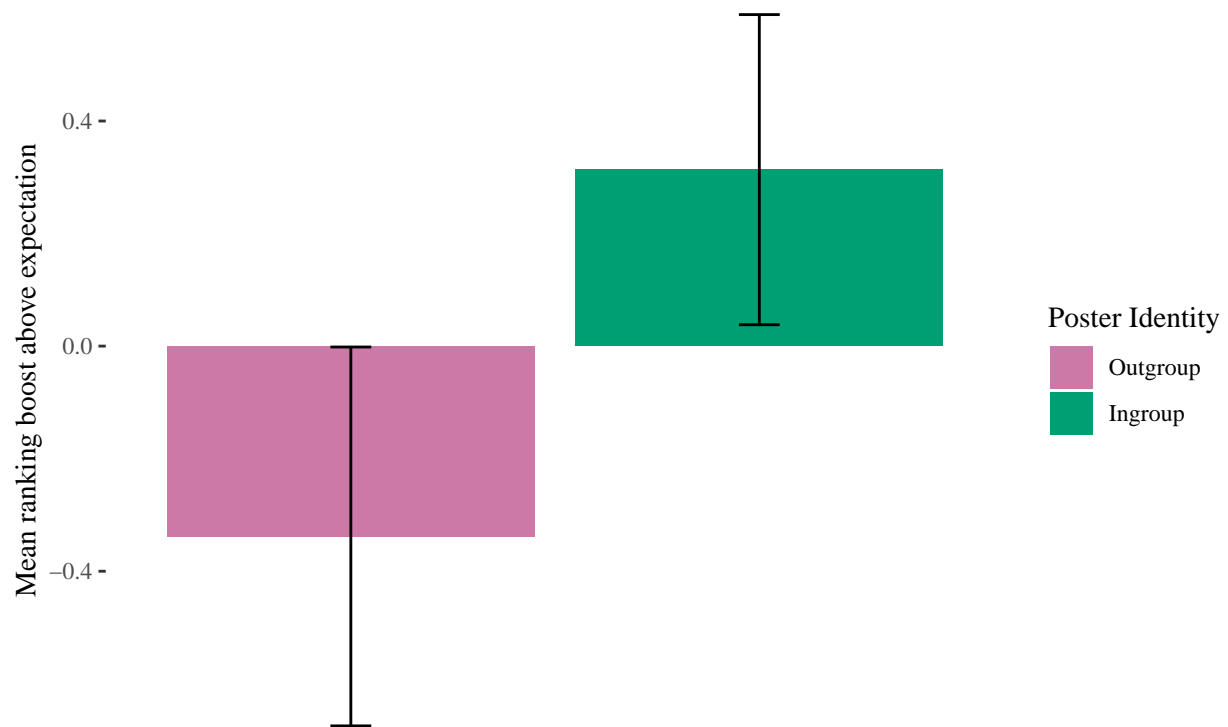
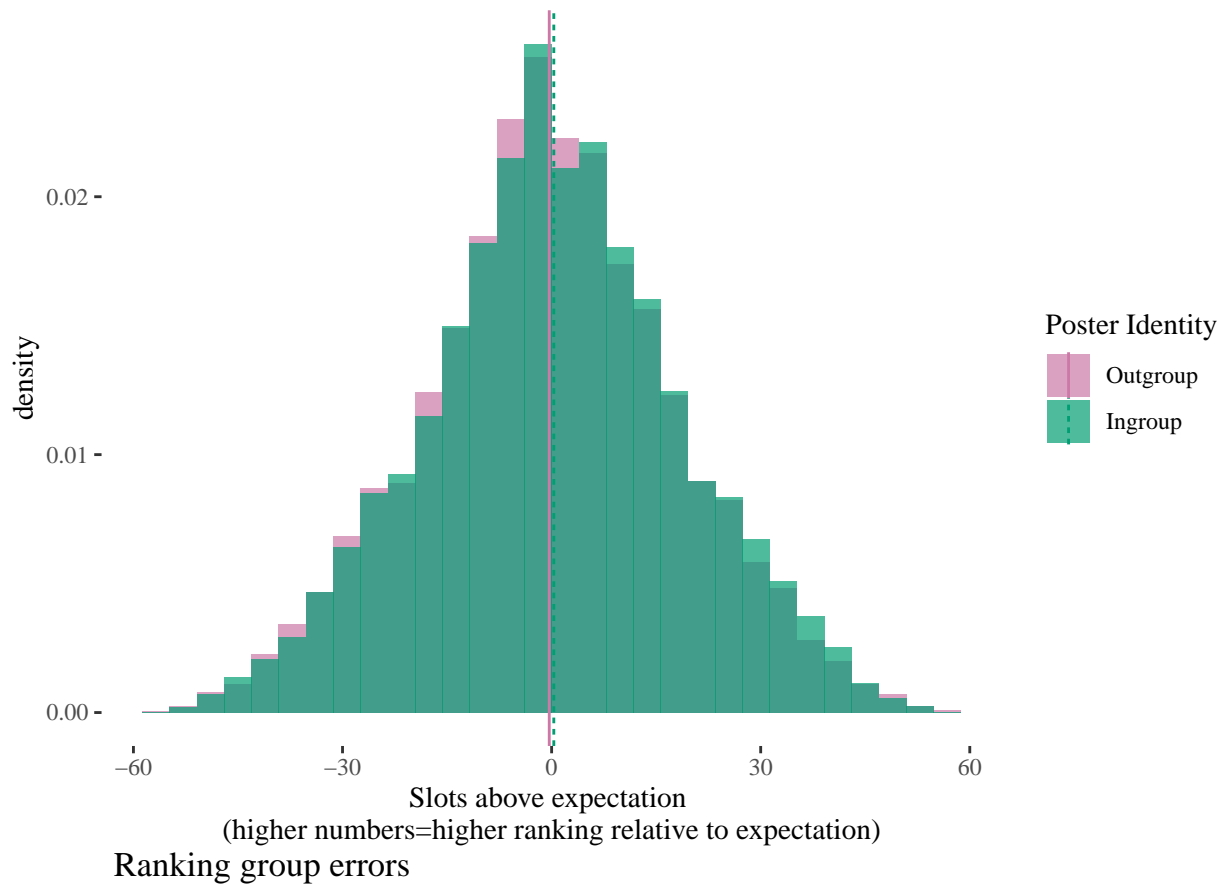
Table 5: Correlations 2

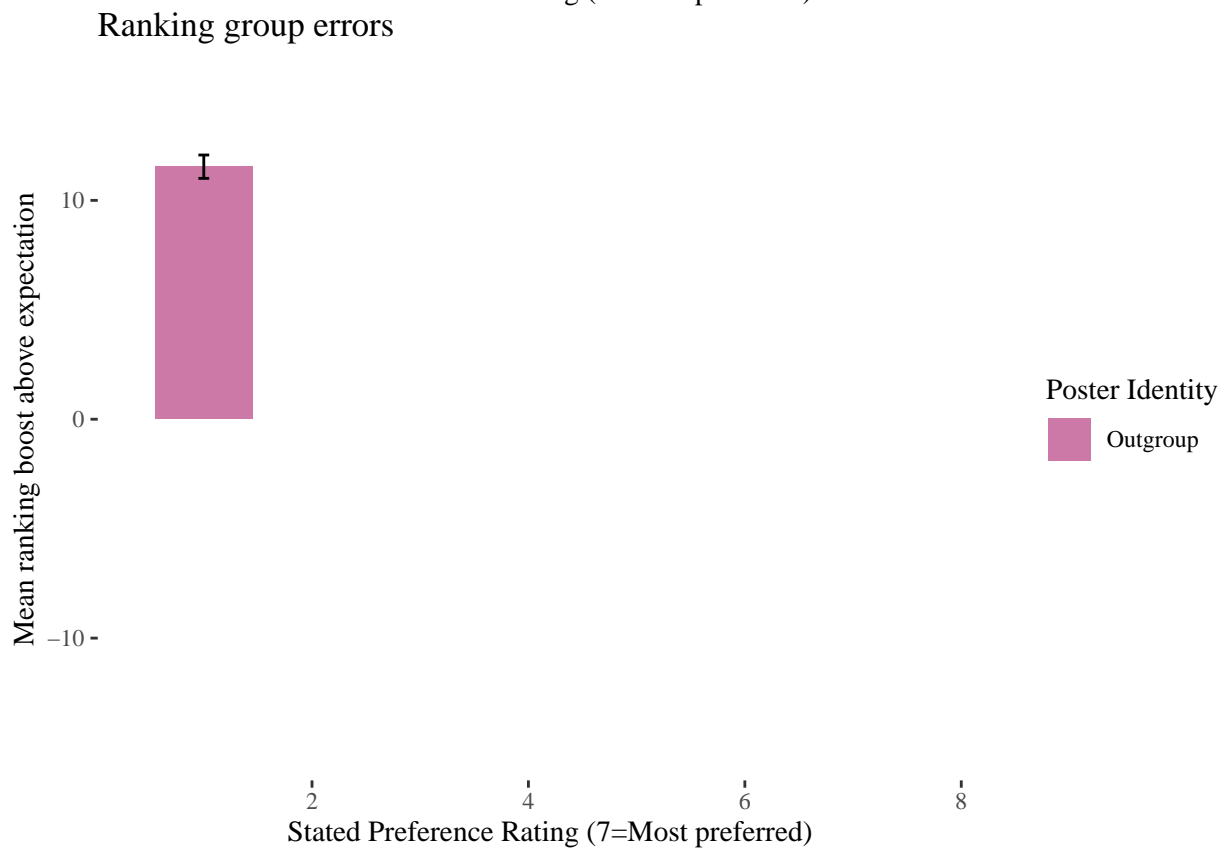
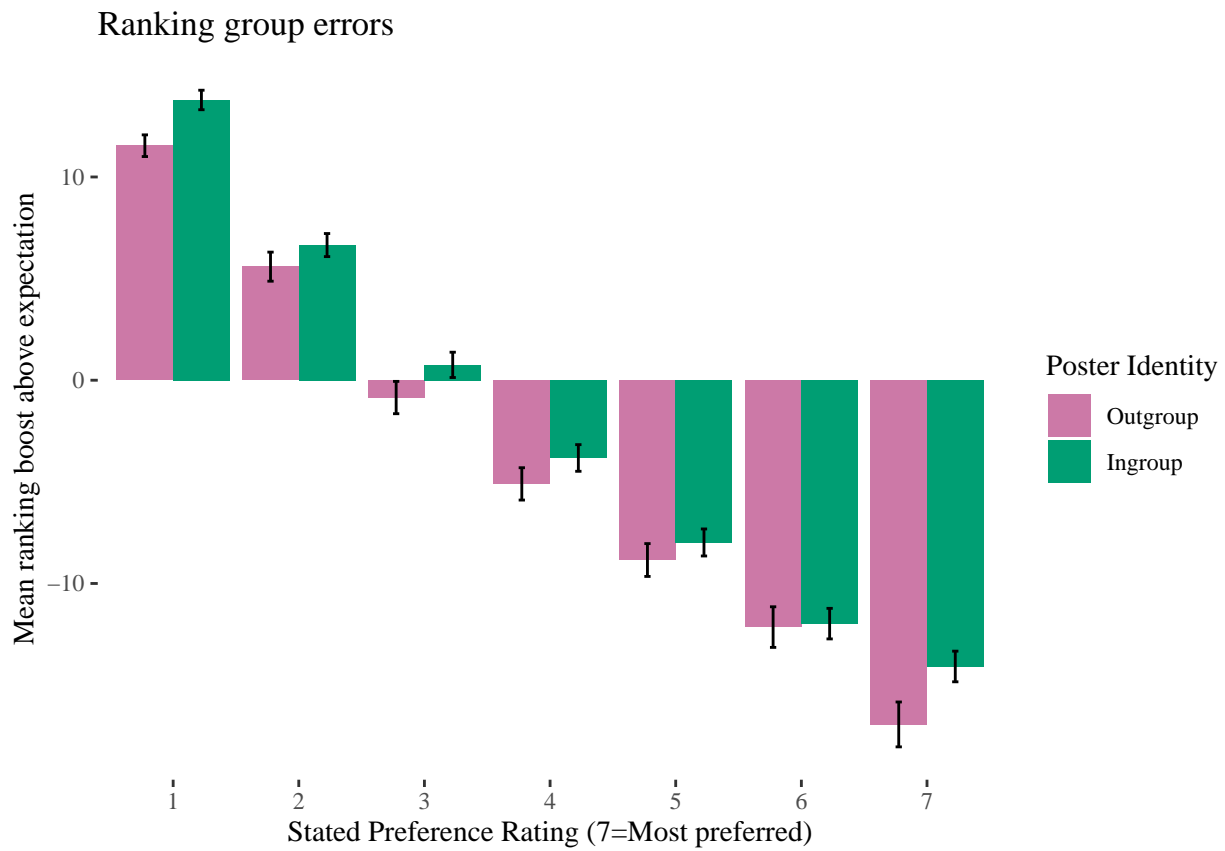
	Pearson	Spearman	Kendall
NF Rank, Preference	-0.095	-0.093	-0.063
PYMK Rank, Familiarity	-0.164	-0.151	-0.102

Correlation matrix for preferences

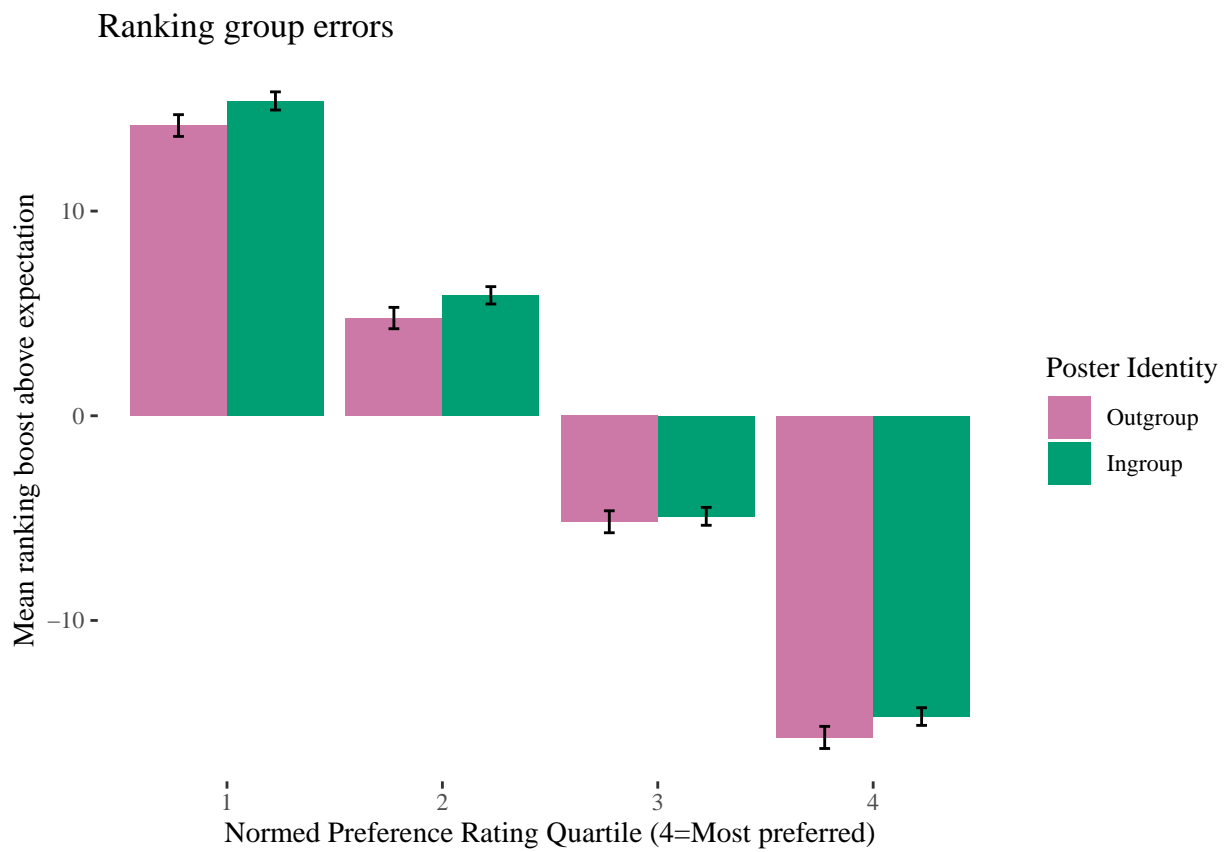


## `stat\_bin()` using `bins = 30`. Pick better value with `binwidth`.

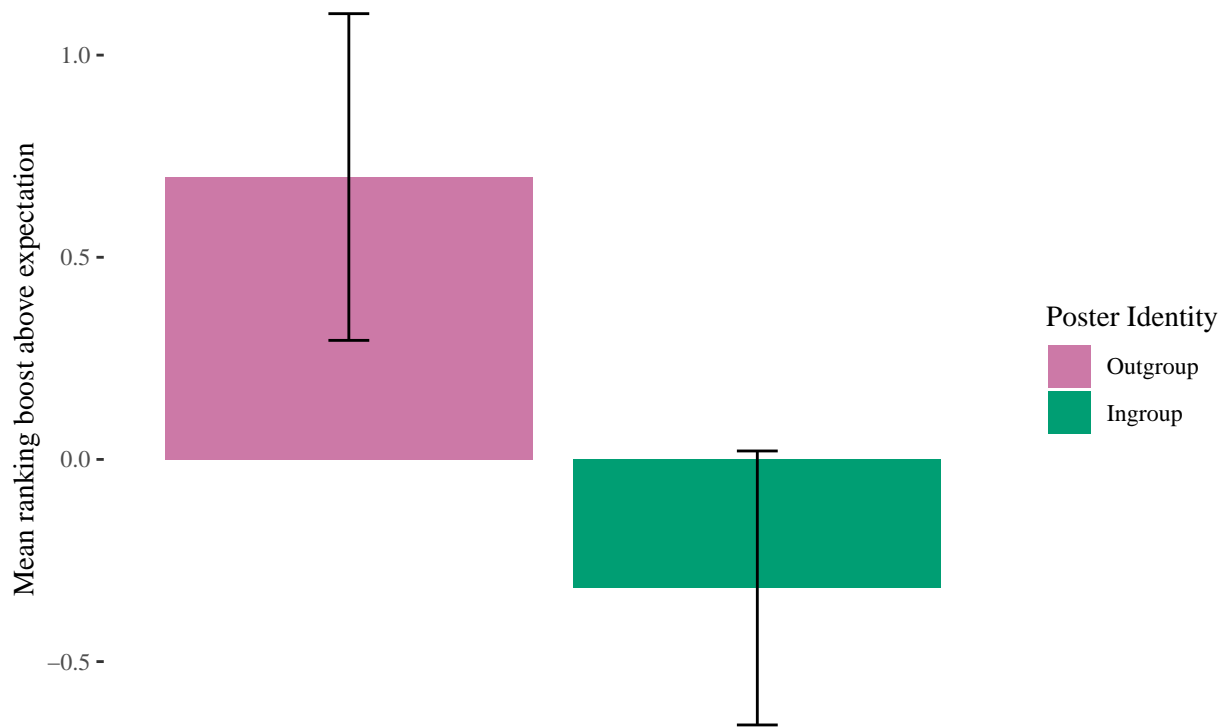
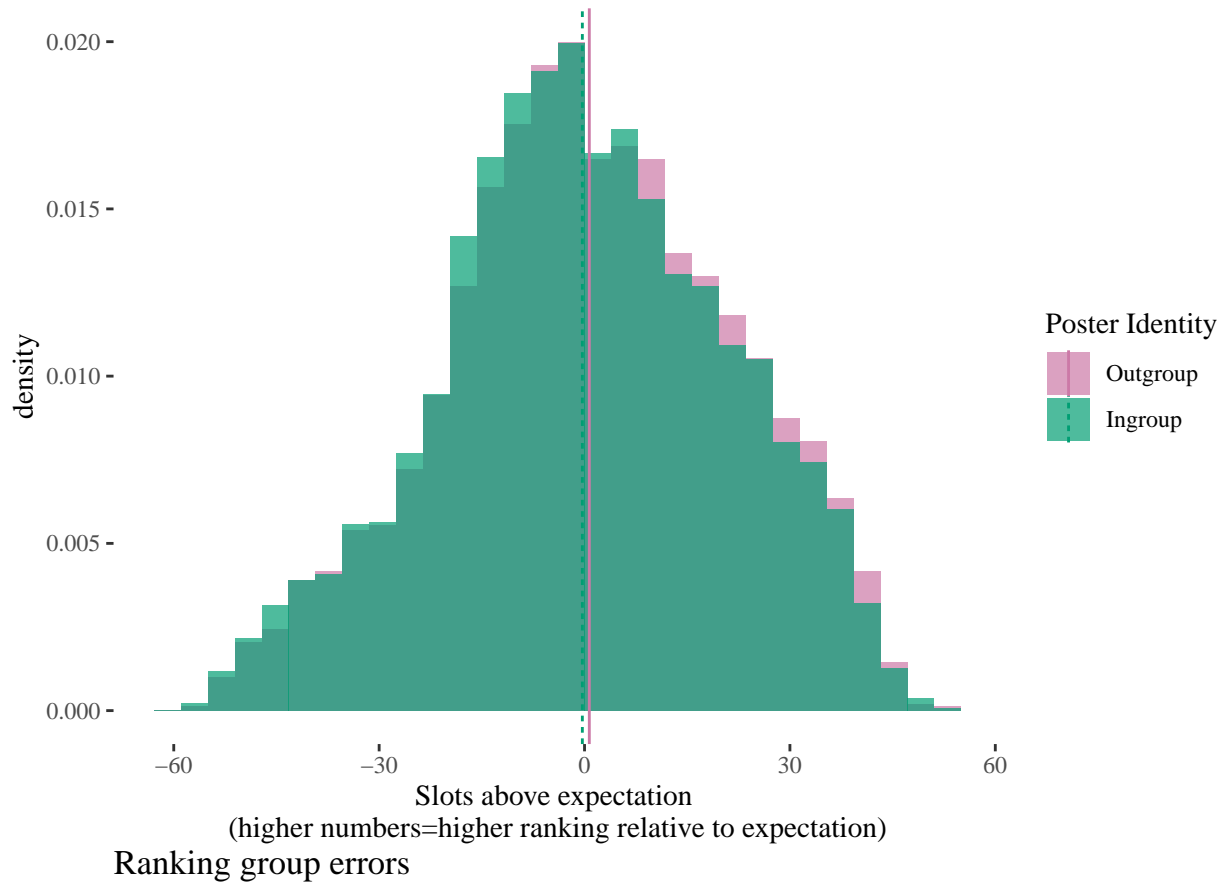


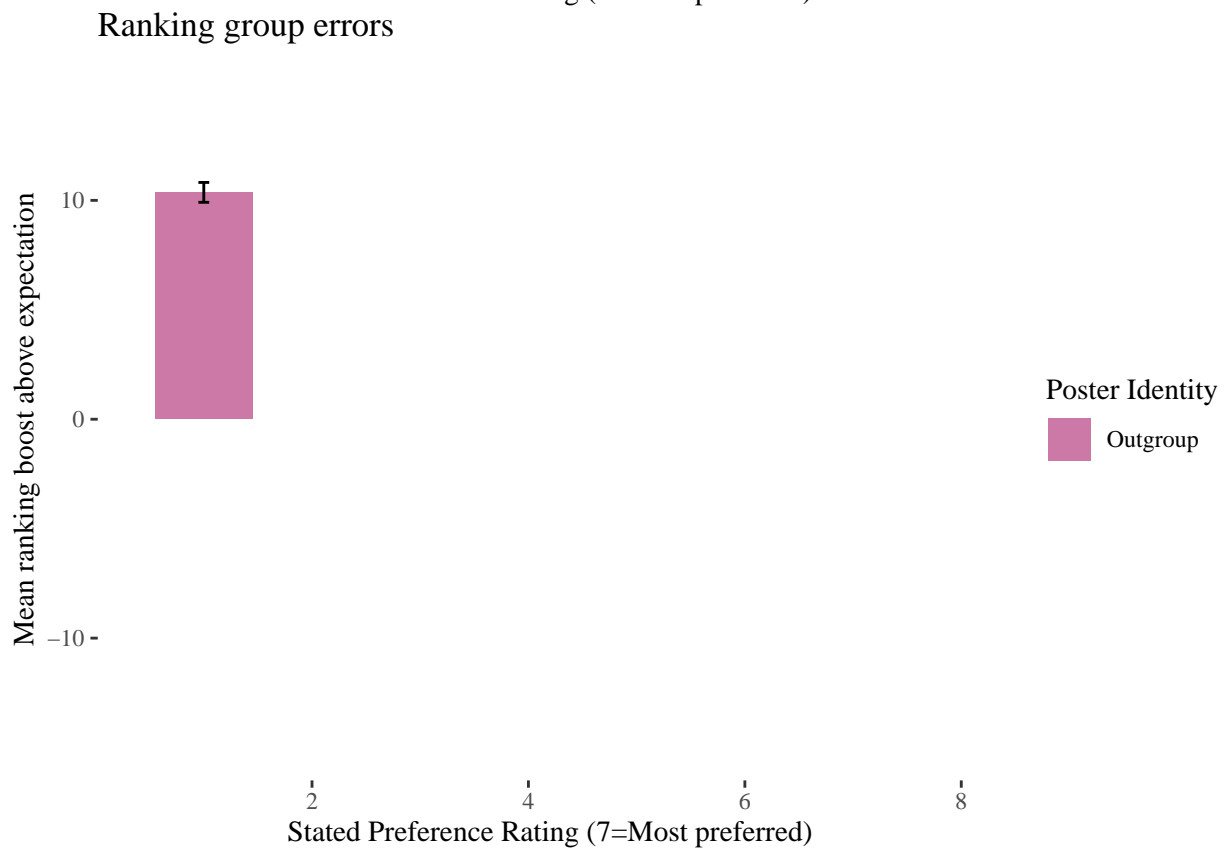
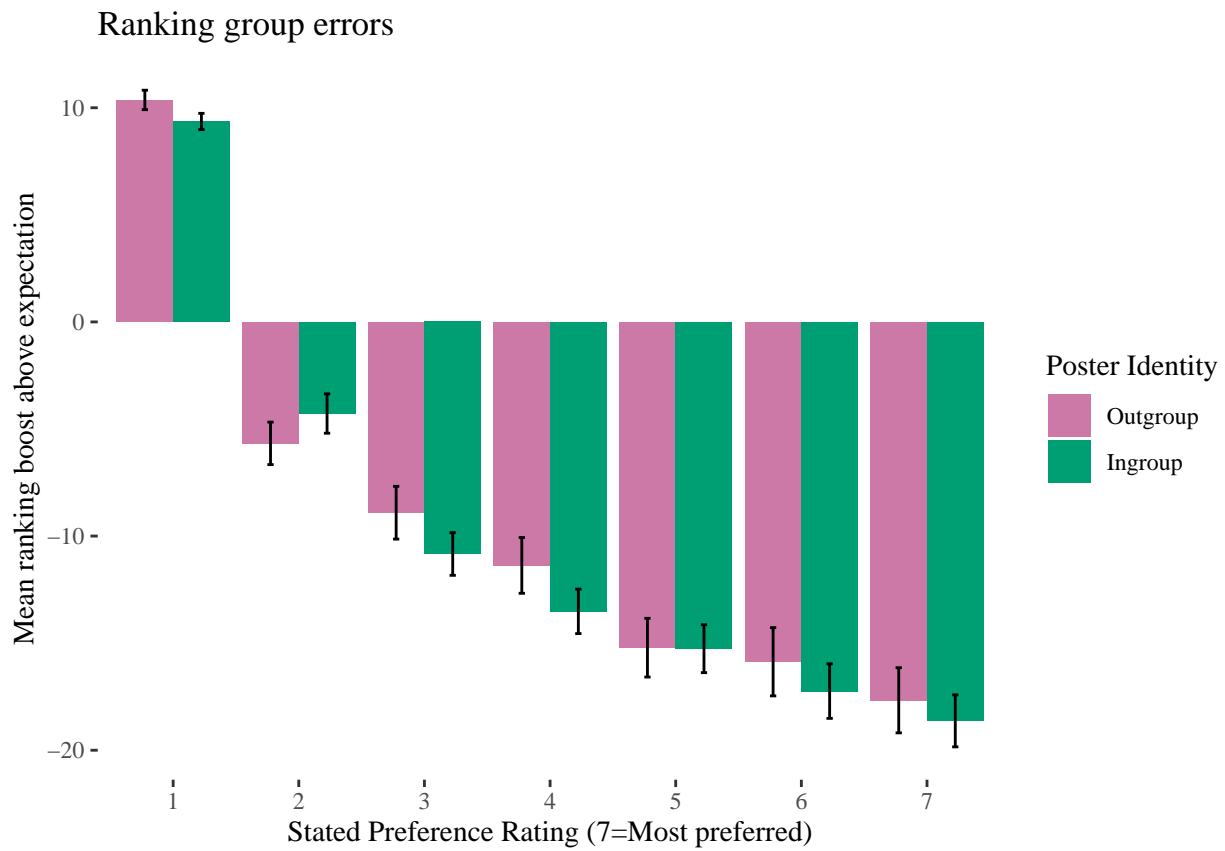






## `stat\_bin()` using `bins = 30`. Pick better value with `binwidth`.

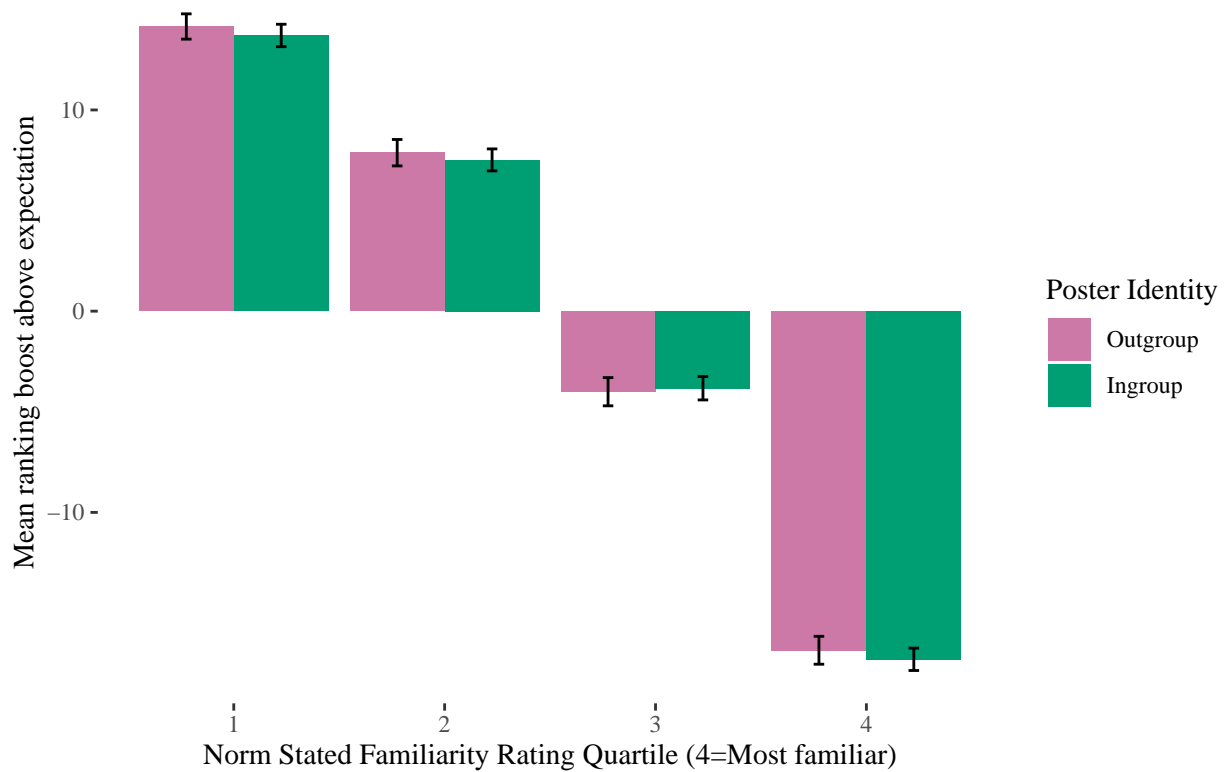




Ranking group errors



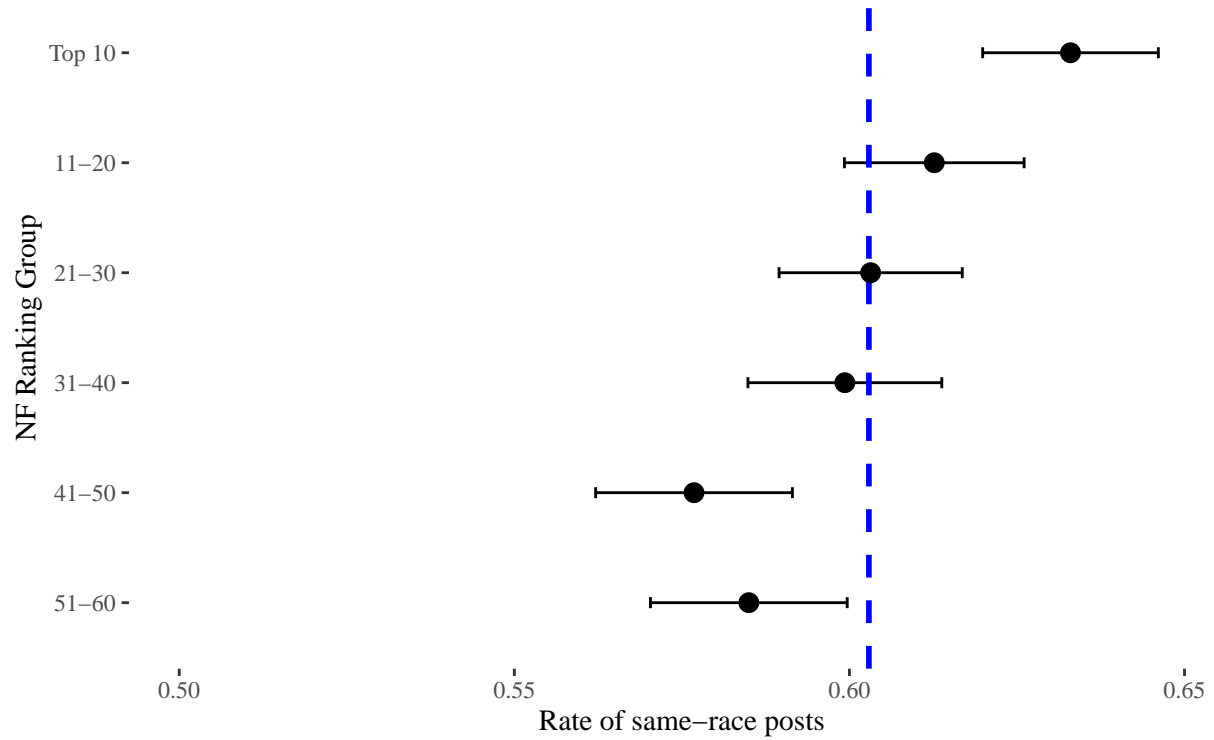
Ranking group errors



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

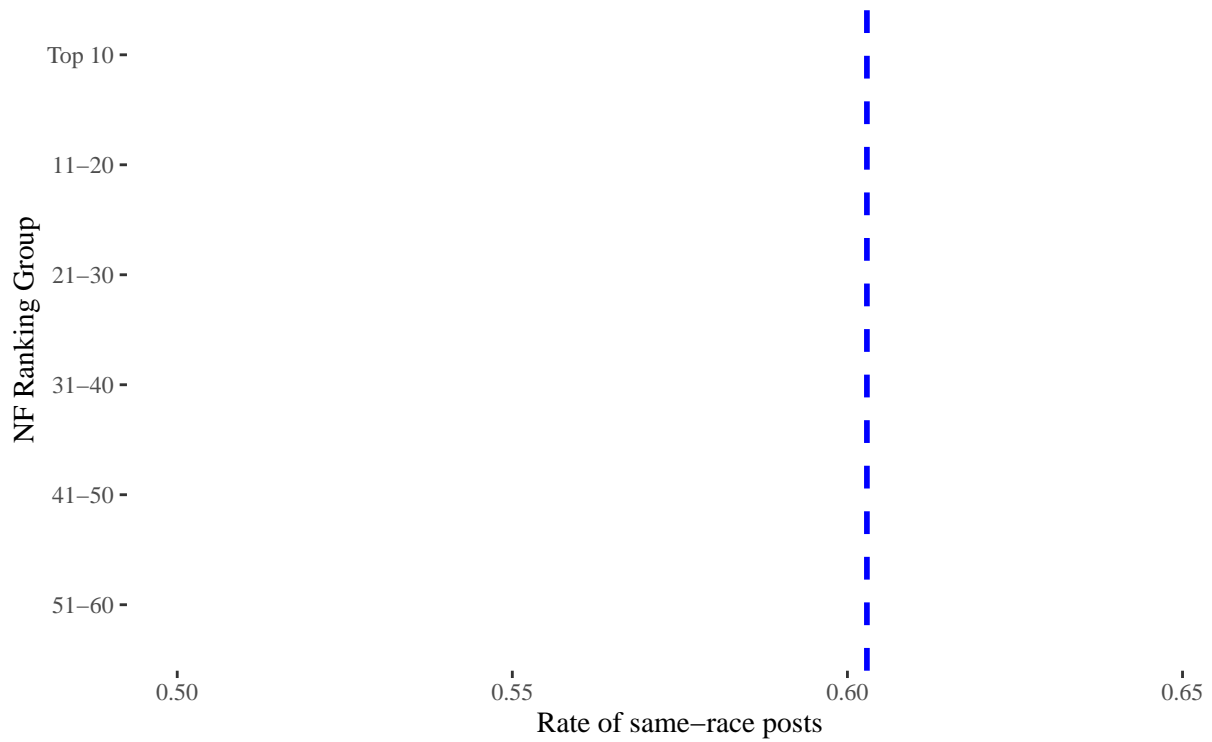
### Newsfeed preference for user's race (US)

Same-race posts get sorted closer to the top



## Newsfeed preference for user's race (US)

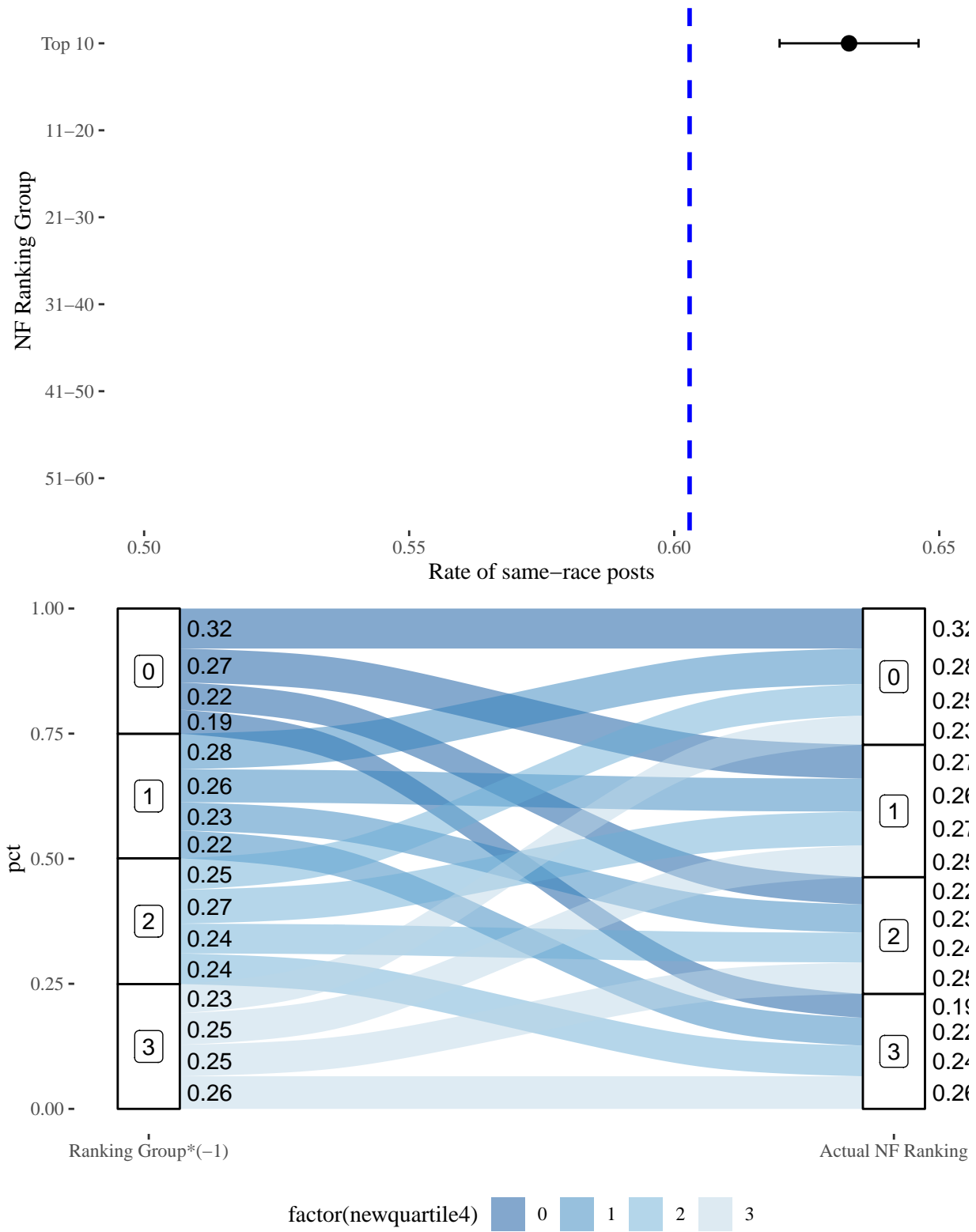
Same-race posts get sorted closer to the top

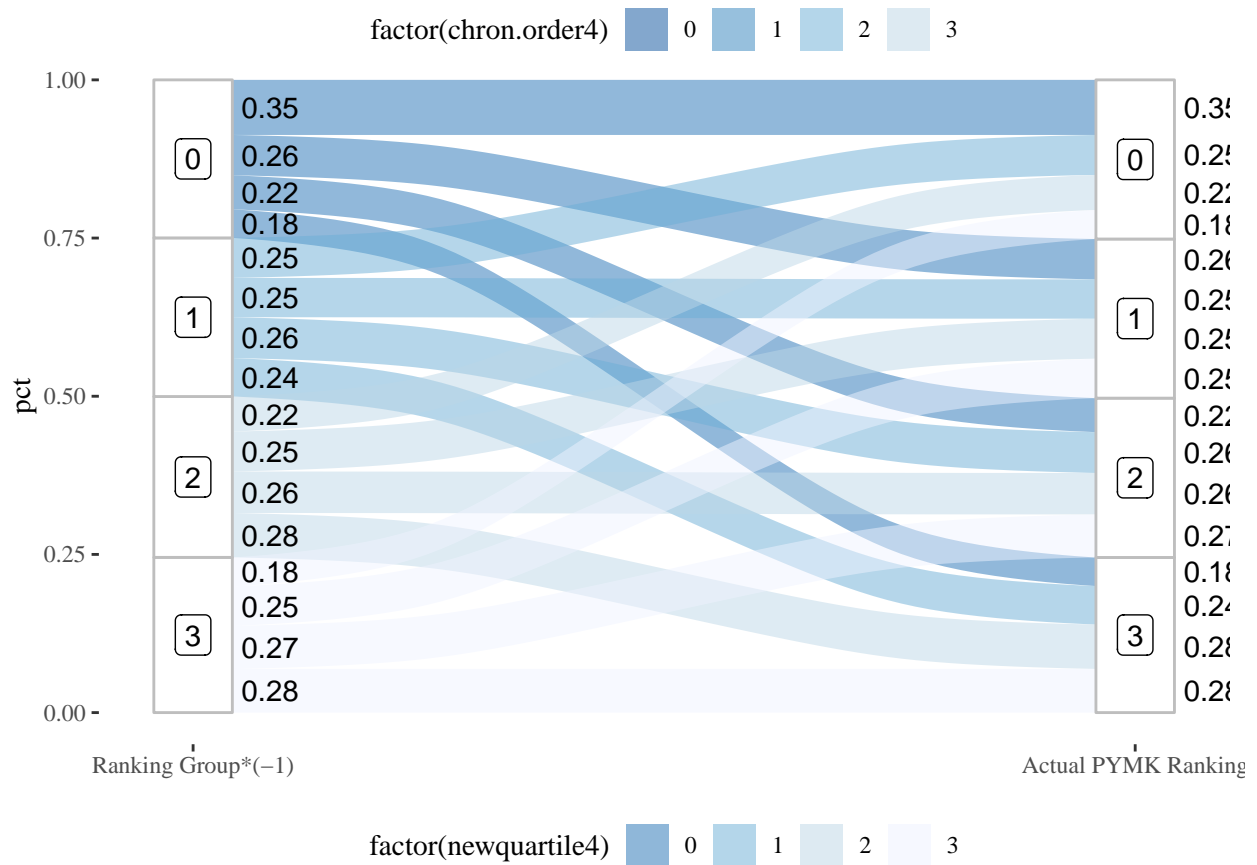
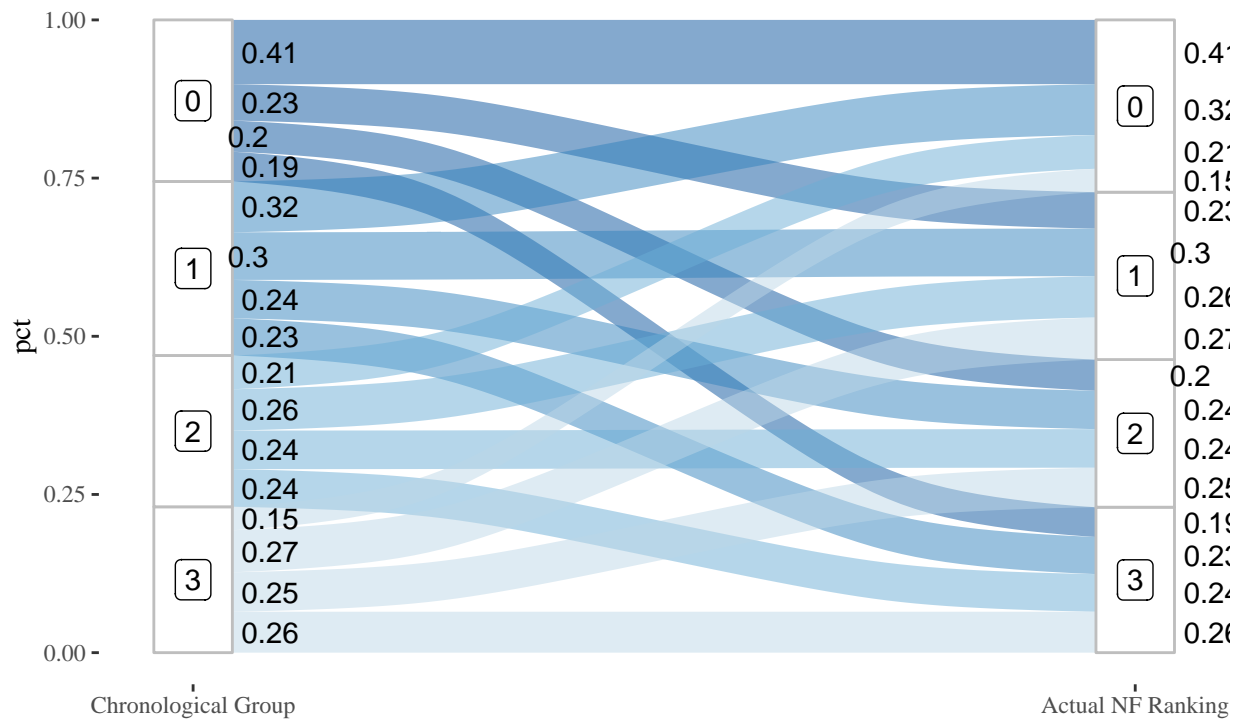


```
## geom_path: Each group consists of only one observation. Do you need to adjust  
## the group aesthetic?
```

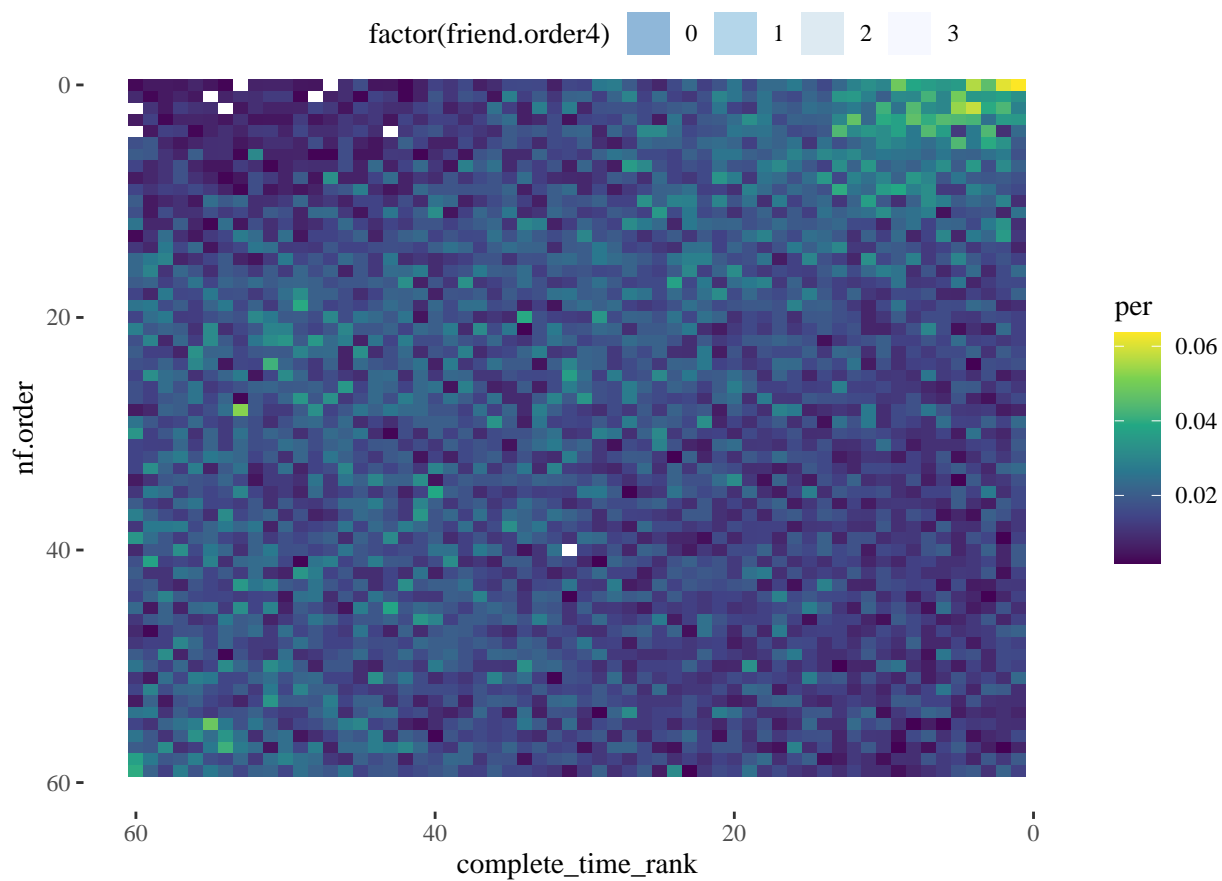
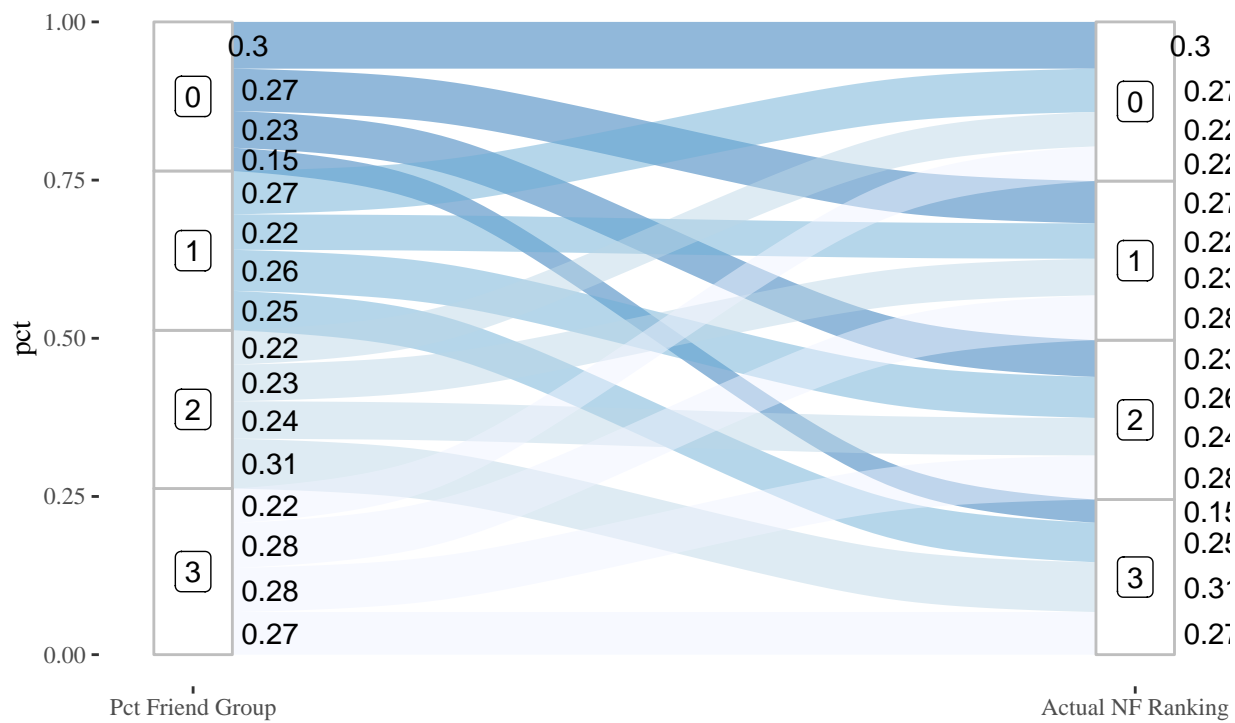
# Newsfeed preference for user's race (US)

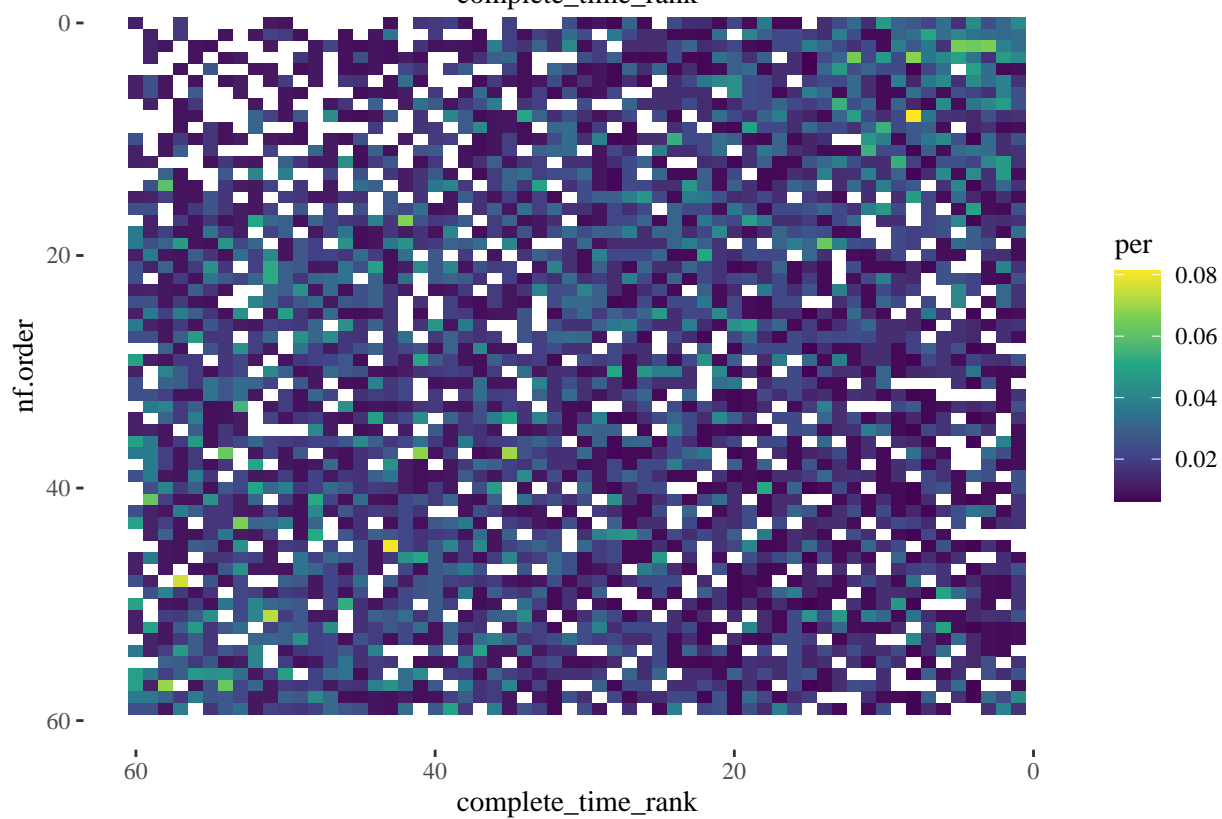
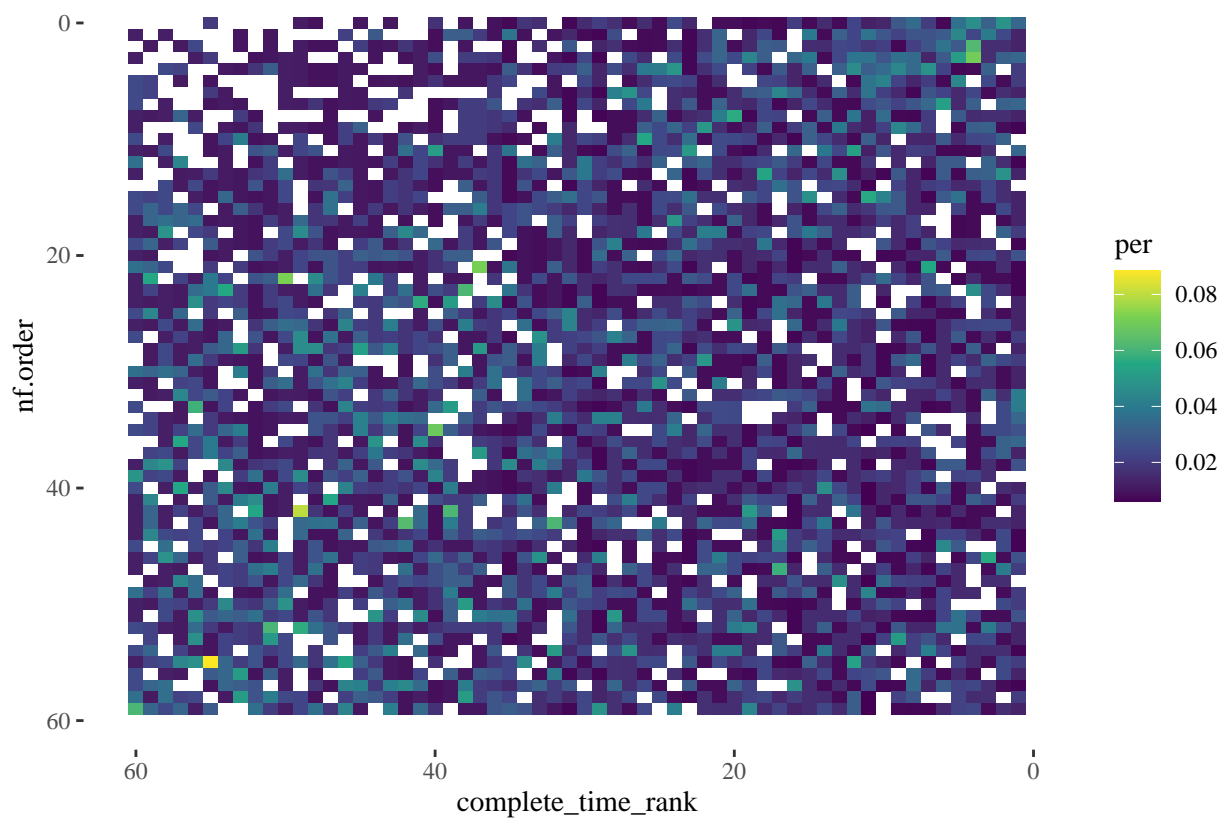
Same-race posts get sorted closer to the top

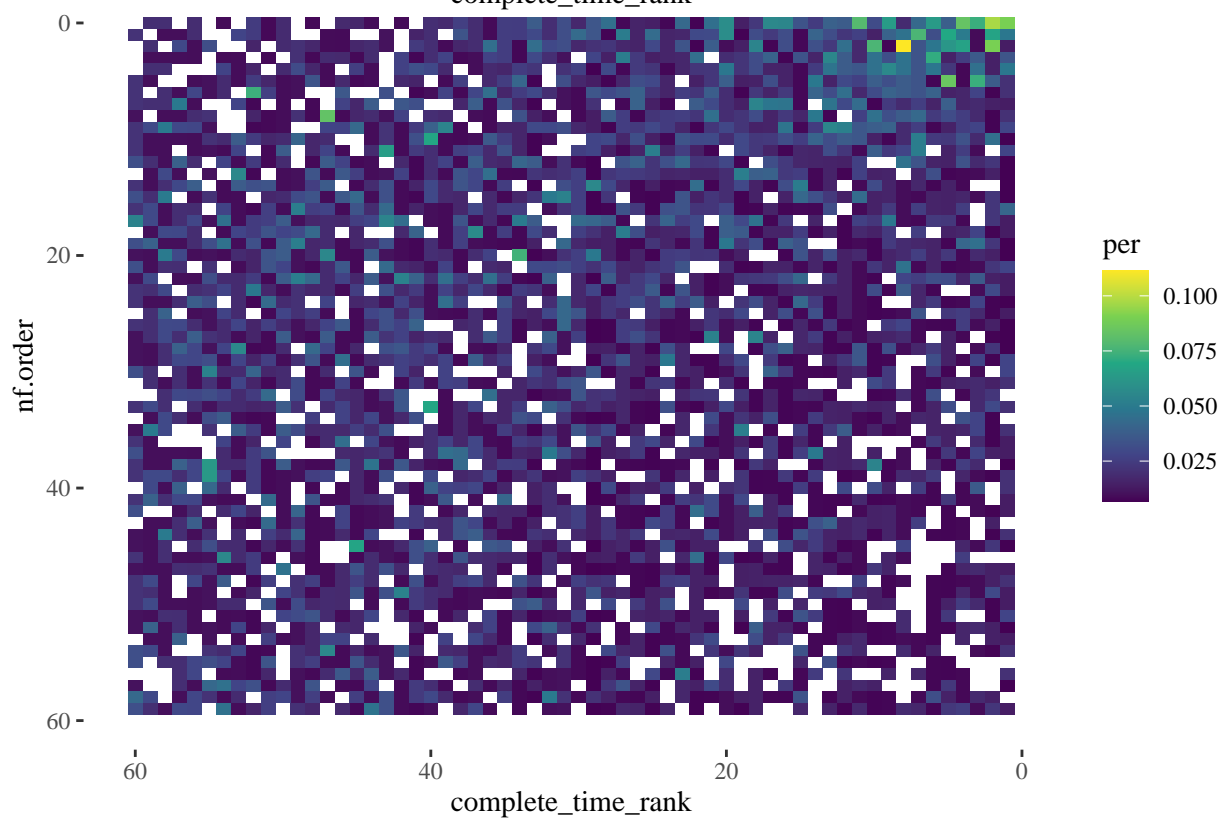
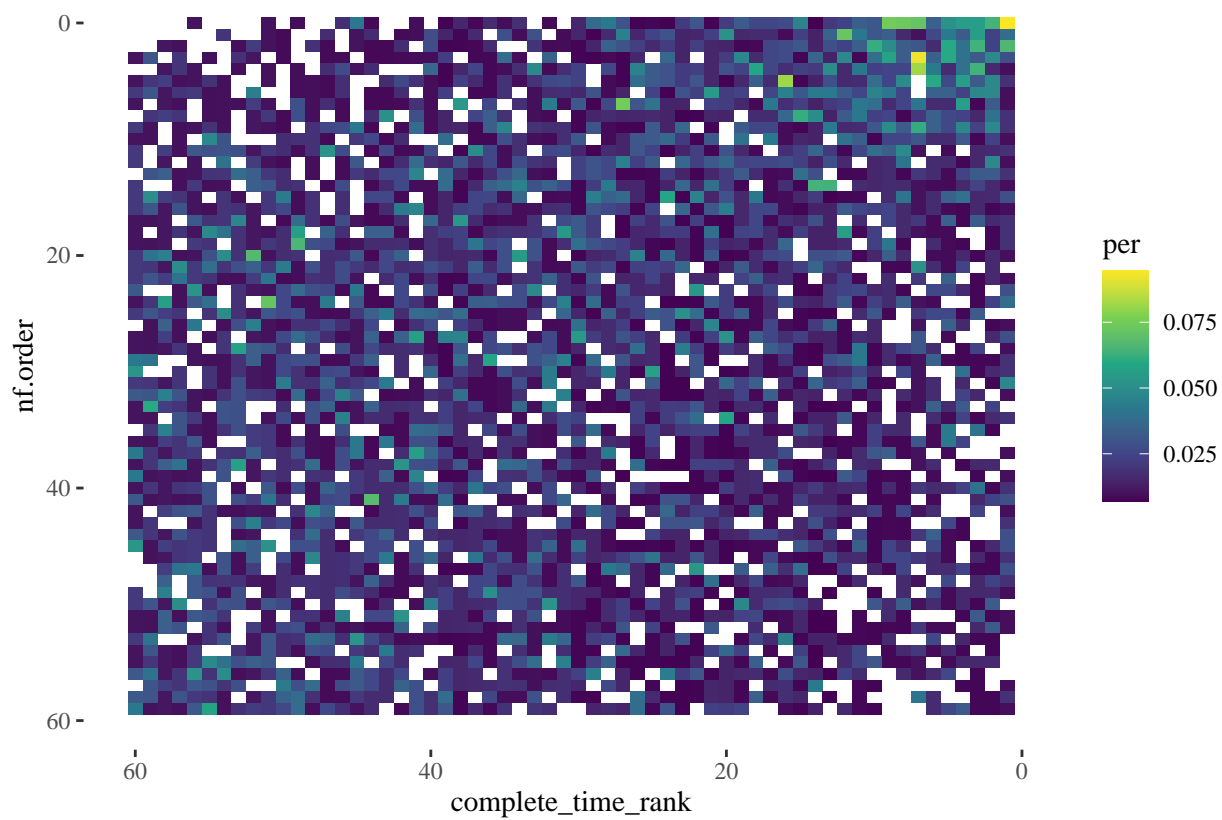


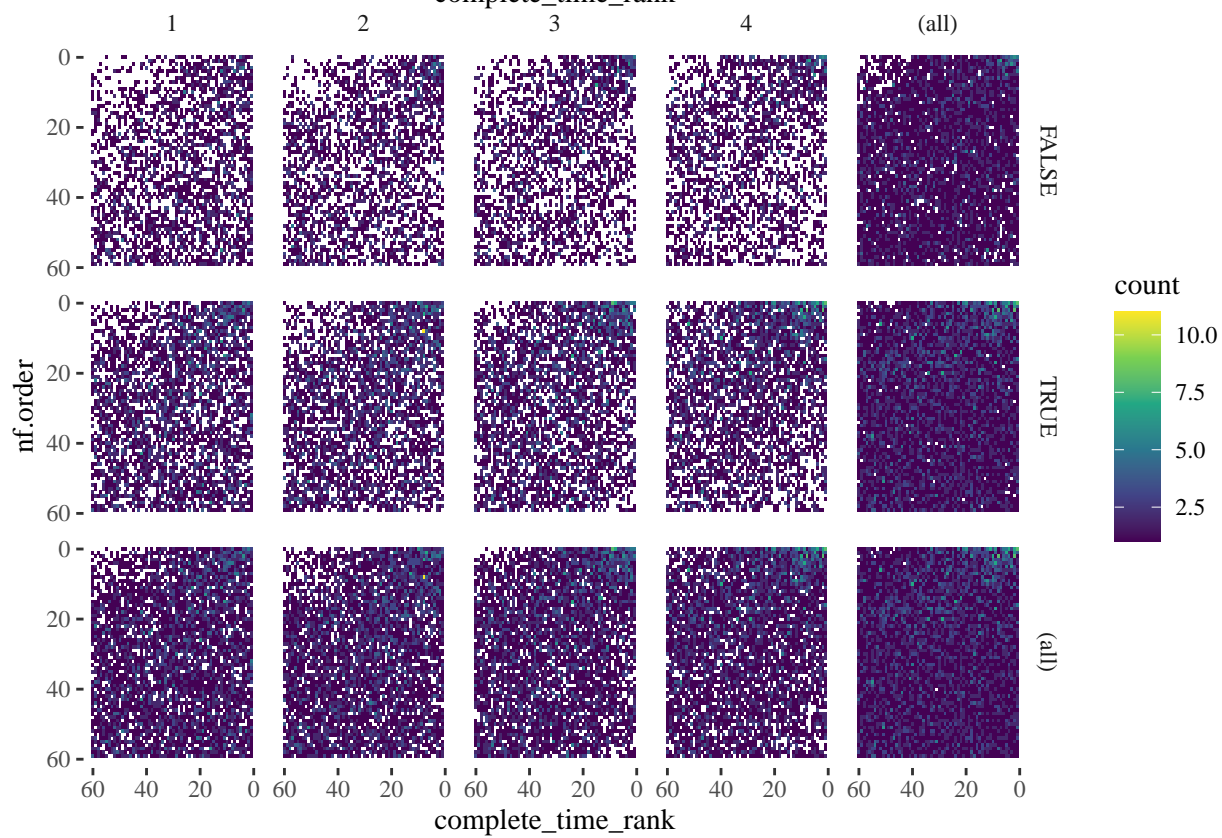
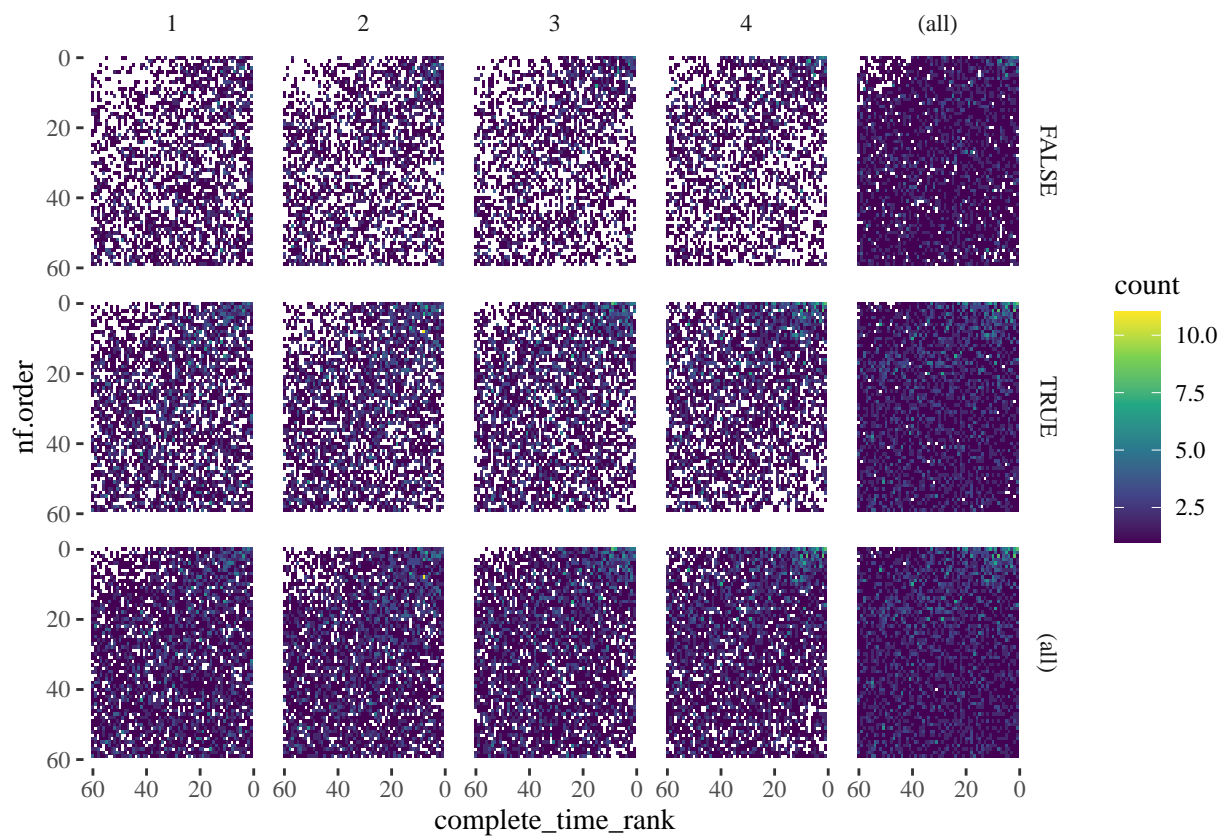


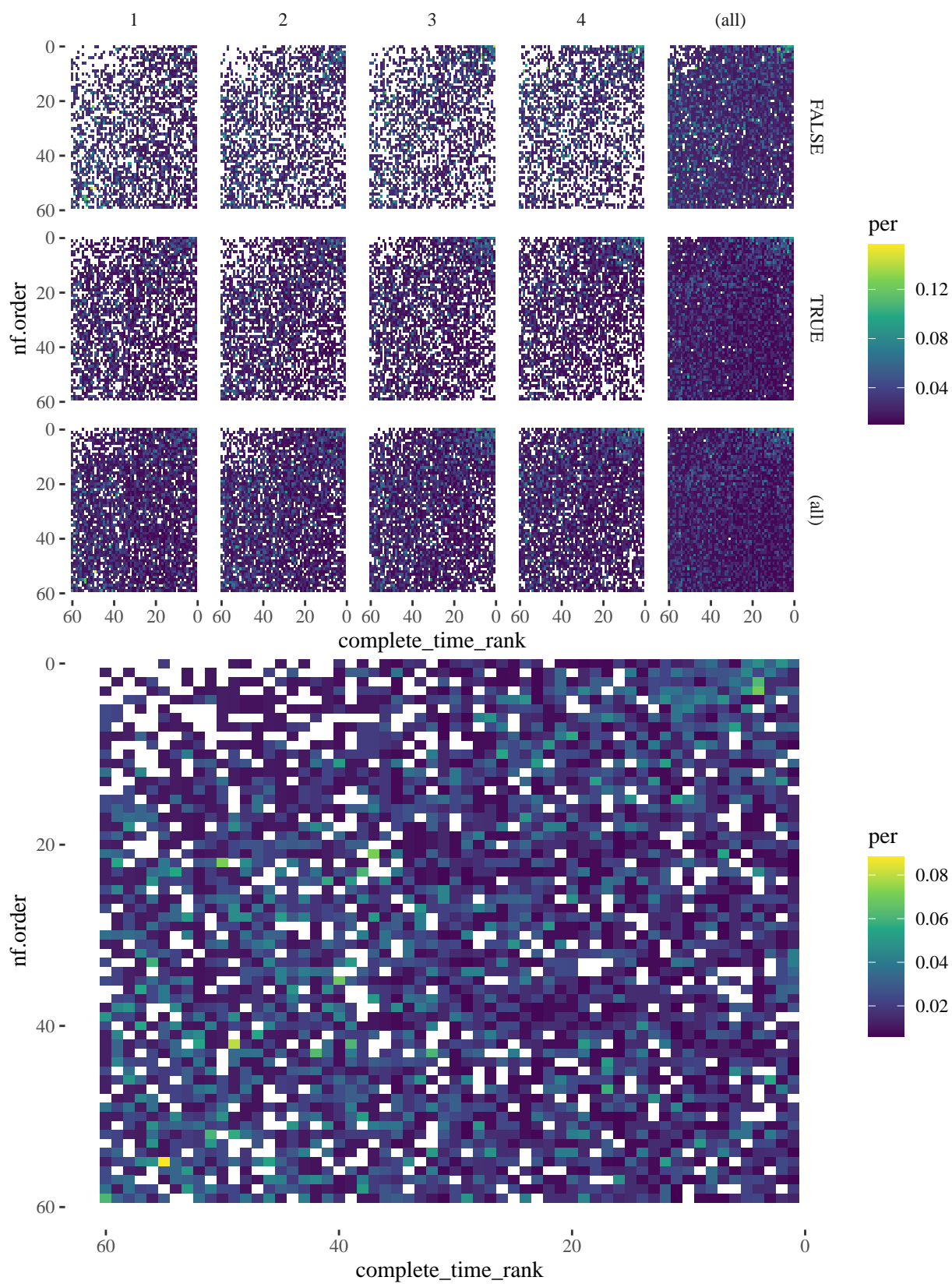


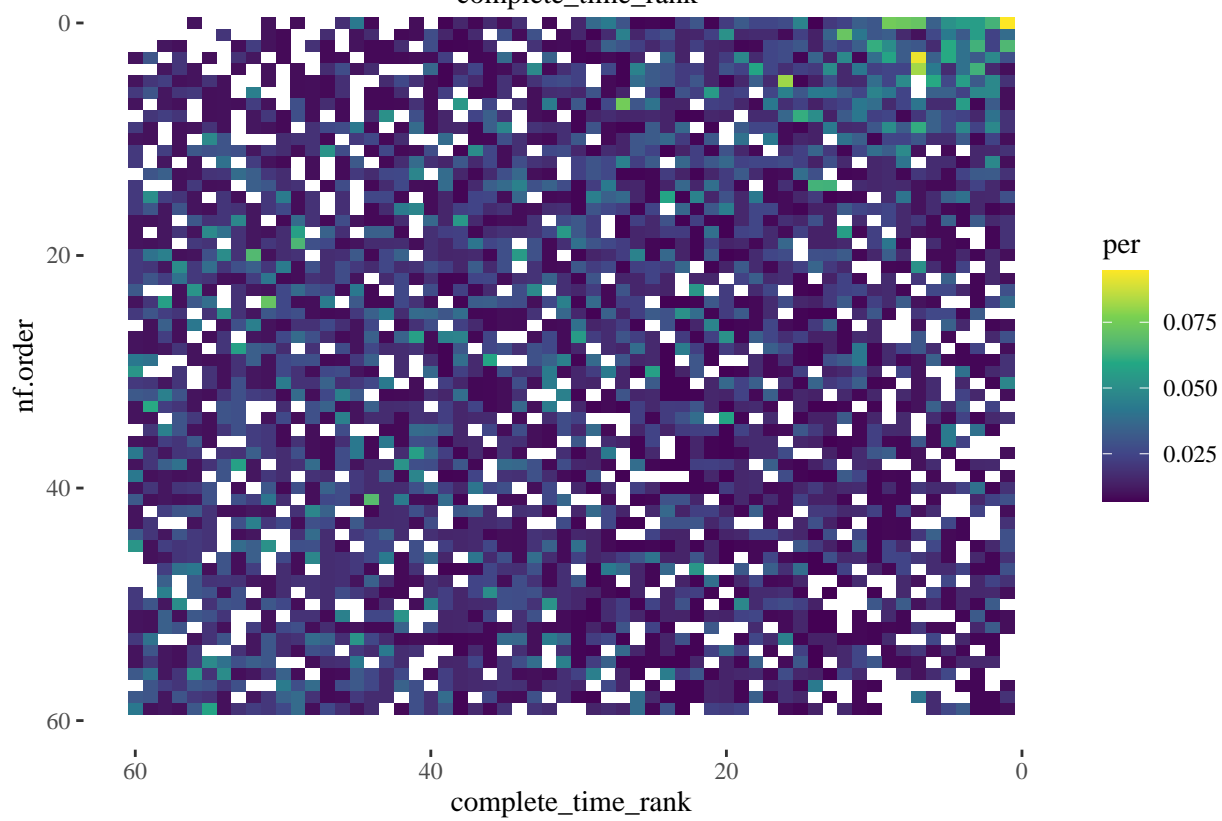
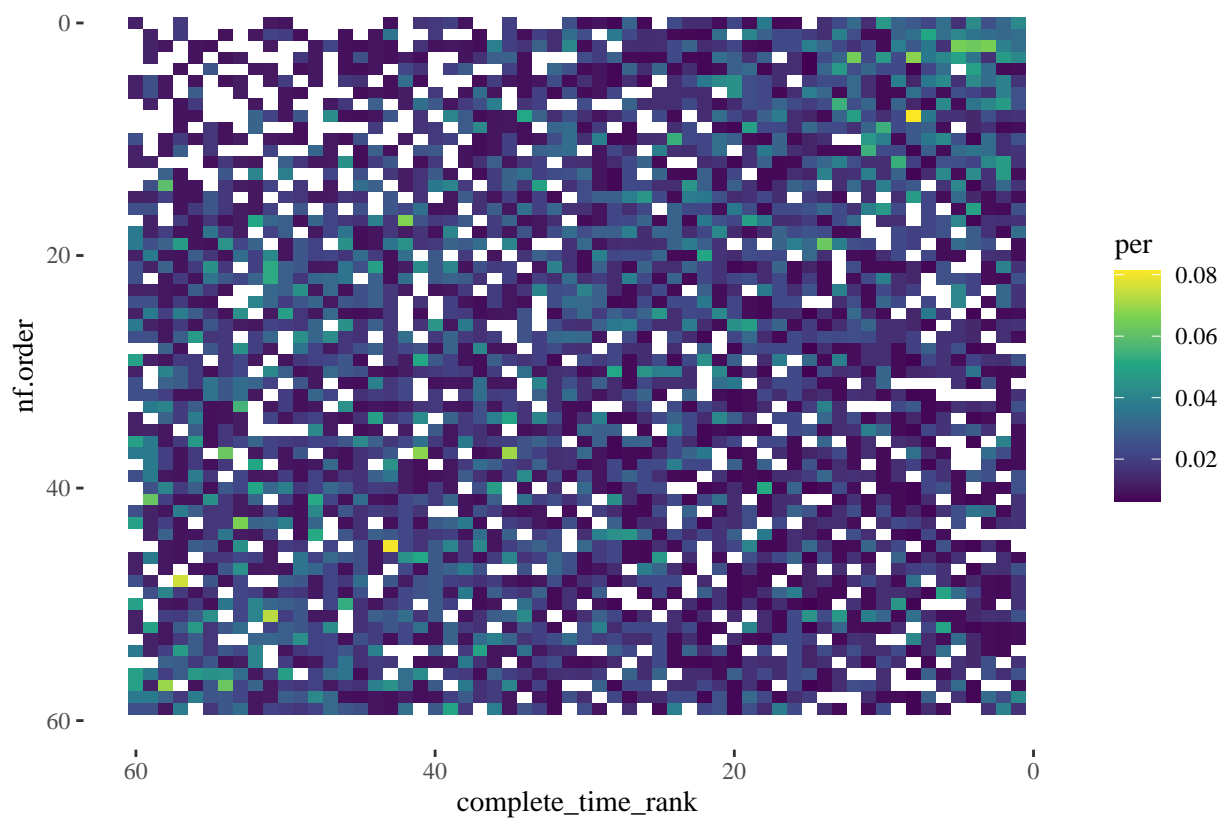


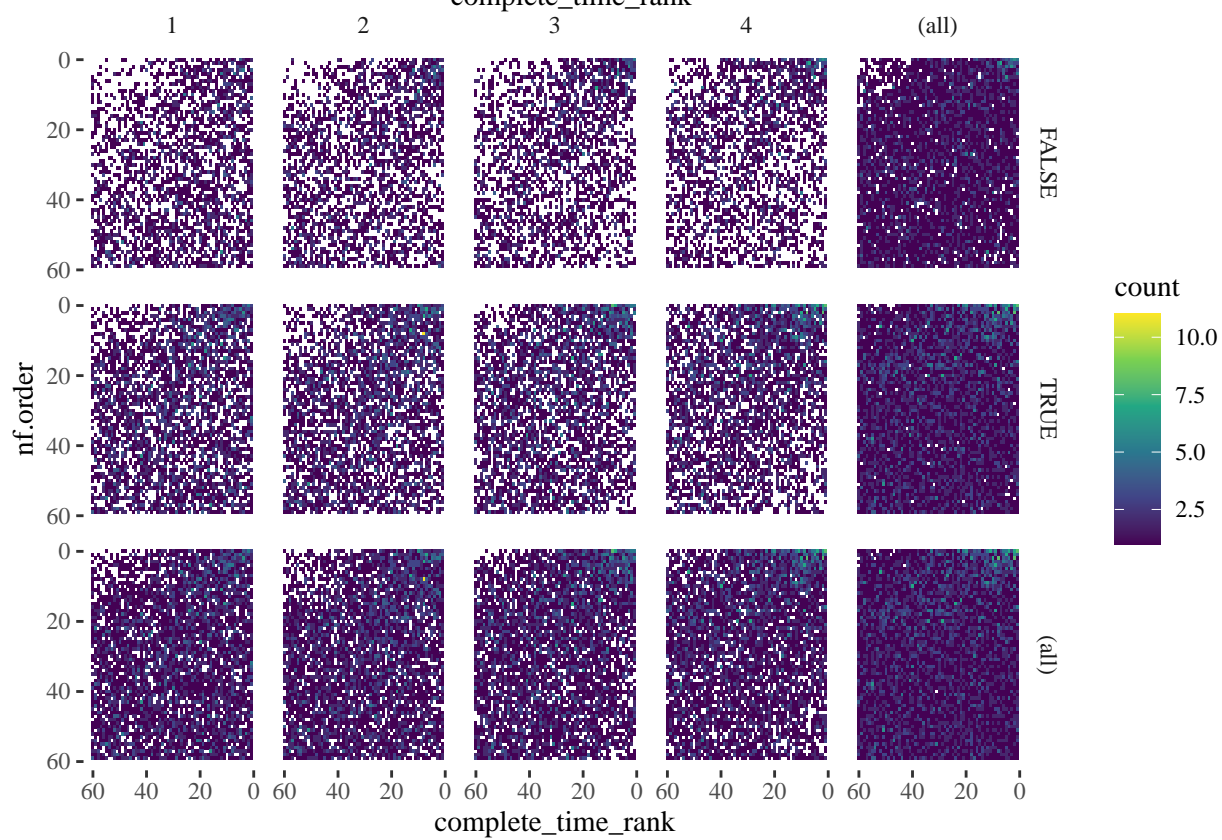
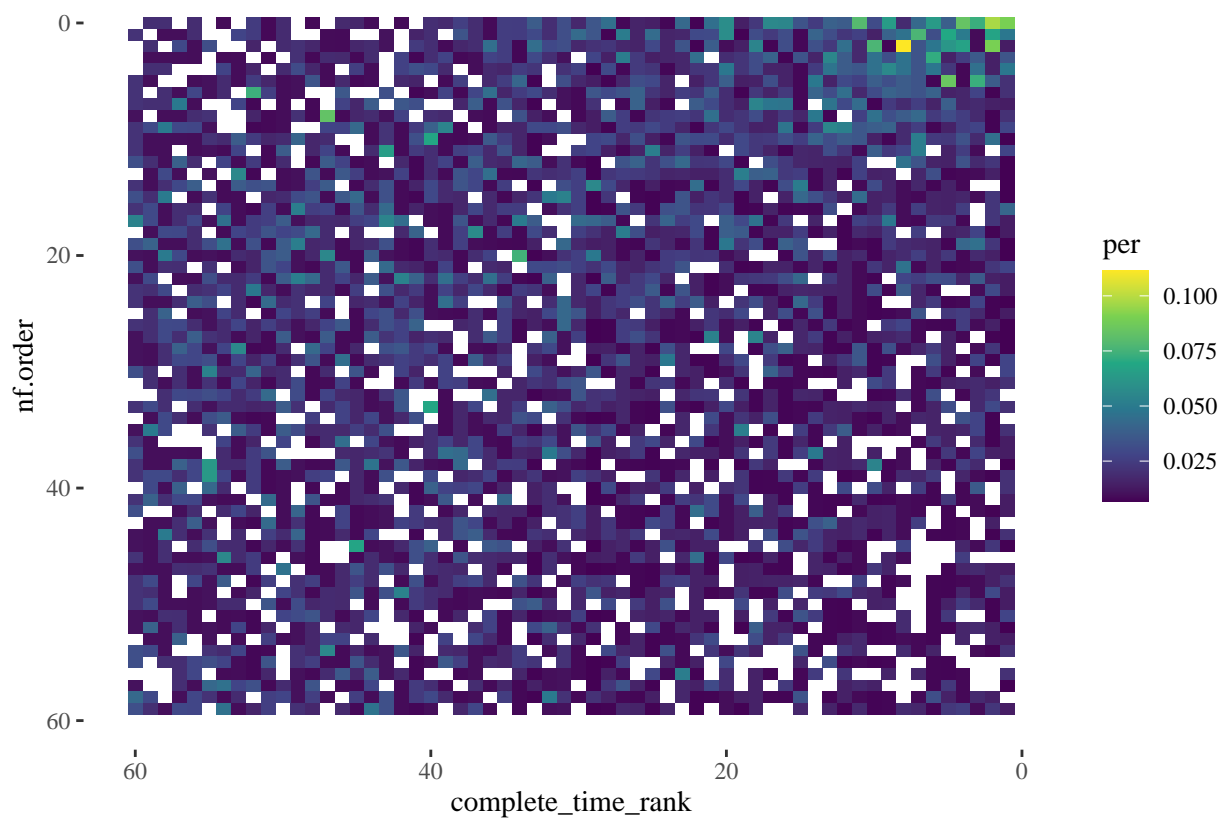


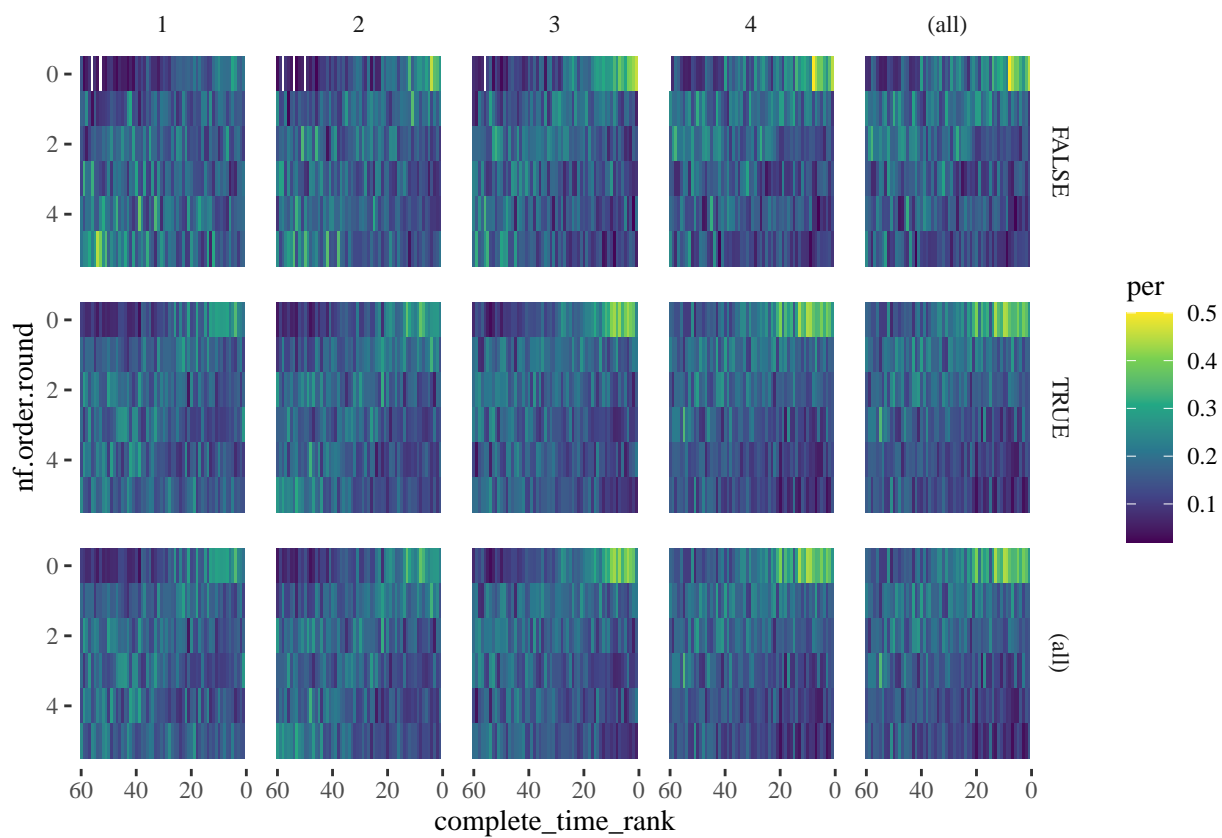
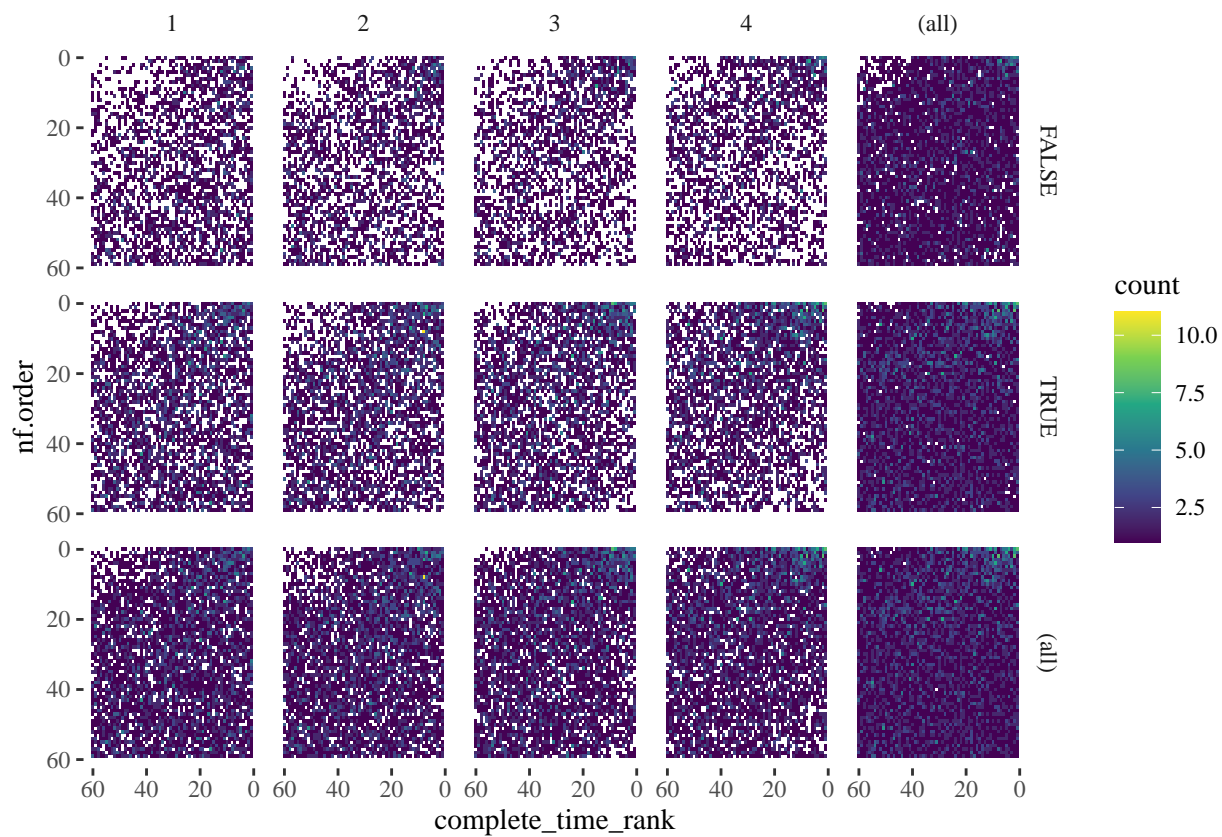




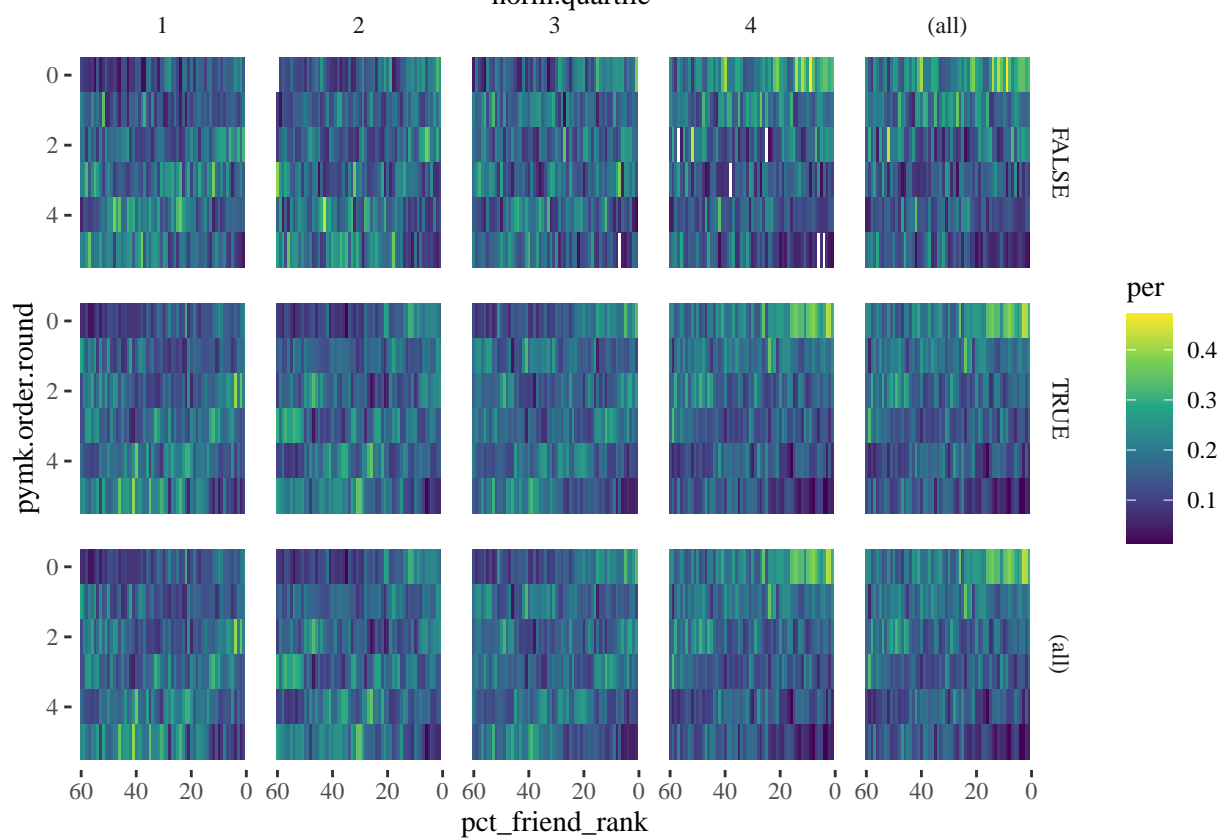
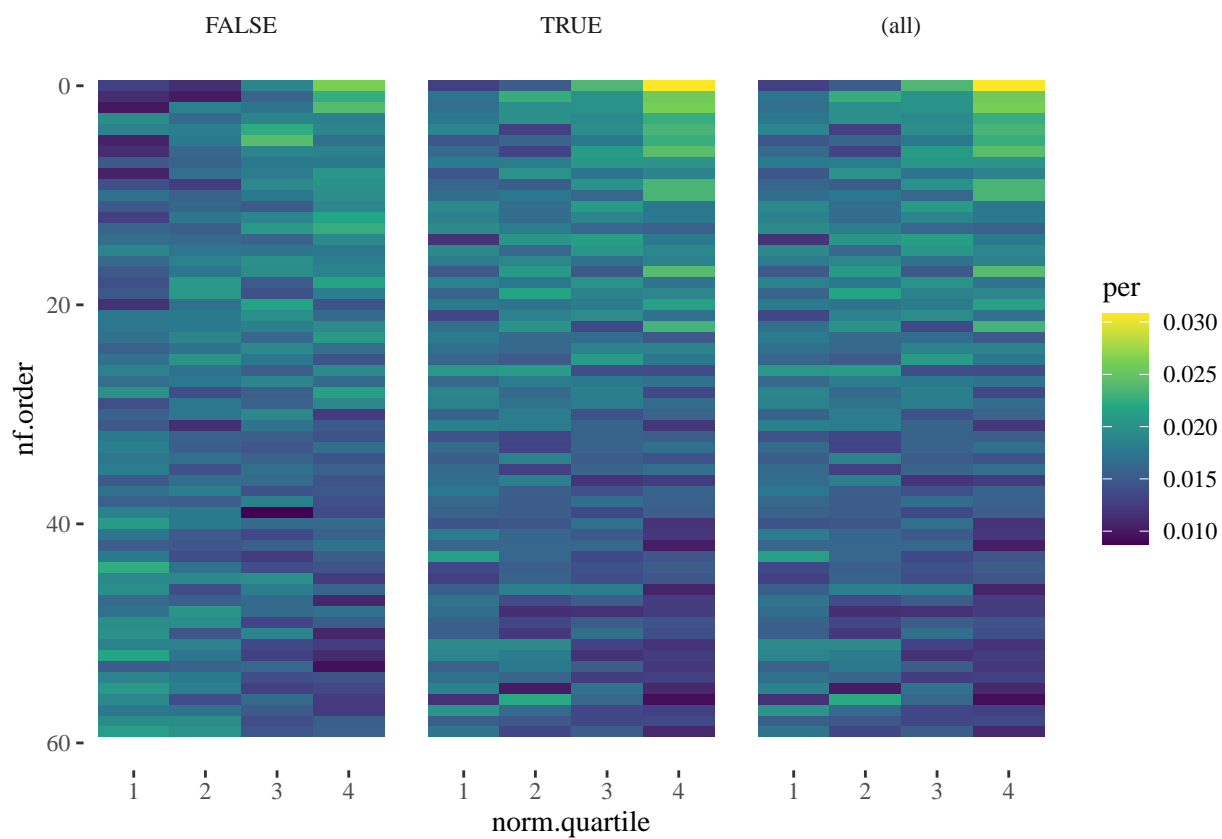


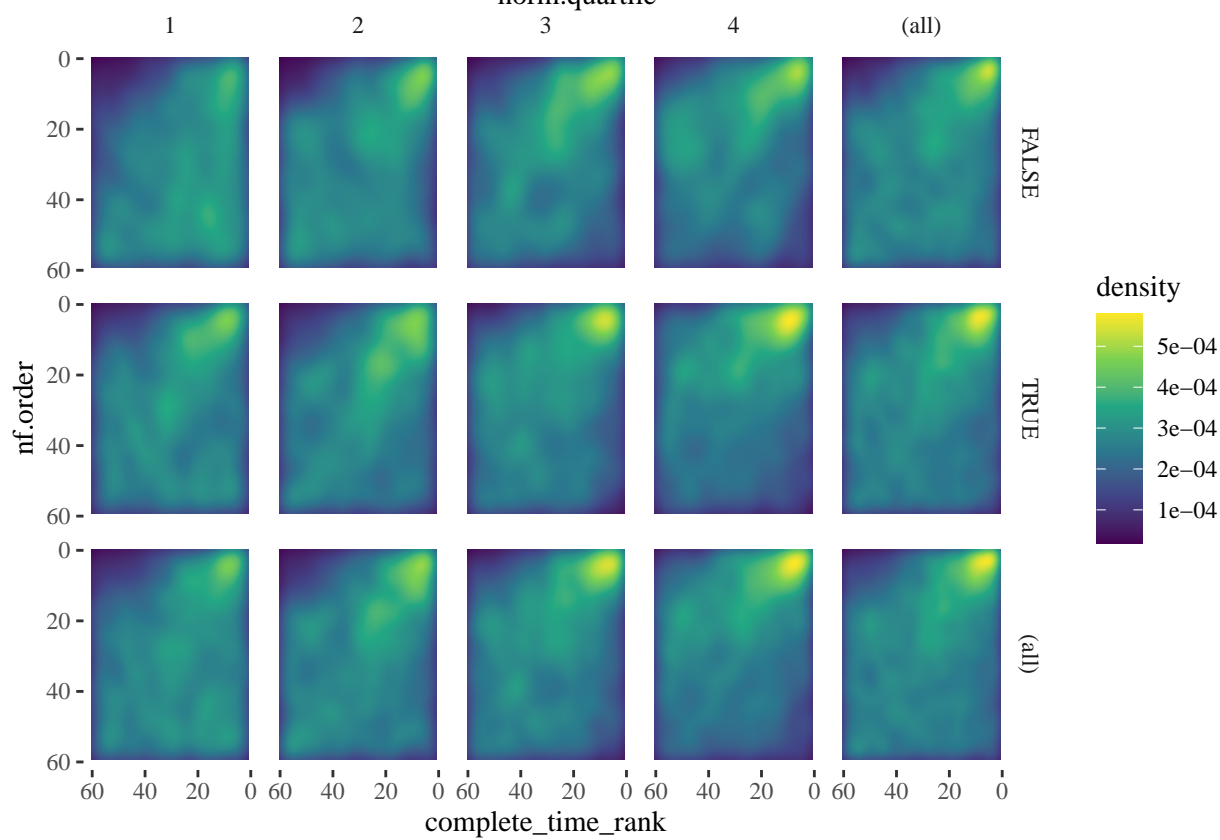
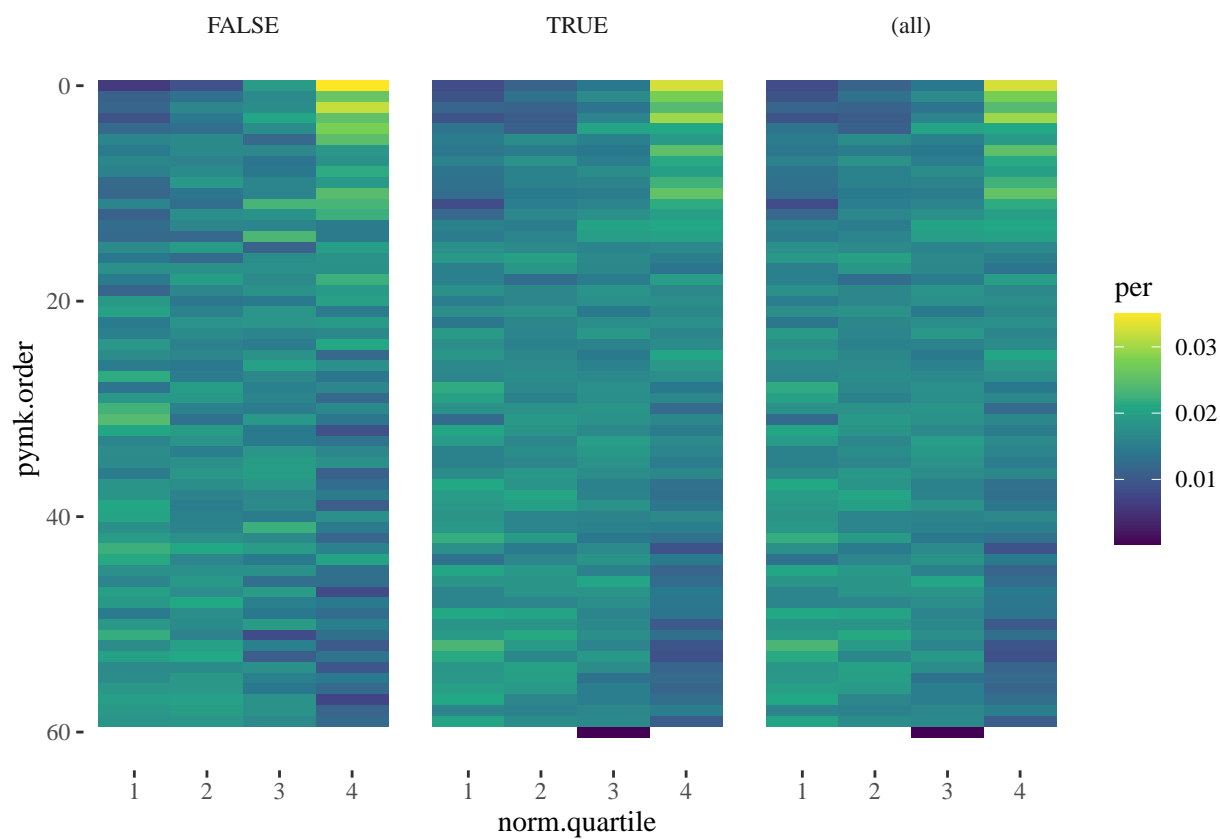


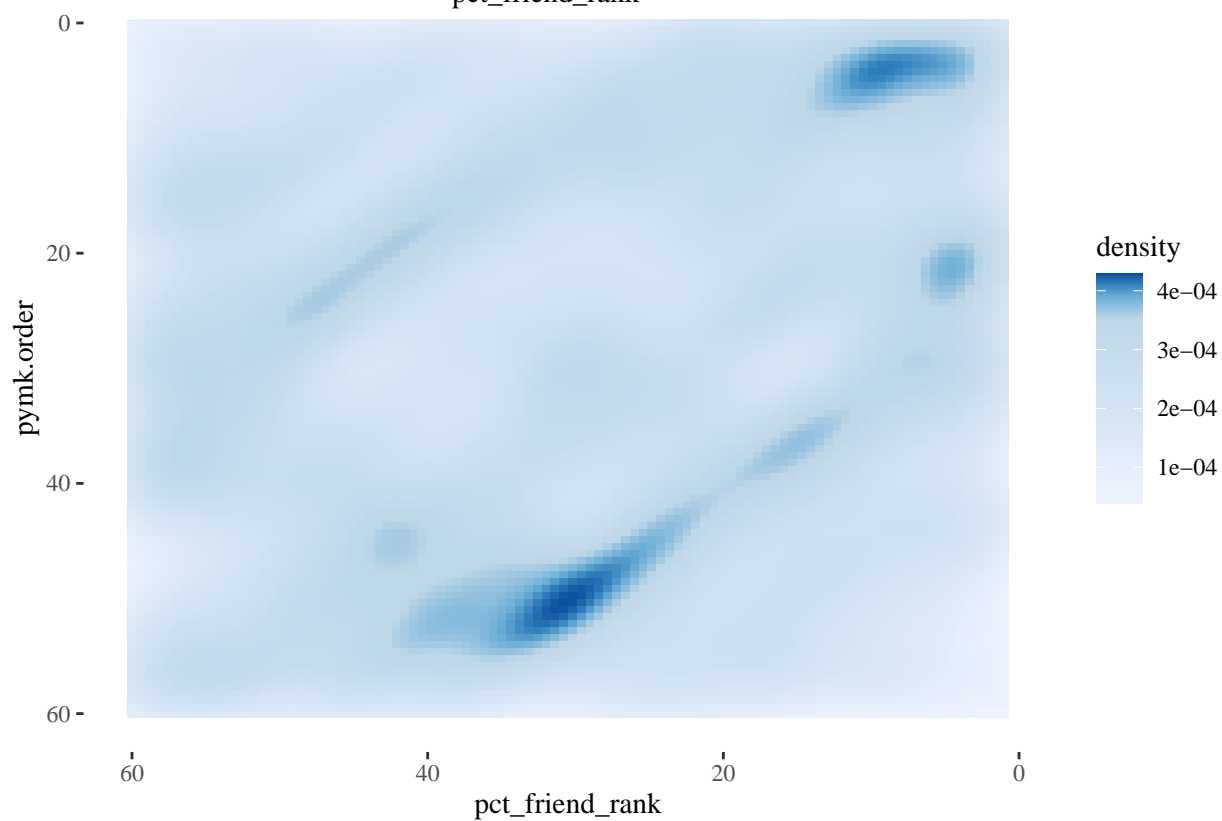
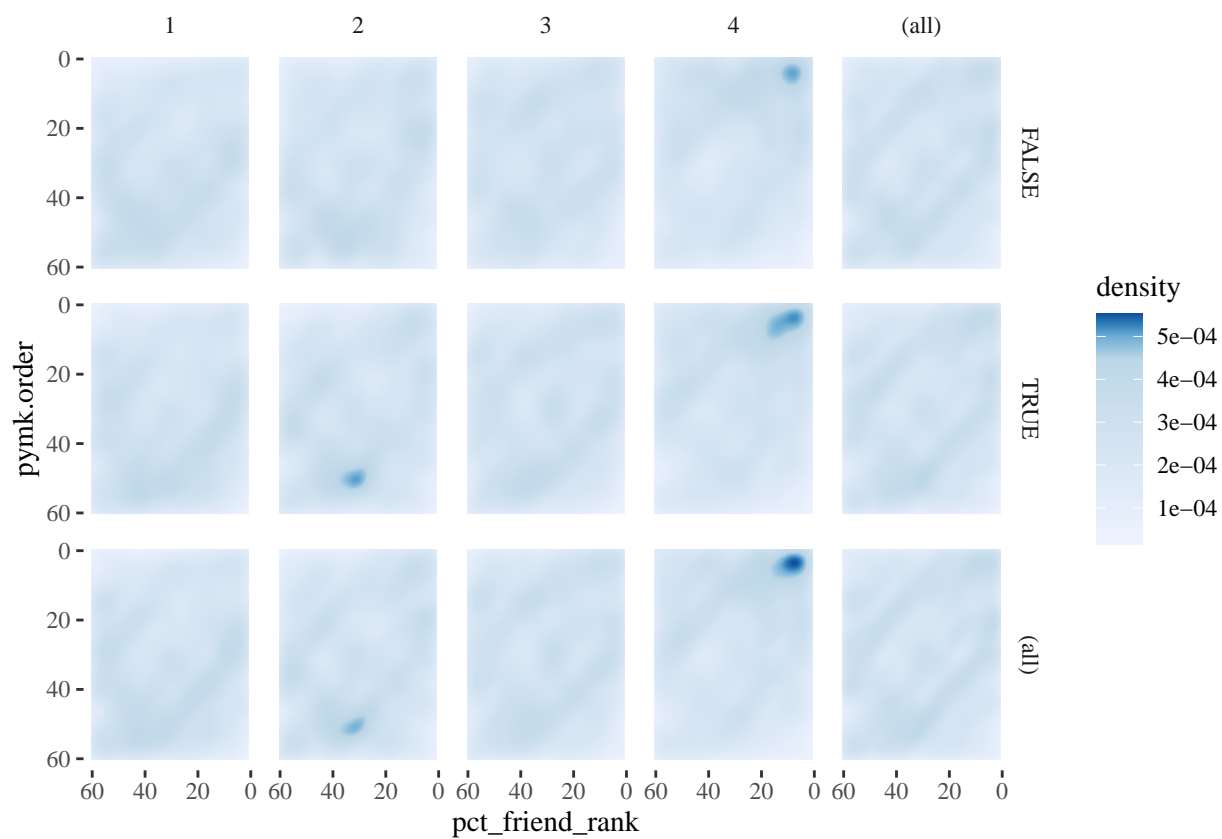


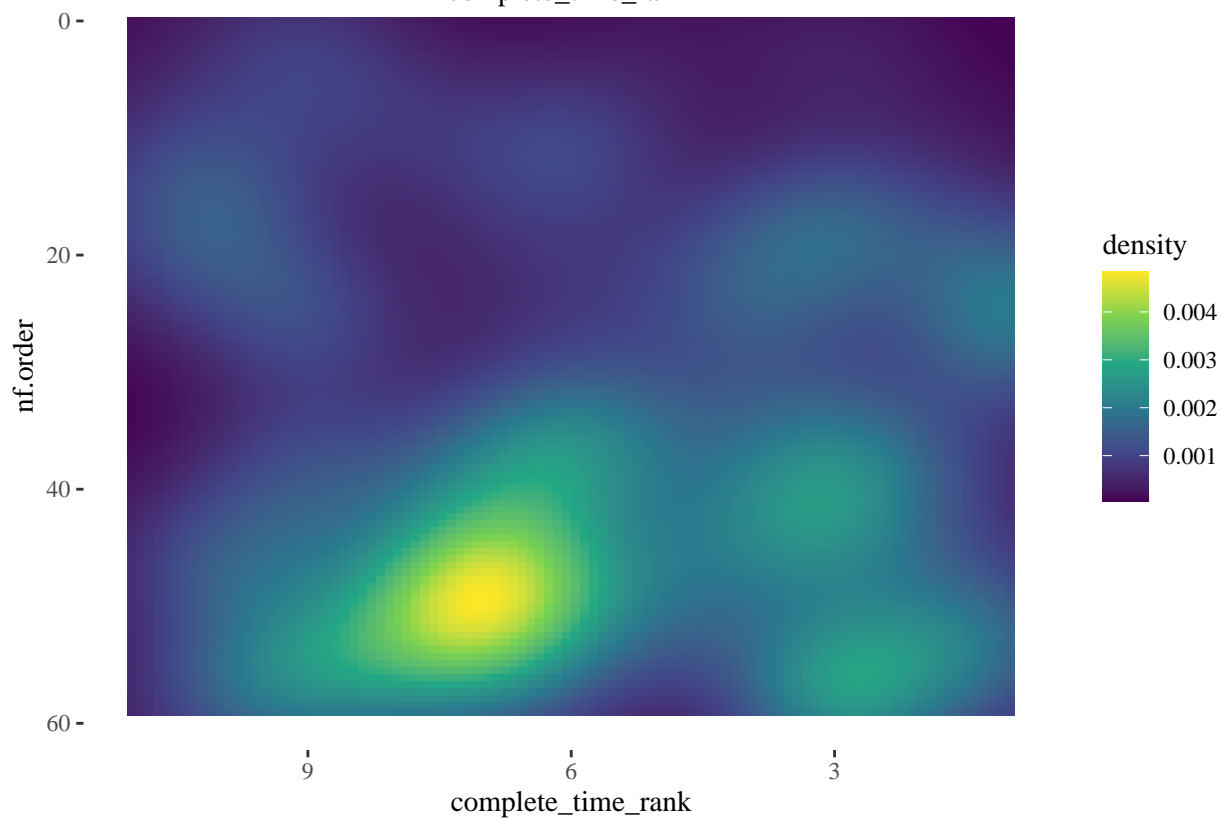
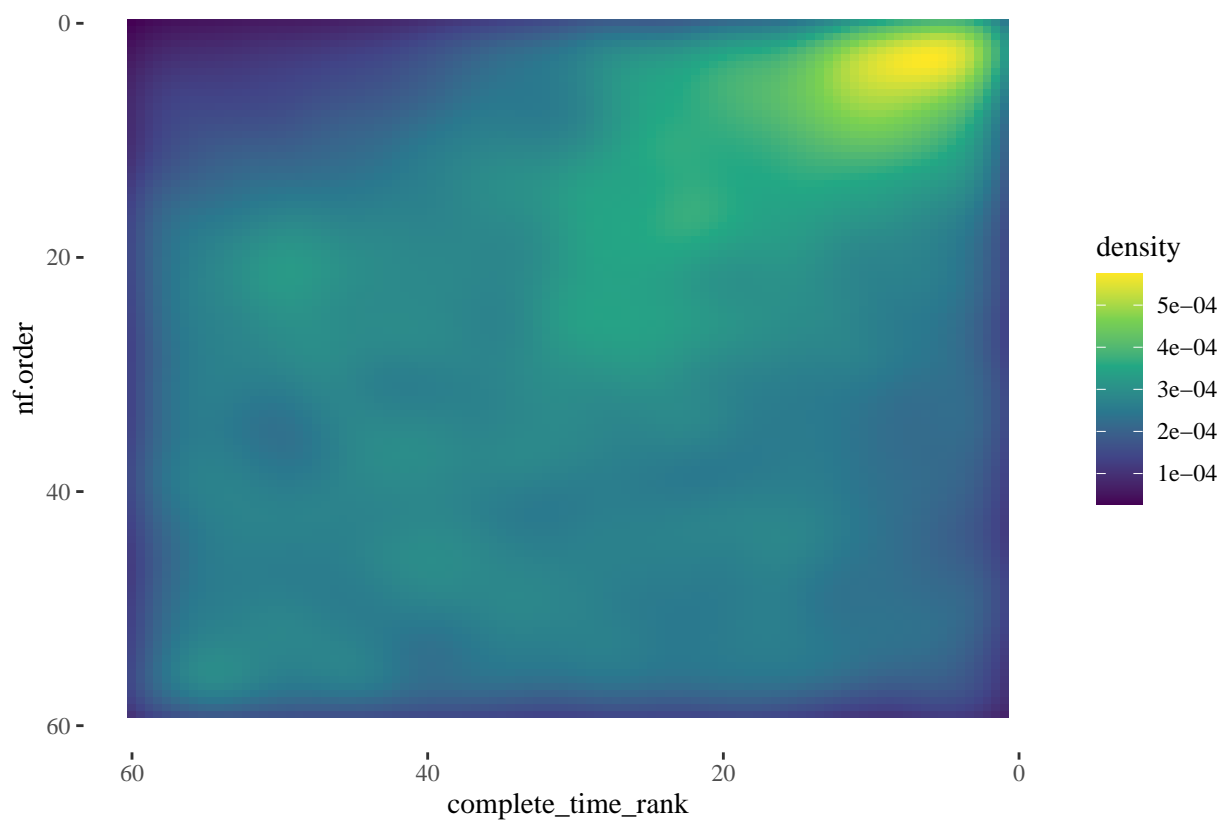


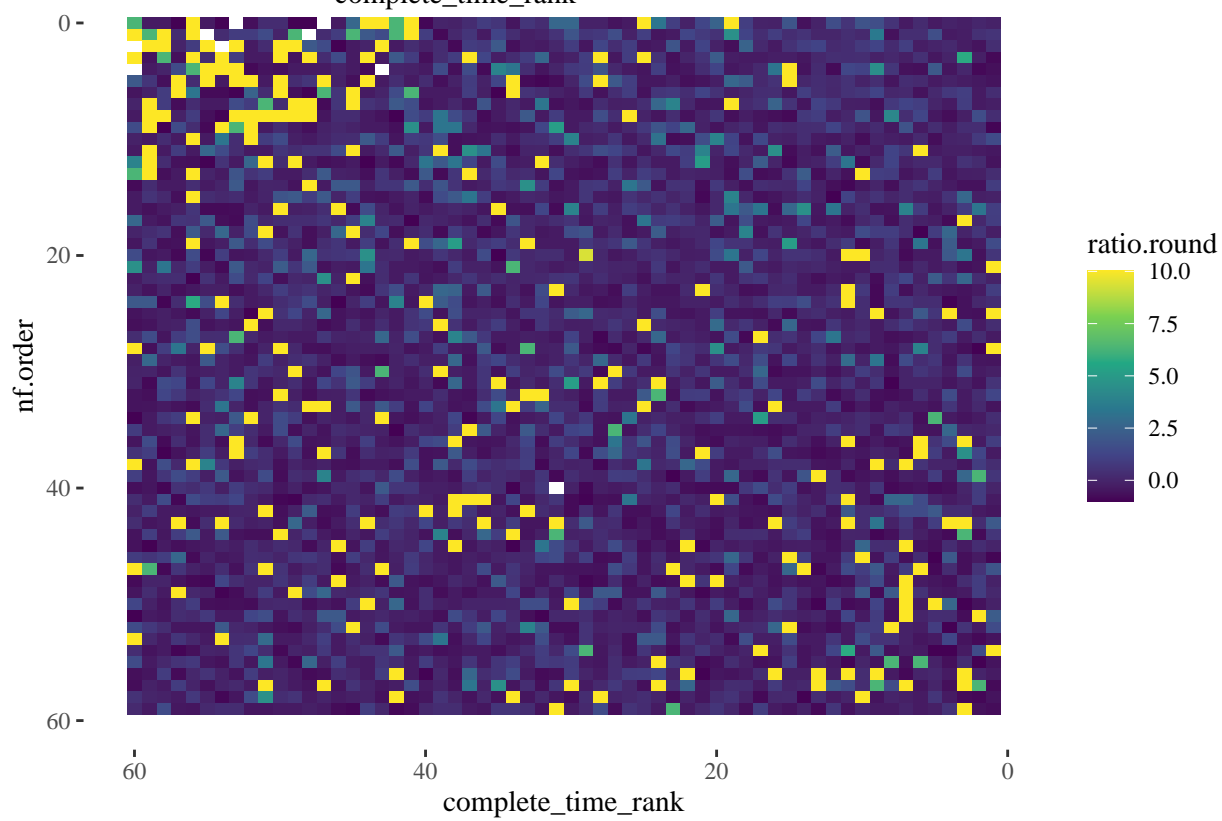
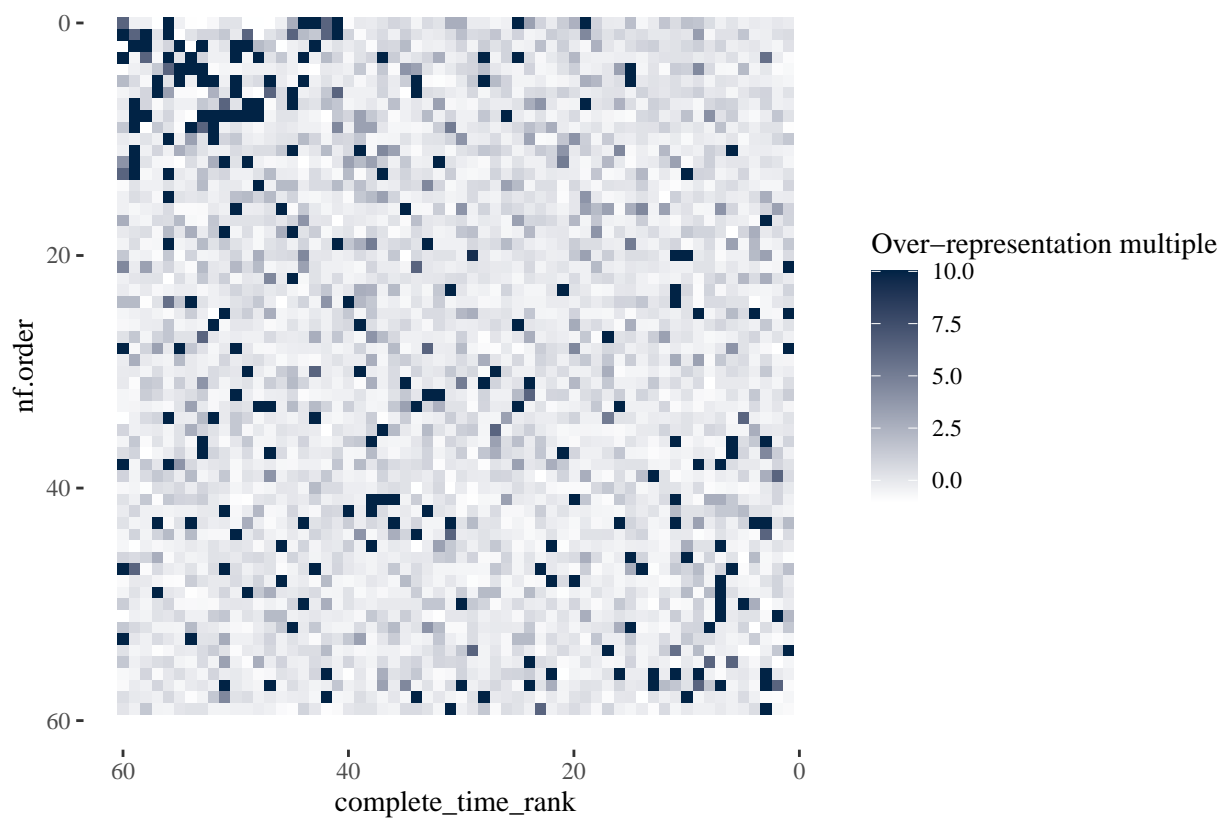


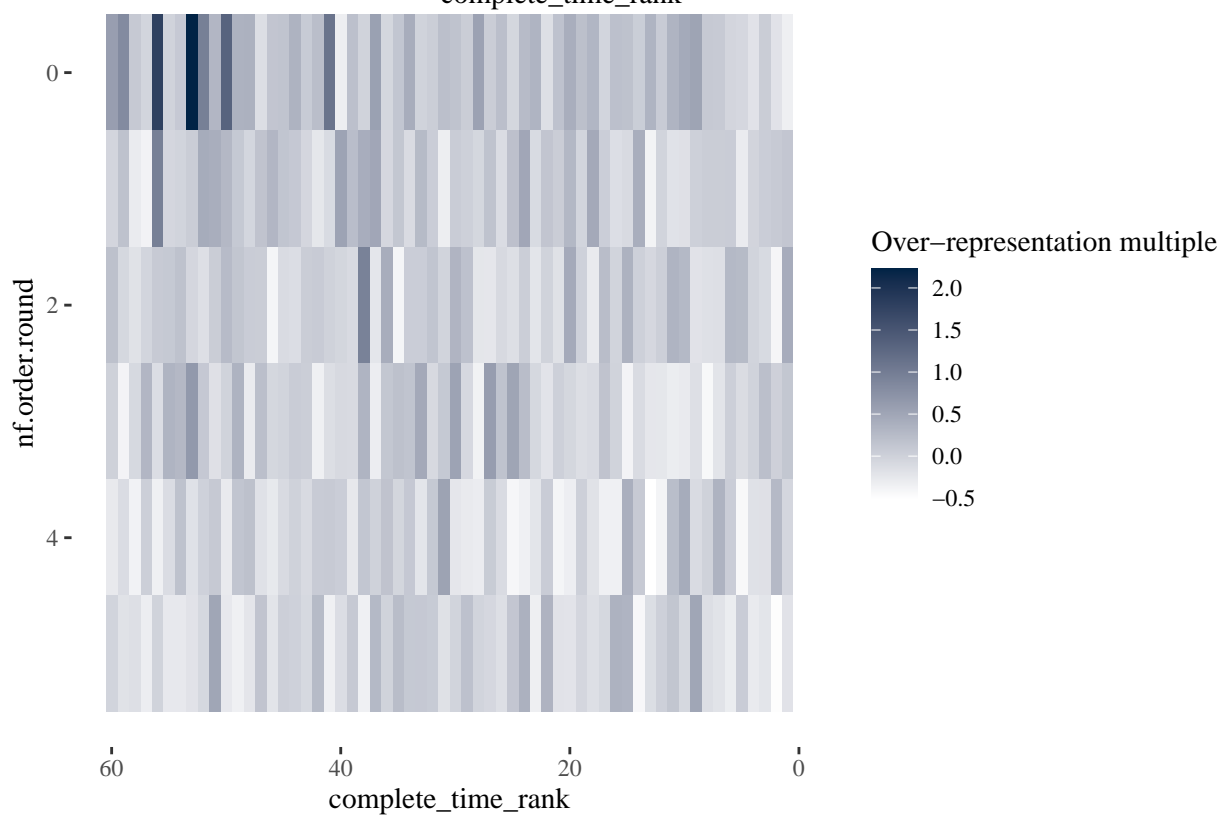
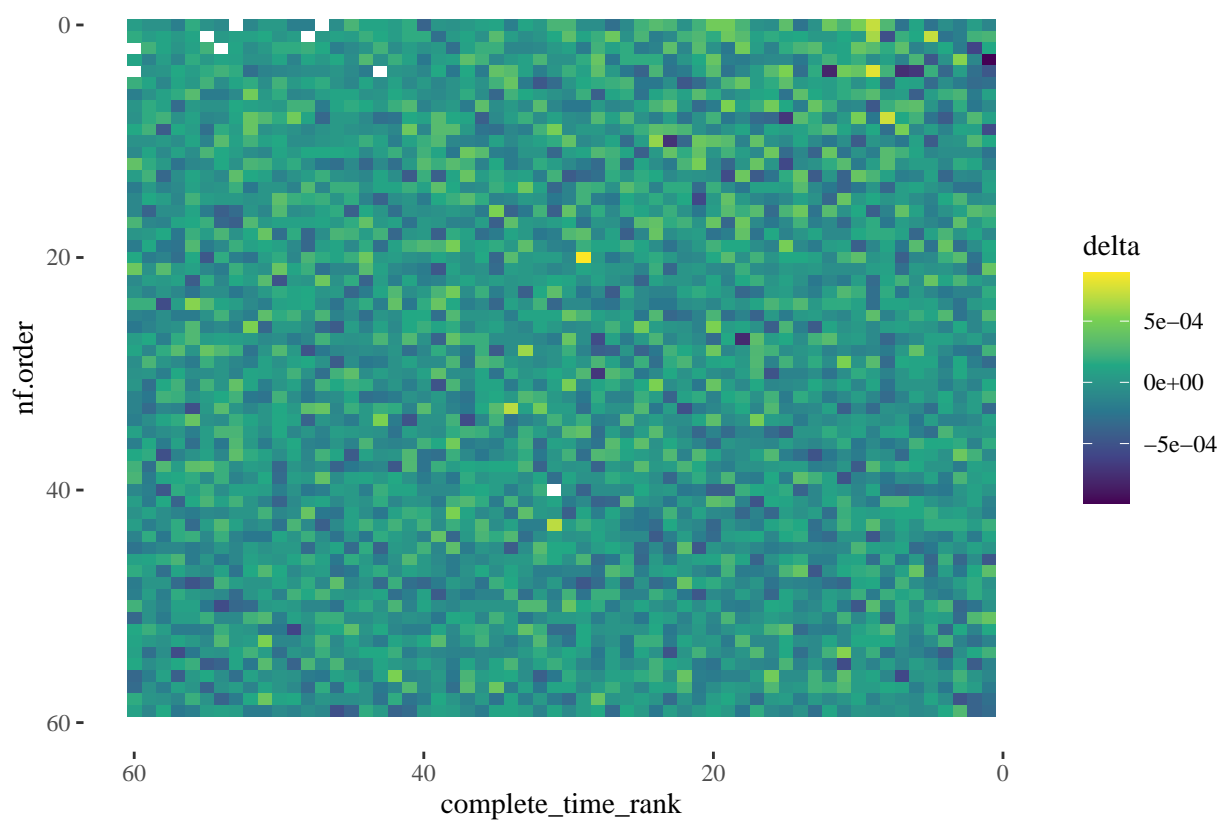


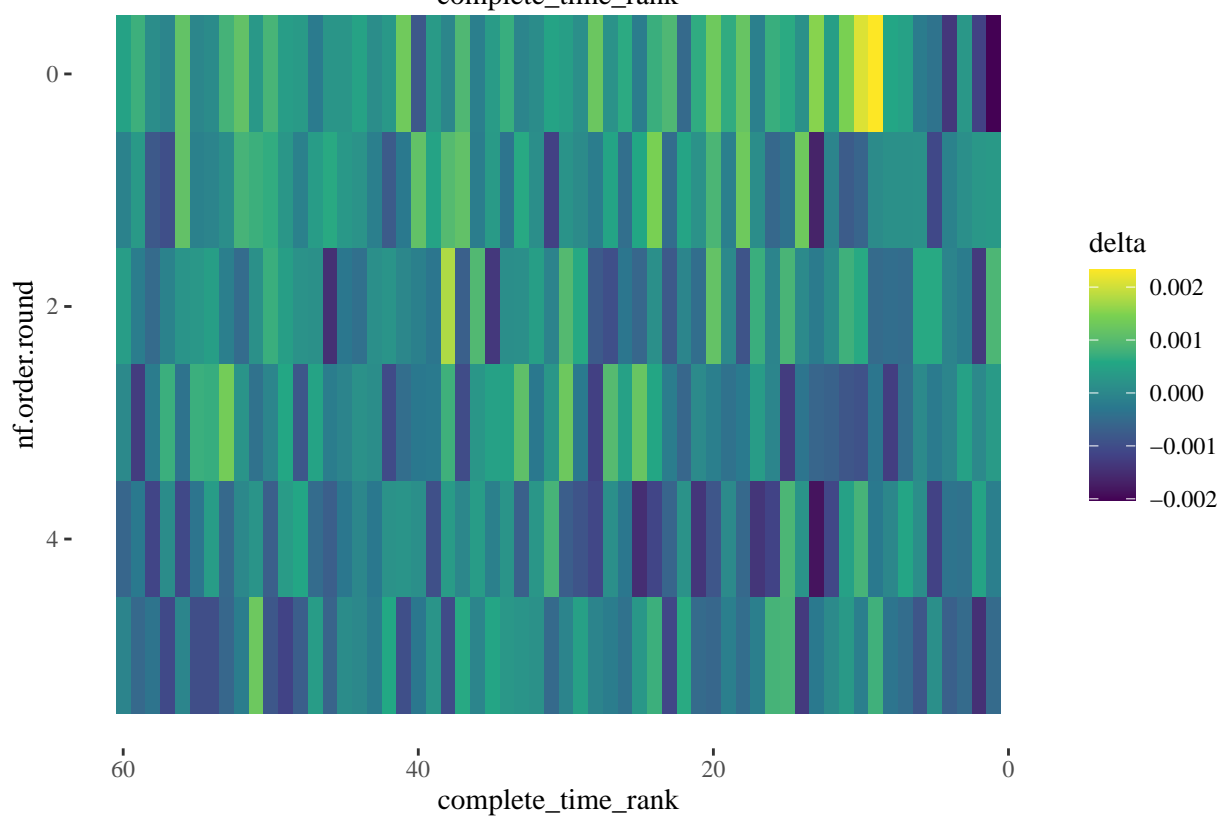
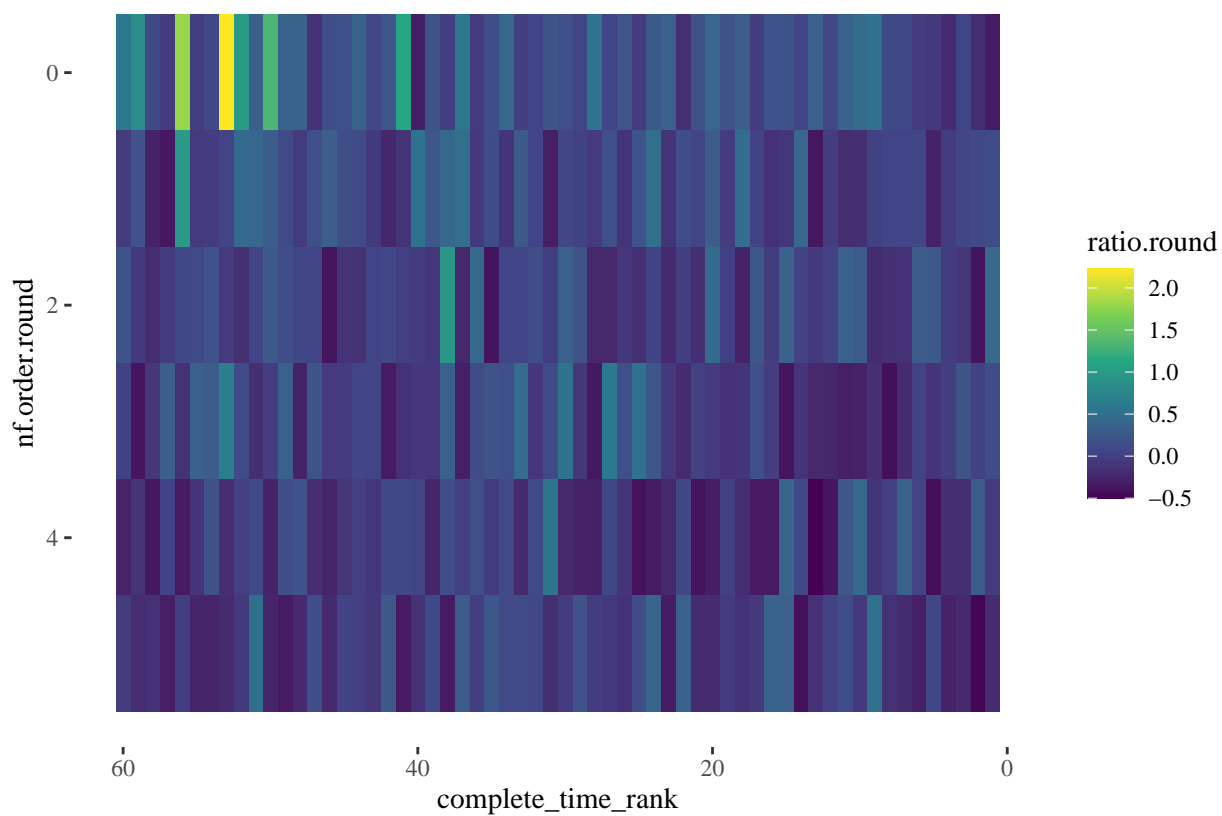


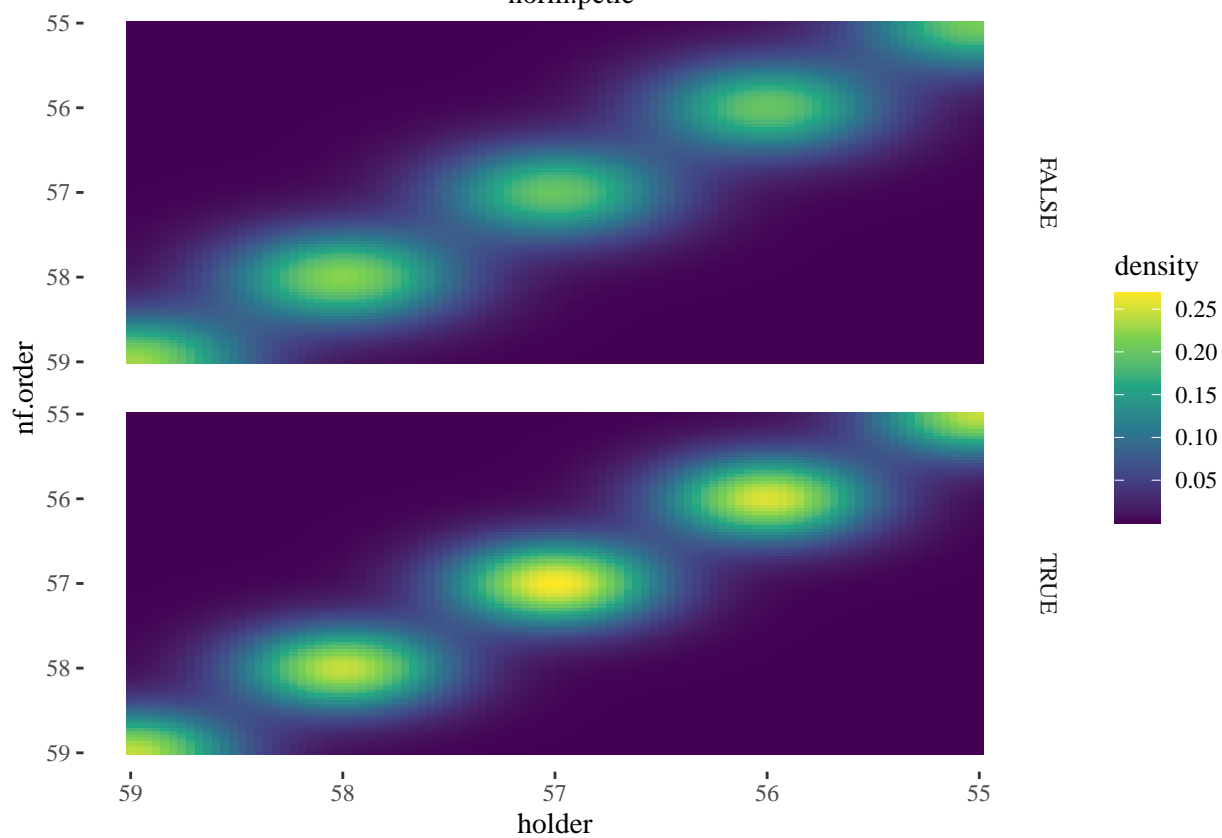
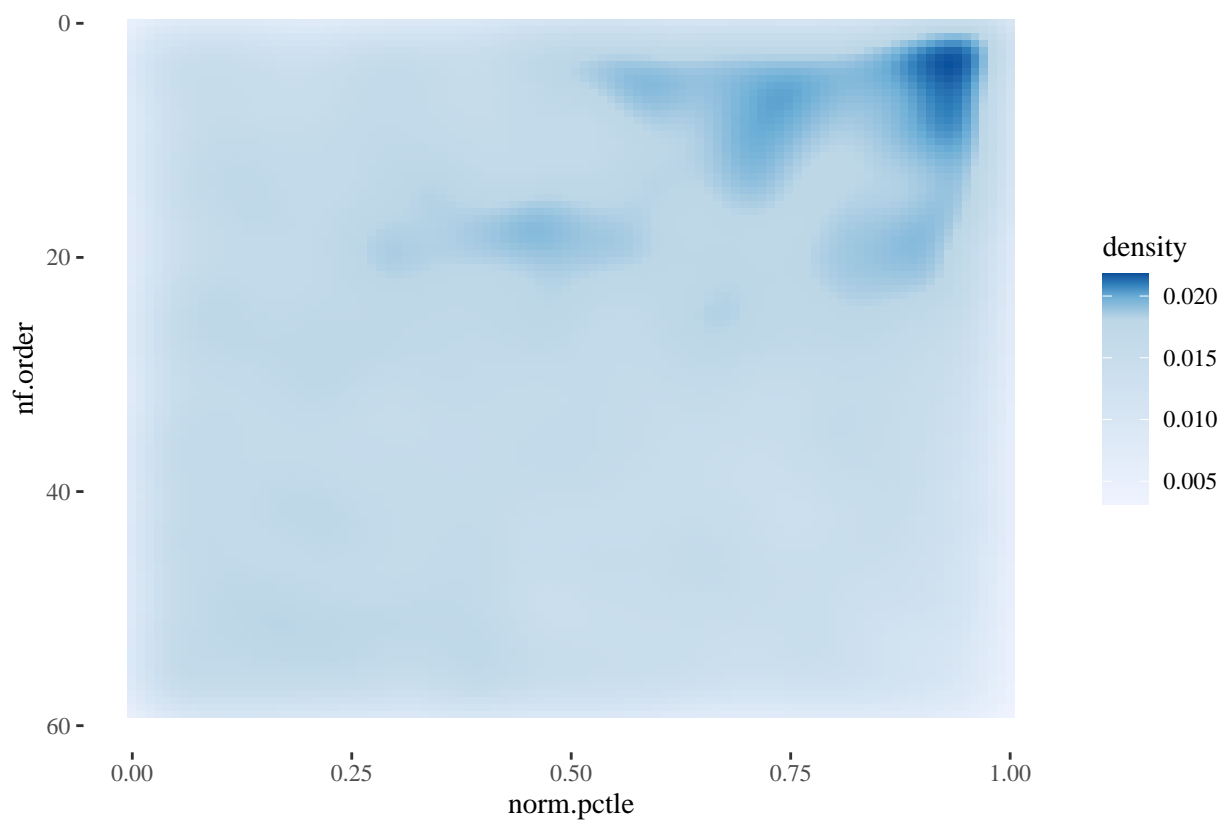




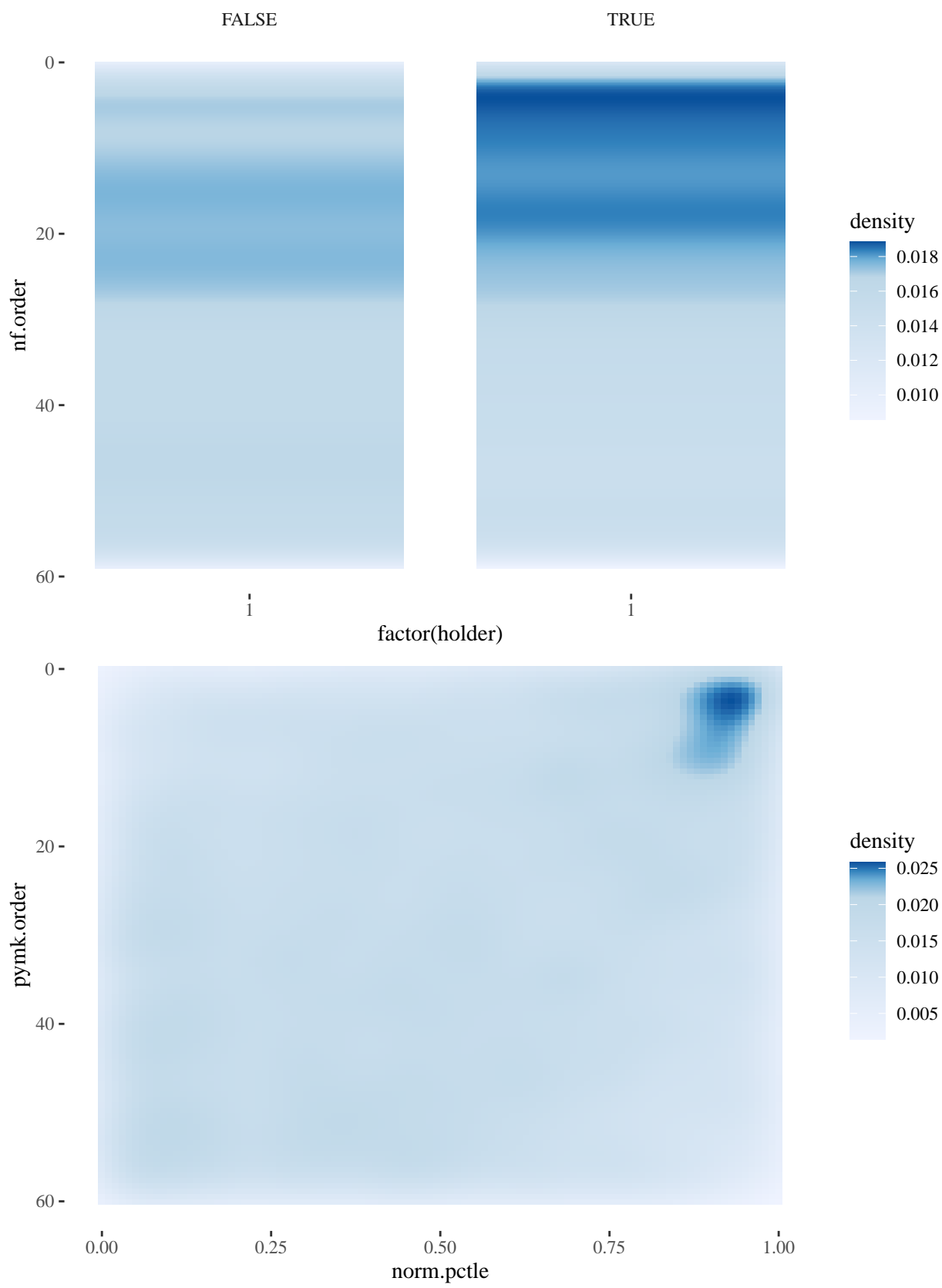


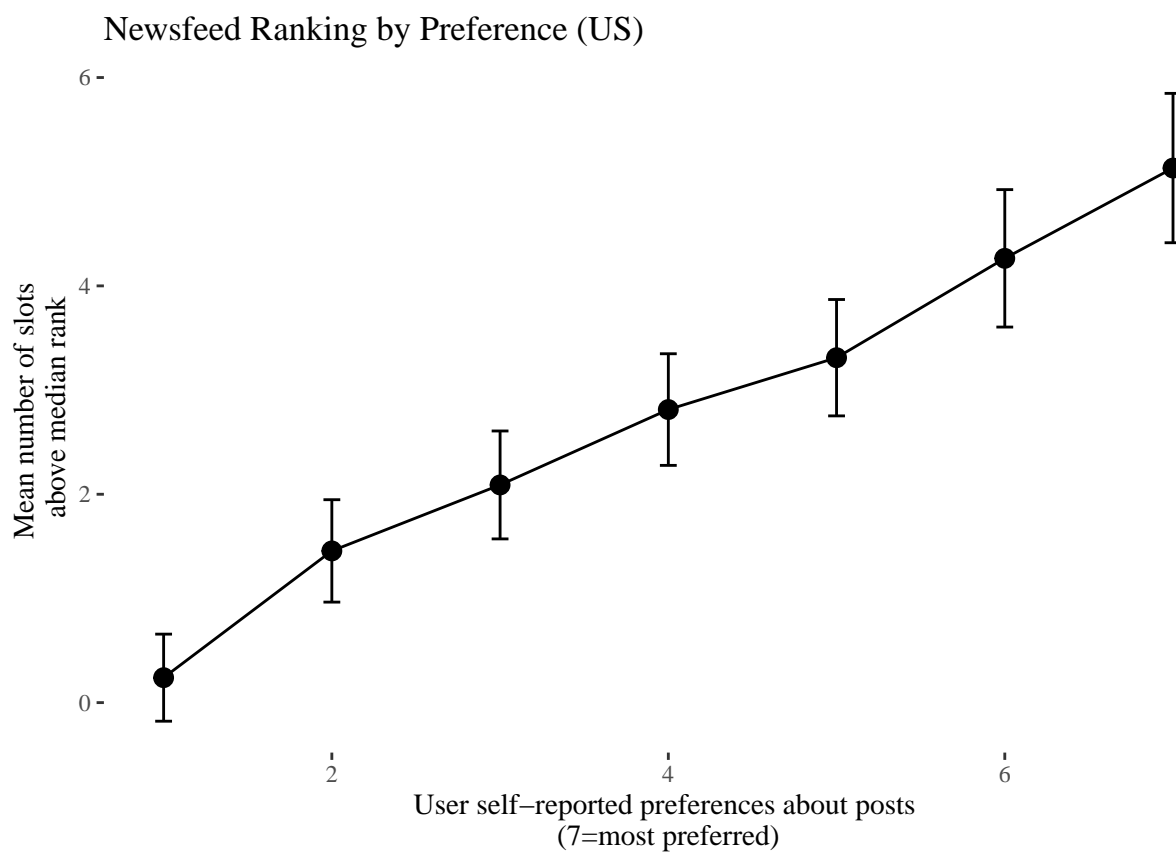
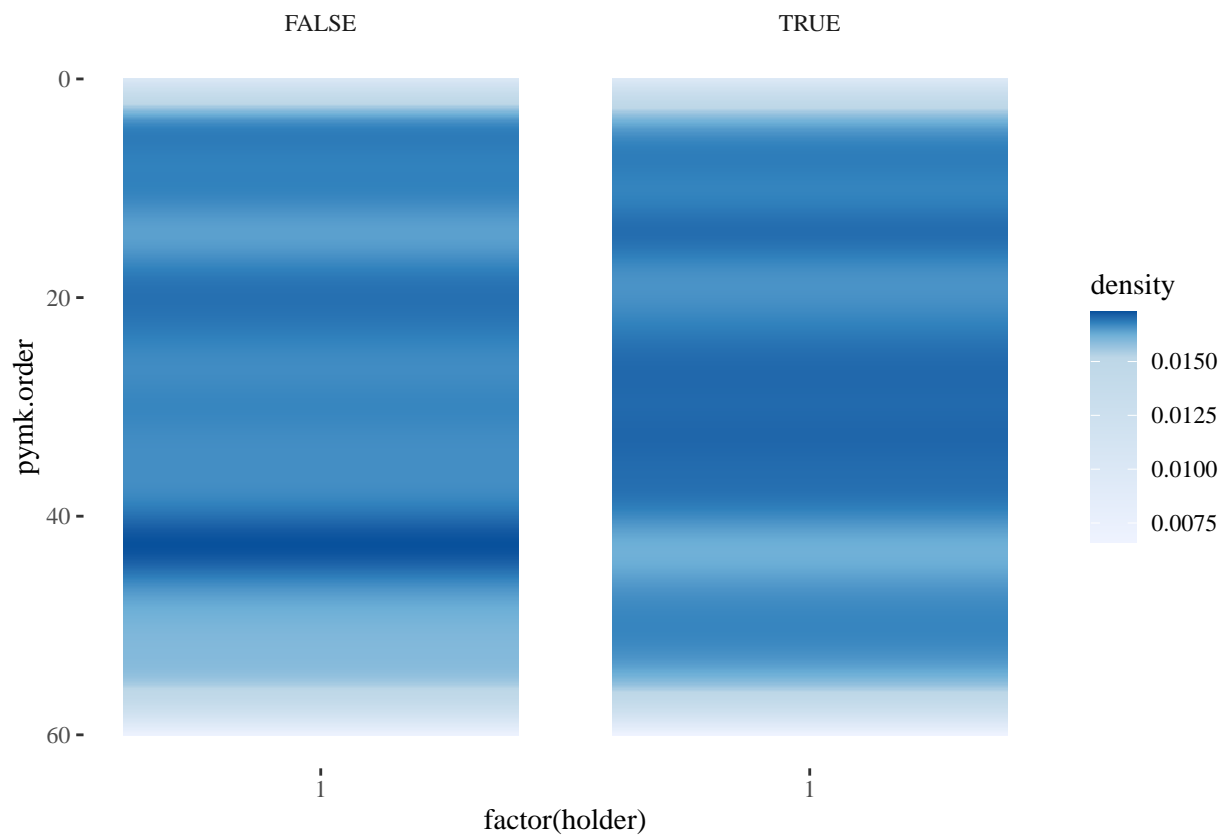




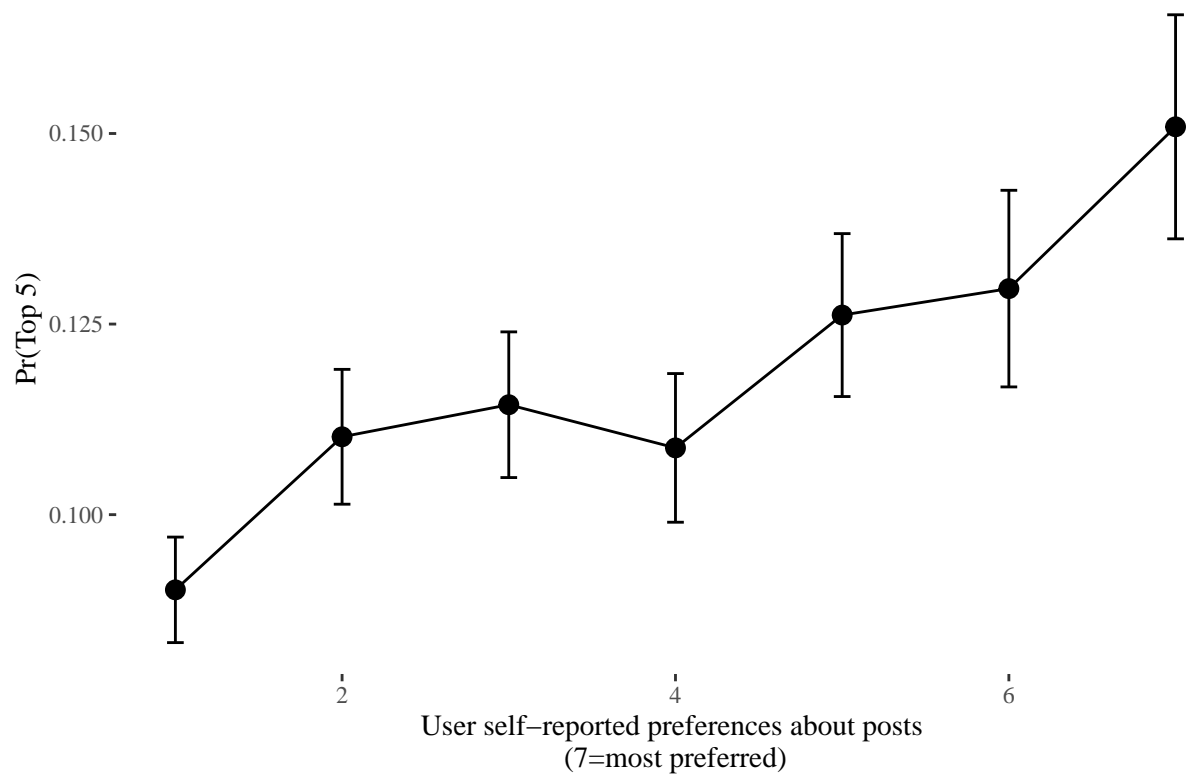




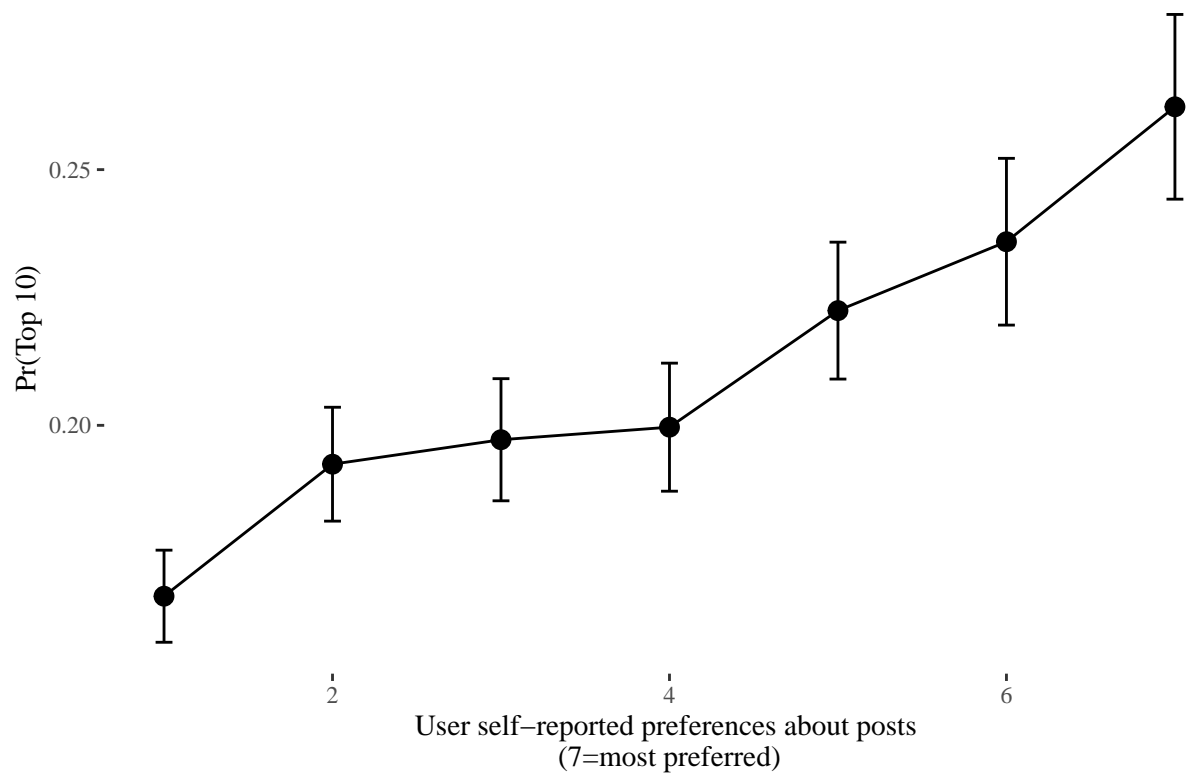




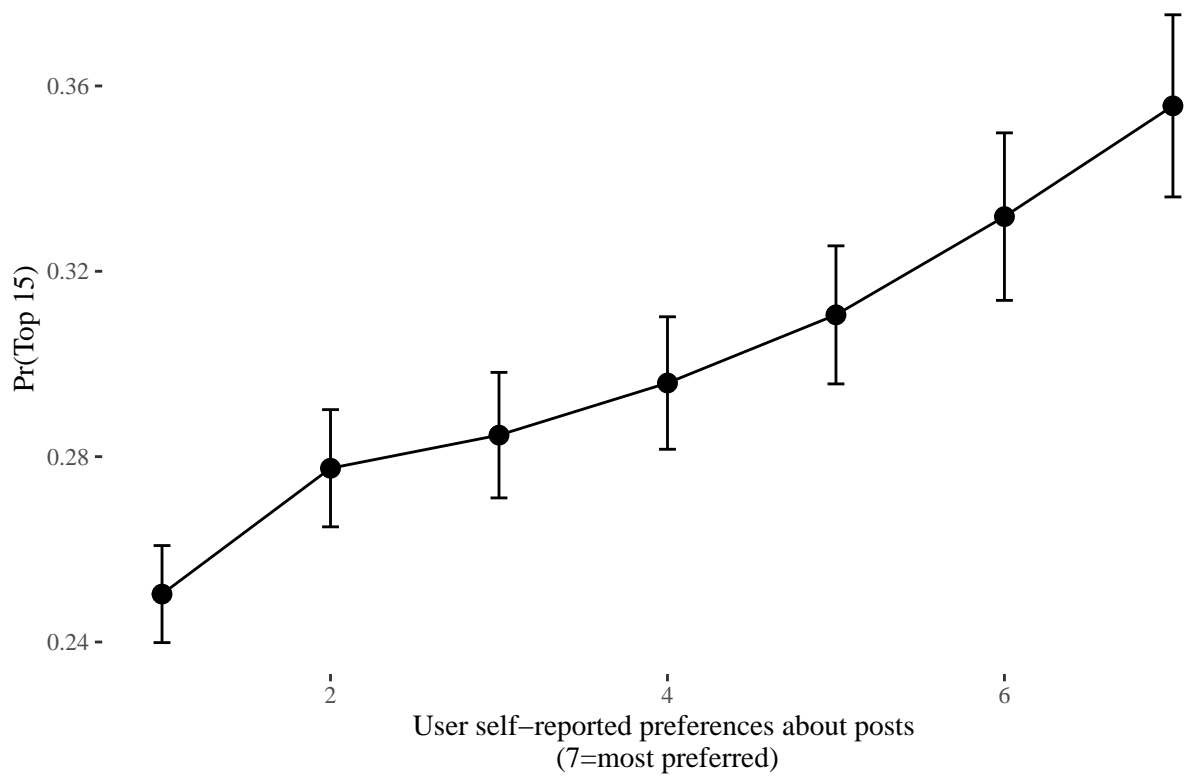
Newsfeed Top 5 by Preference (US)



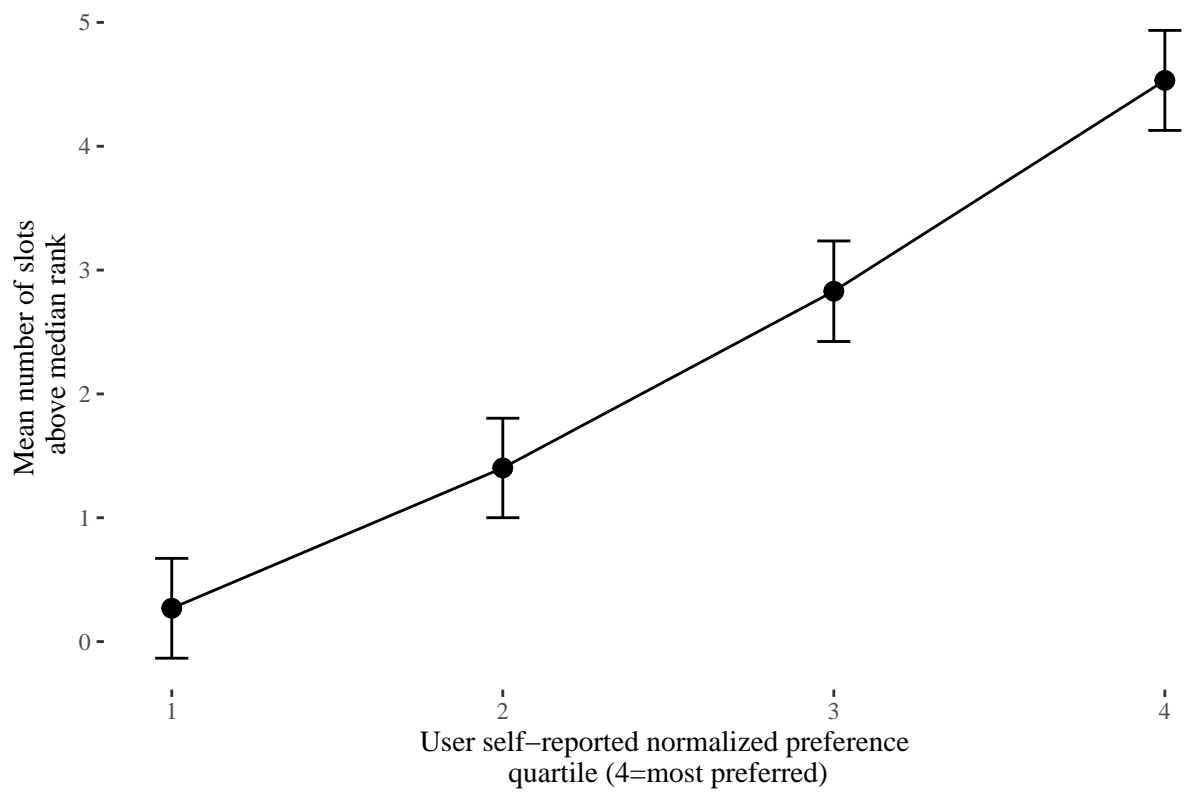
Newsfeed Top 10 by Preference (US)



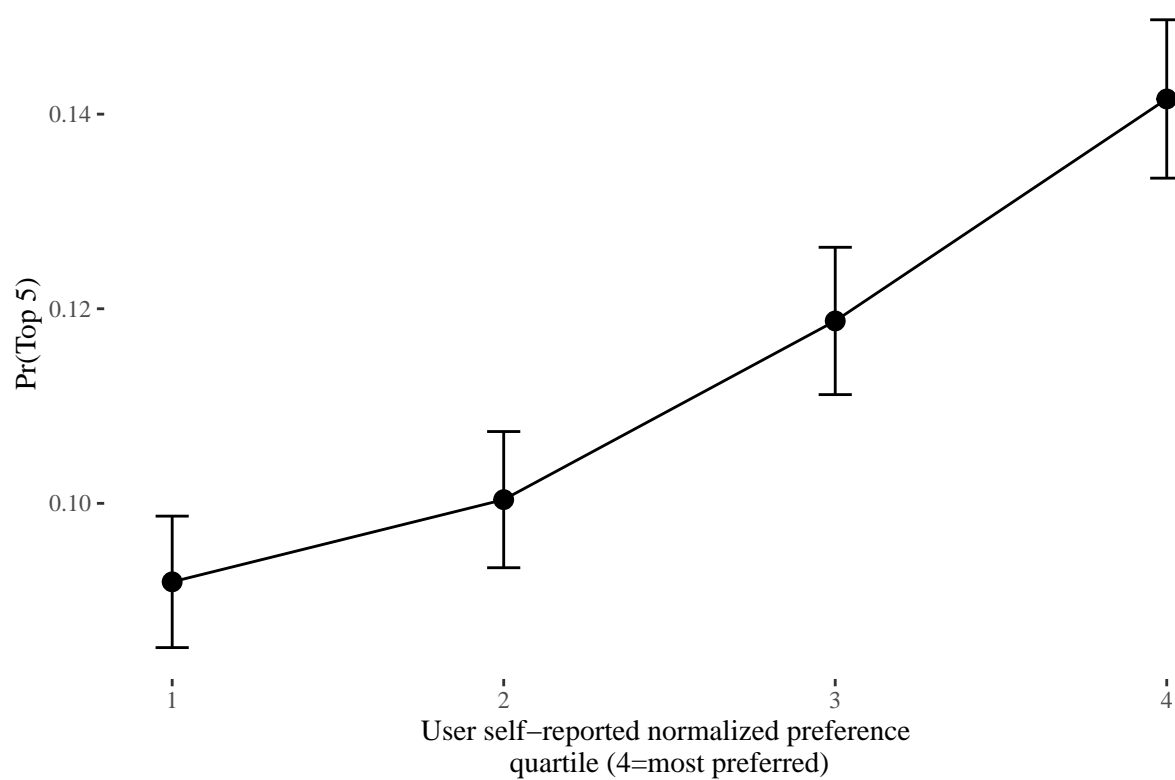
Newsfeed Top 15 by Preference (US)



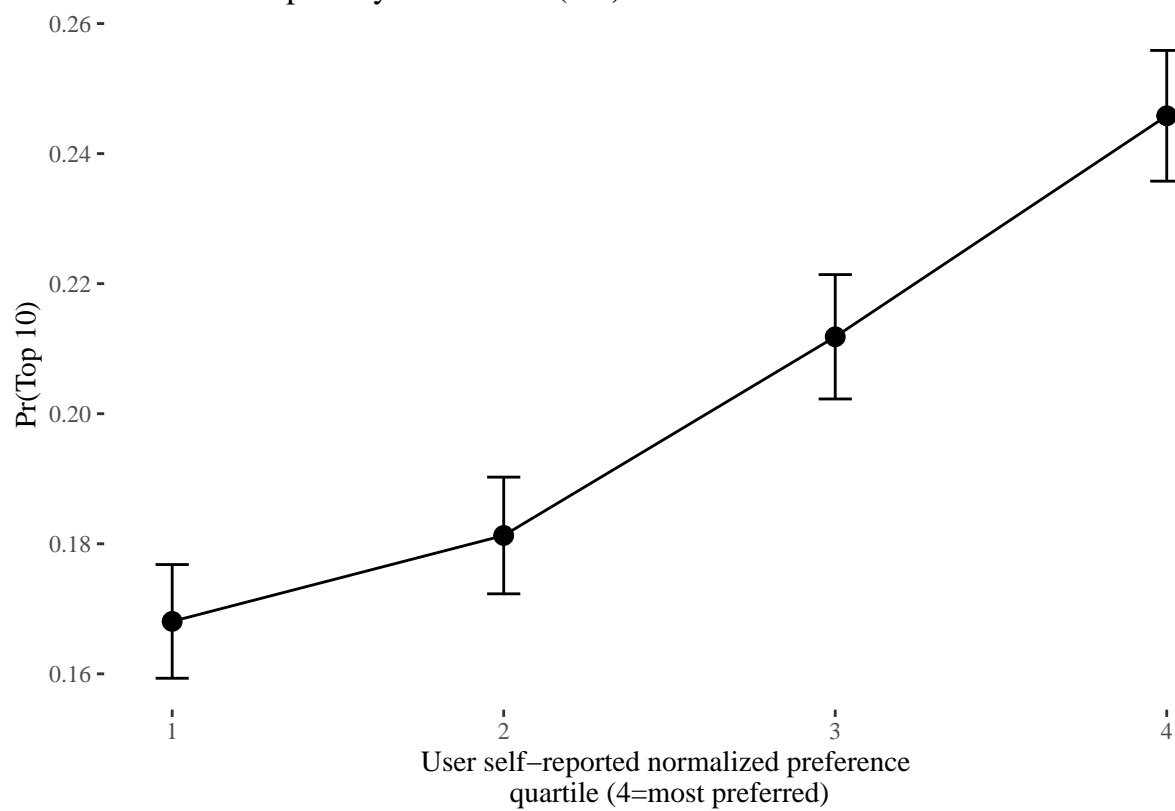
Newsfeed Ranking by Preference (US)



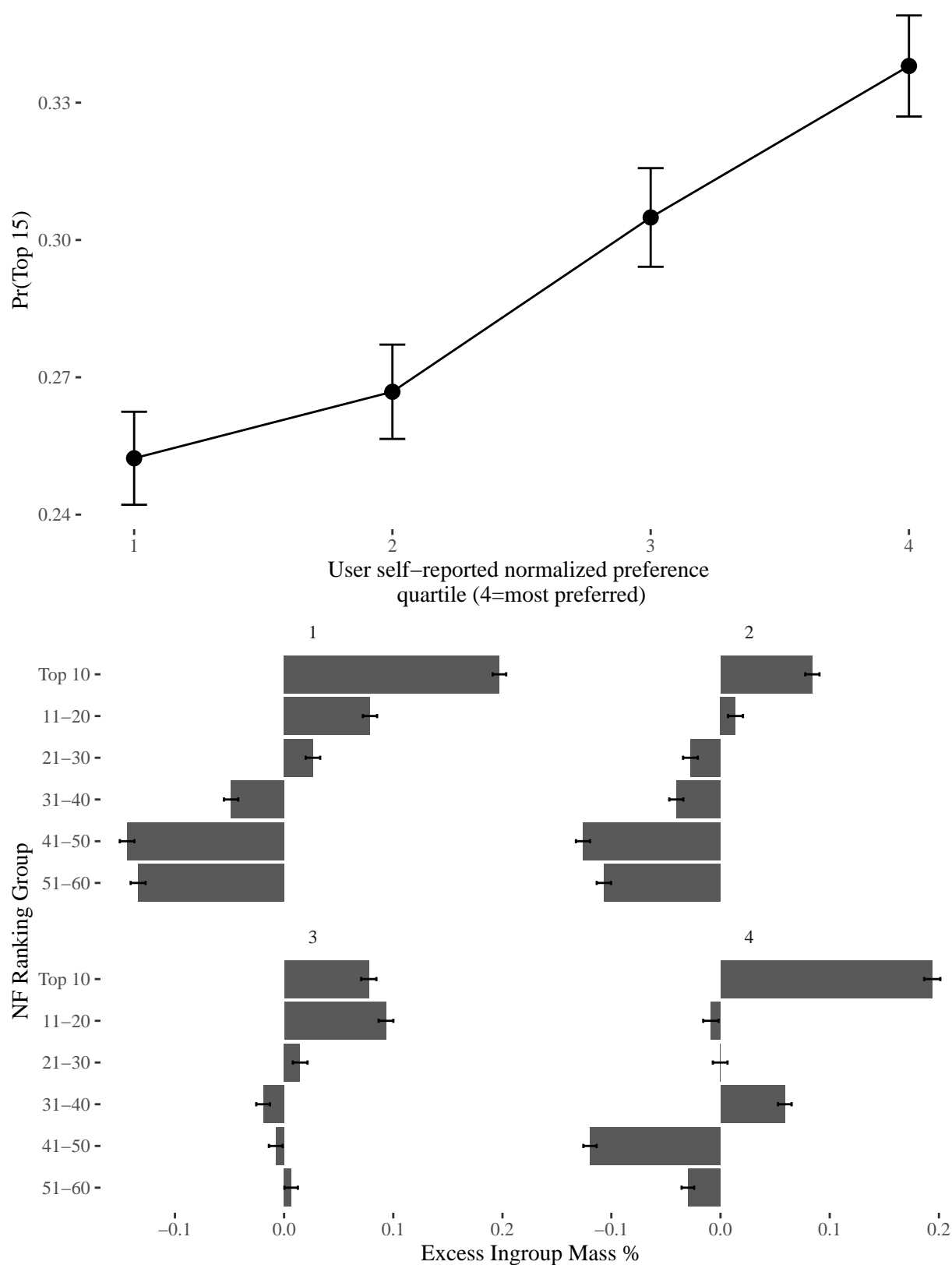
Newsfeed Top 5 by Preference (US)

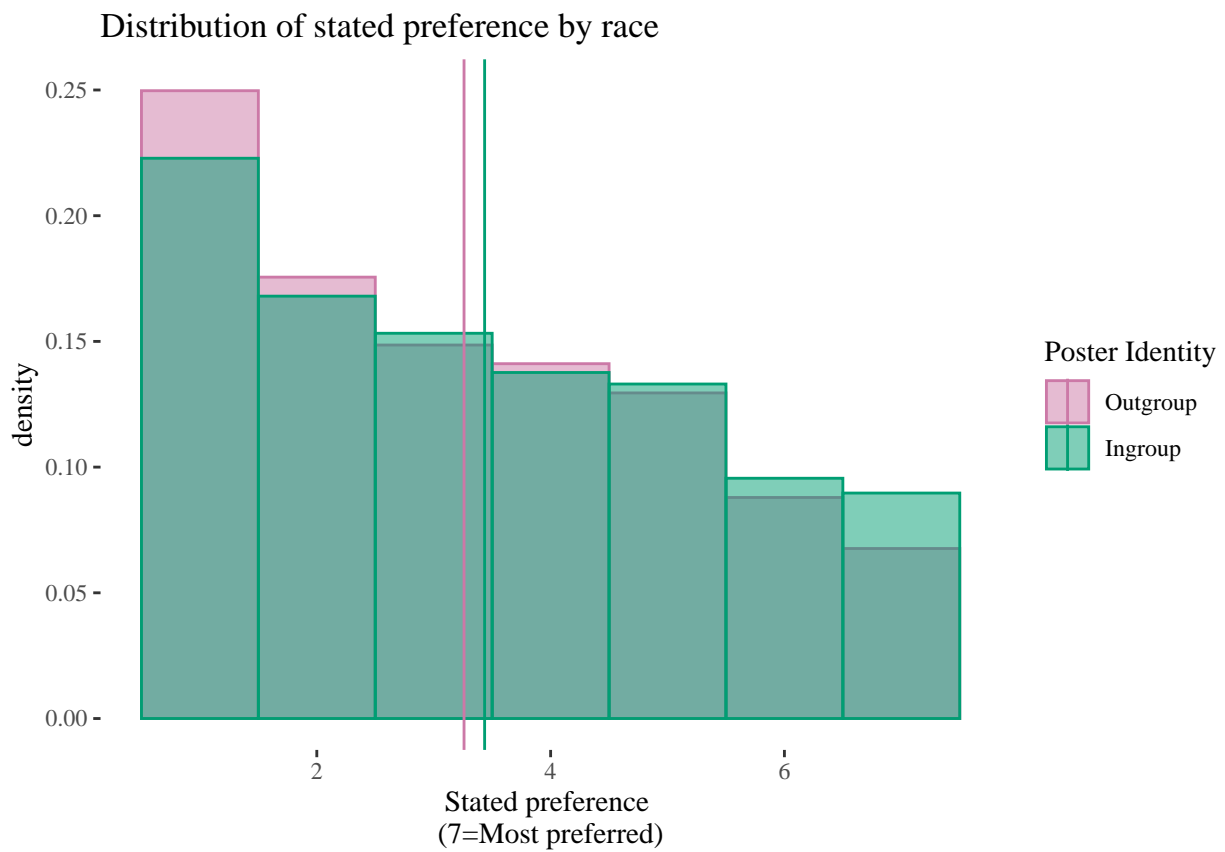
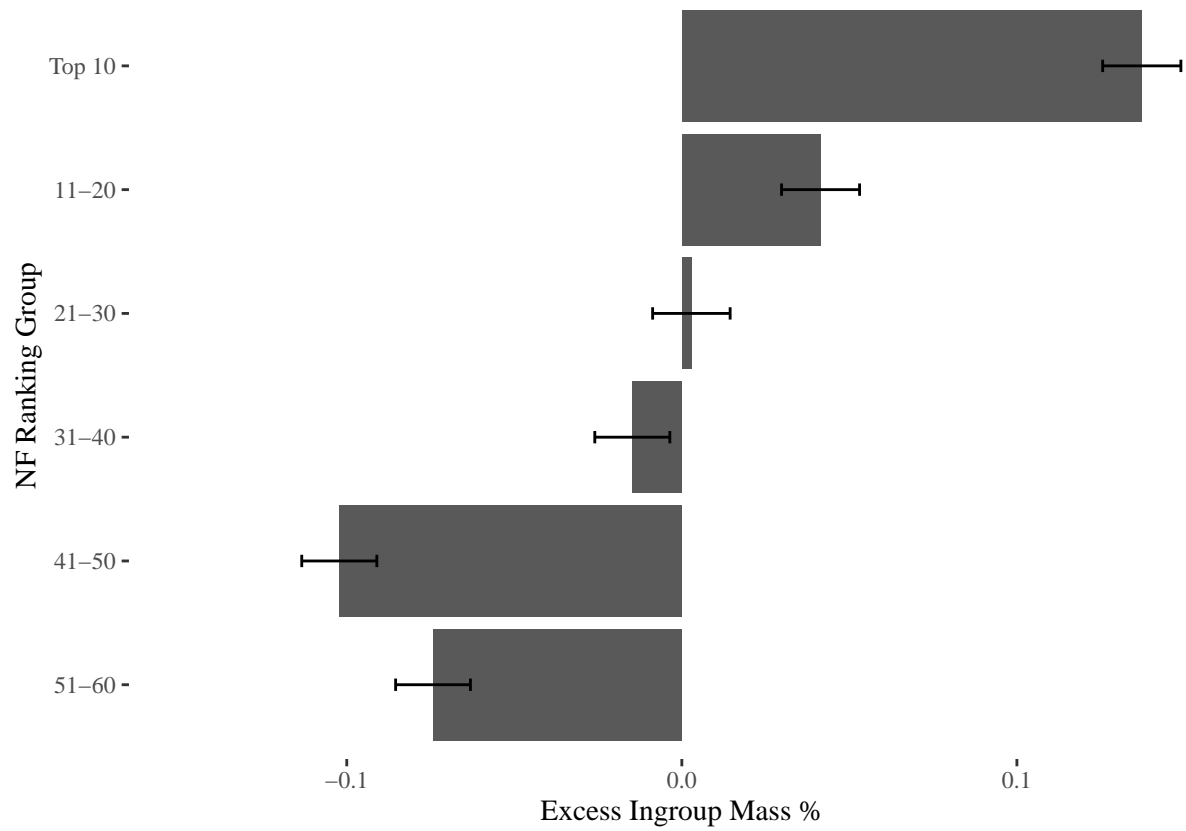


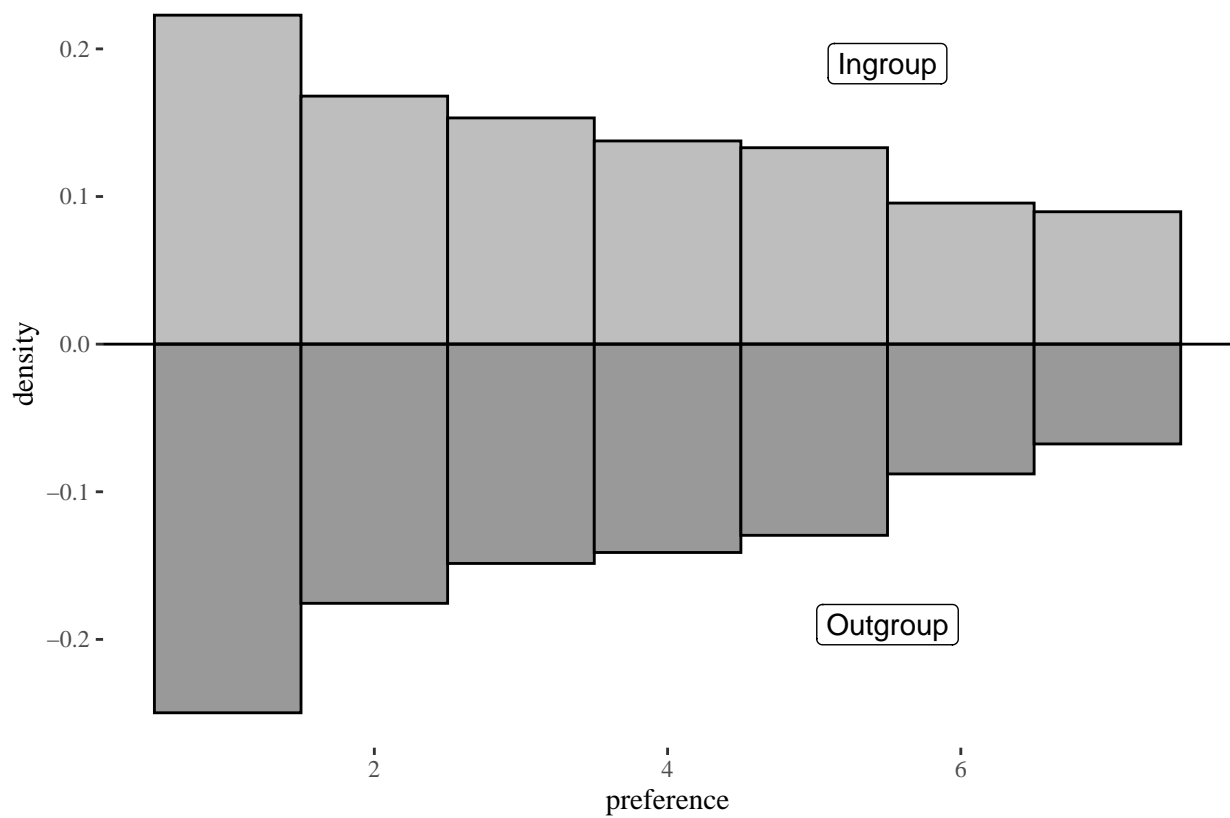
Newsfeed Top 10 by Preference (US)



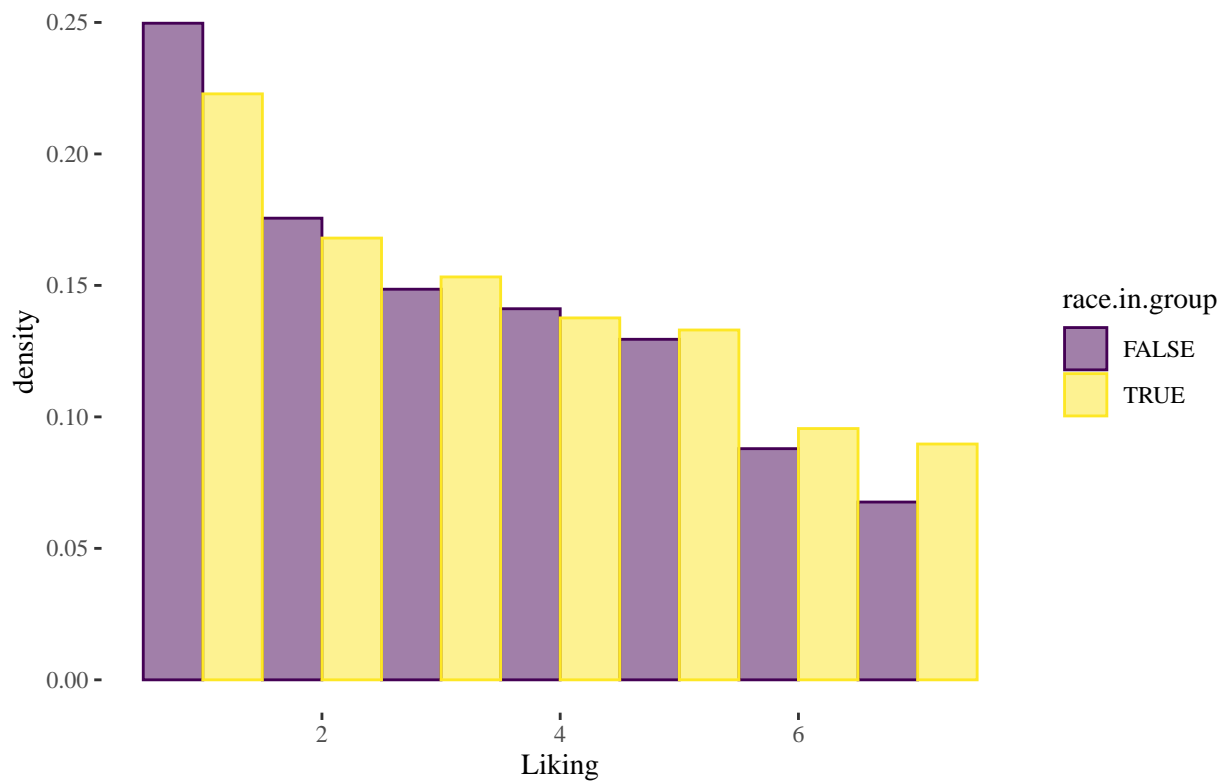
# Newsfeed Top 15 by Preference (US)





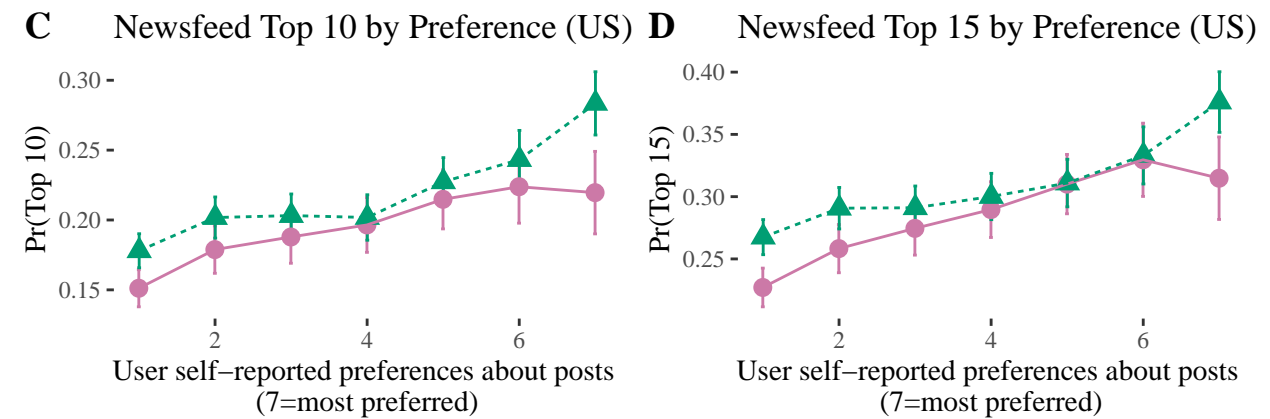
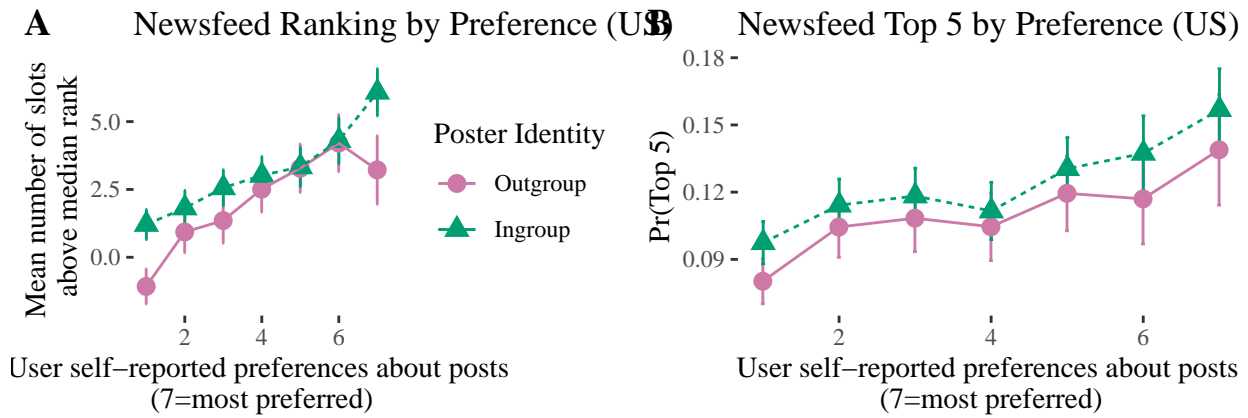
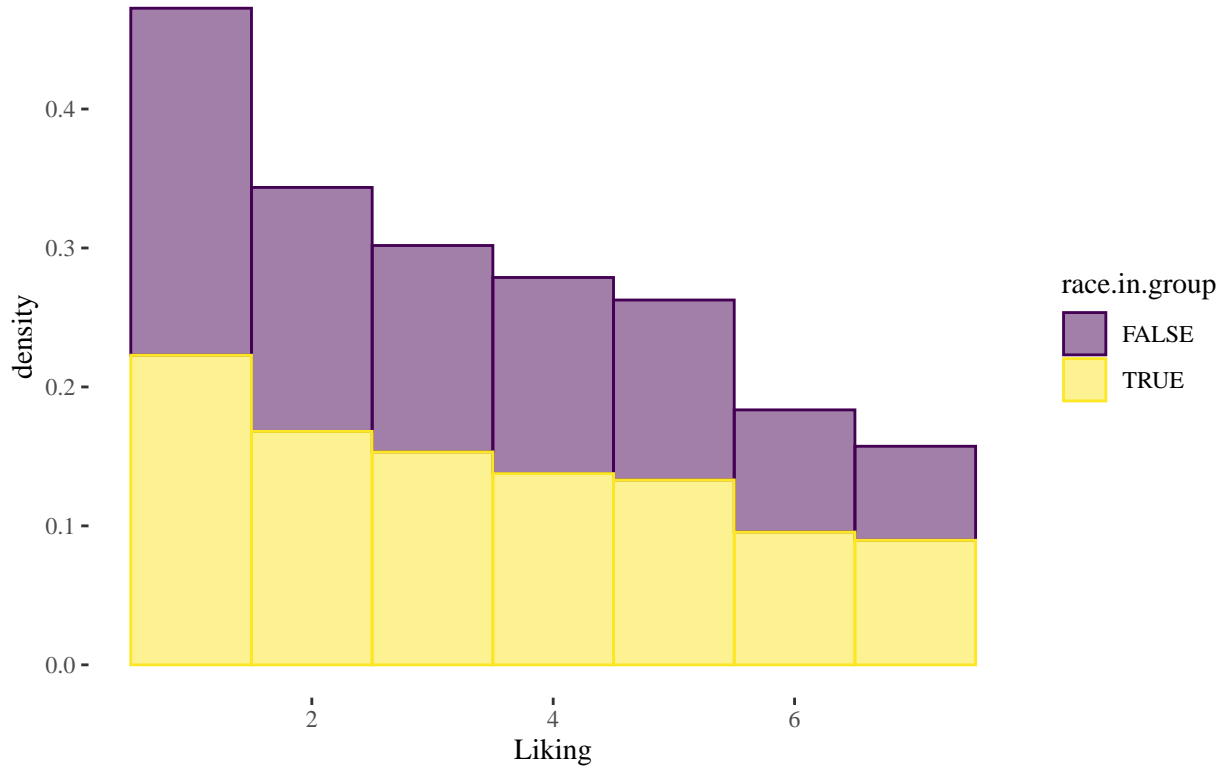


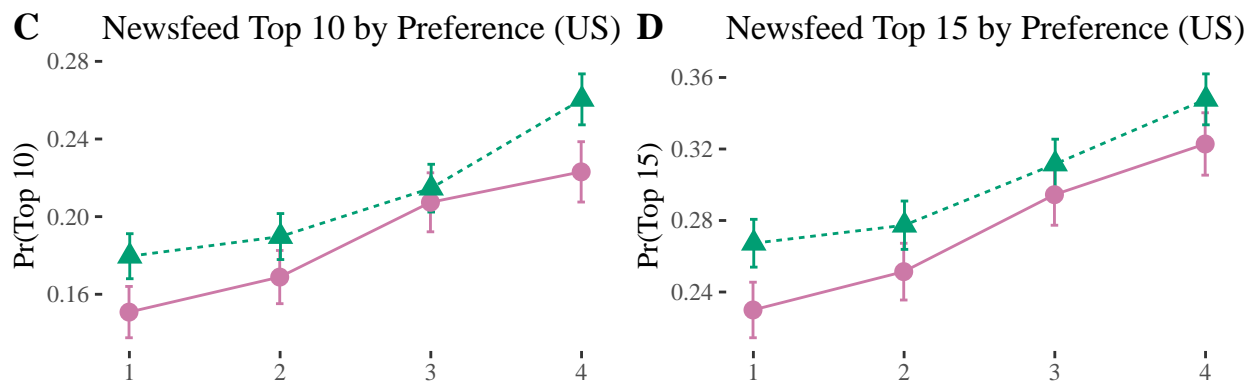
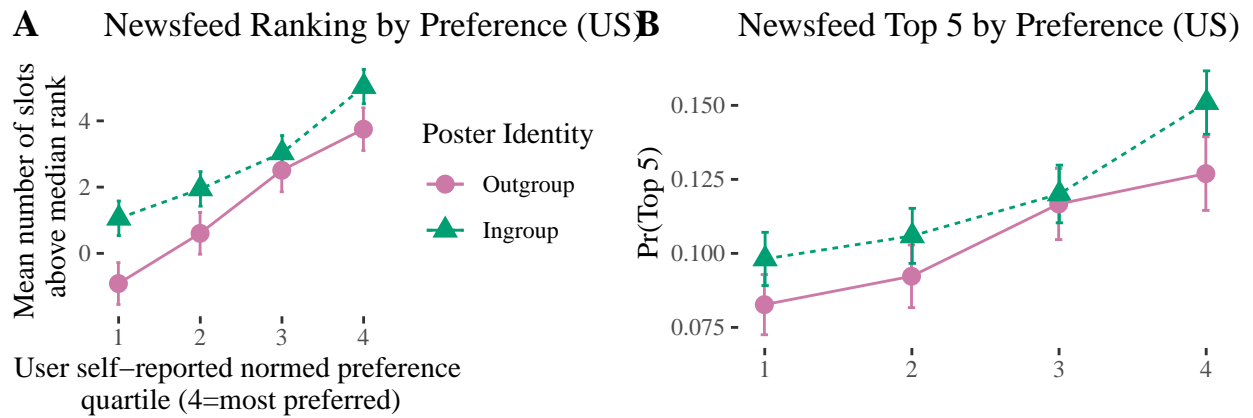
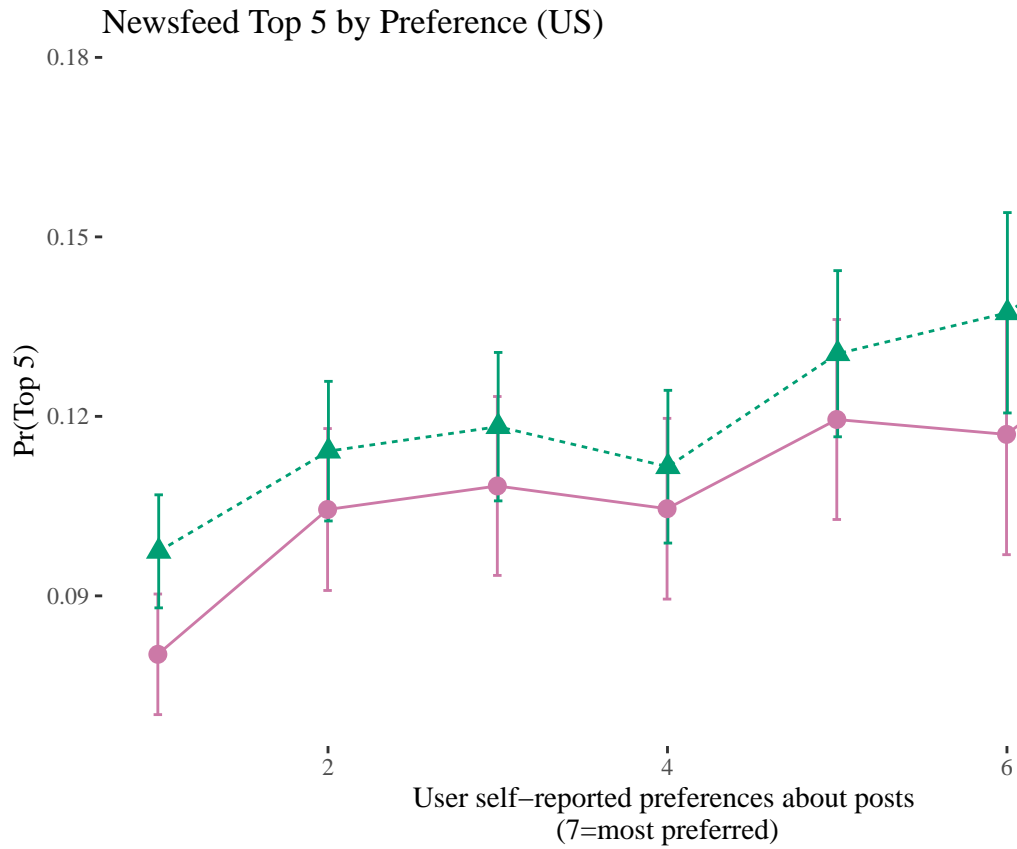
Distribution of raw pref by race



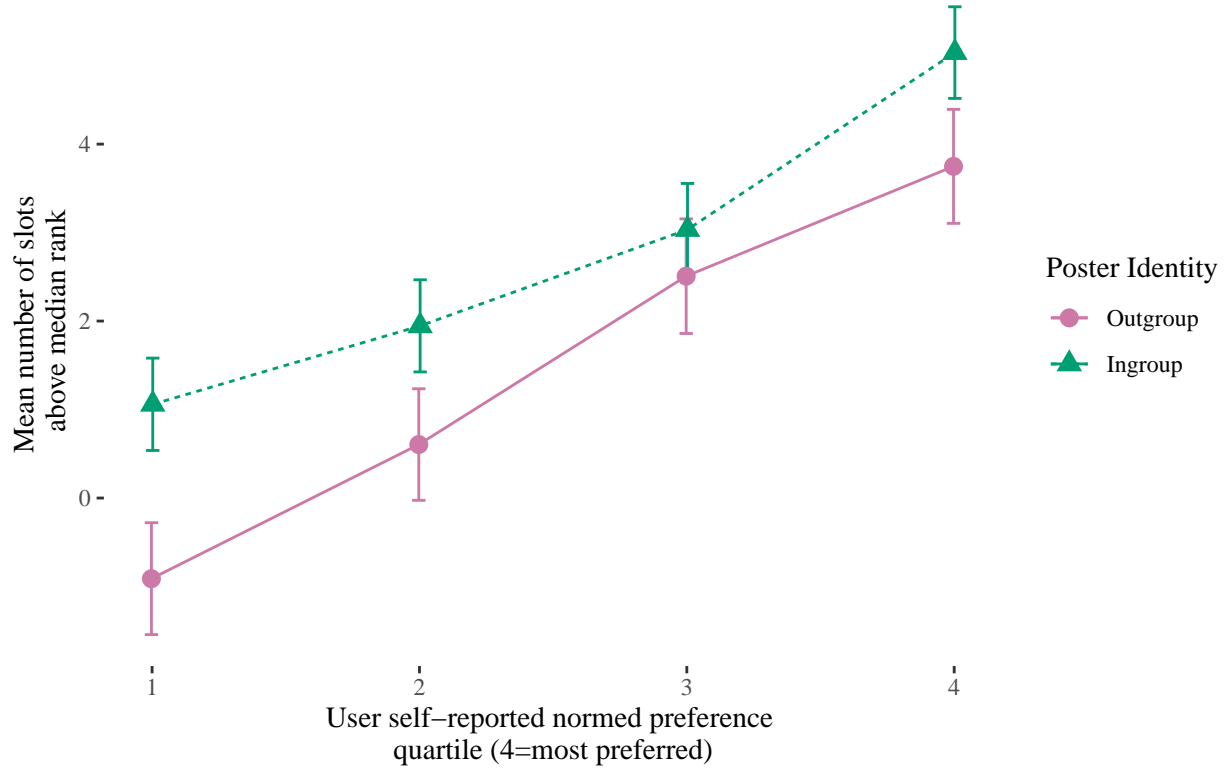


Distribution of raw pref by race

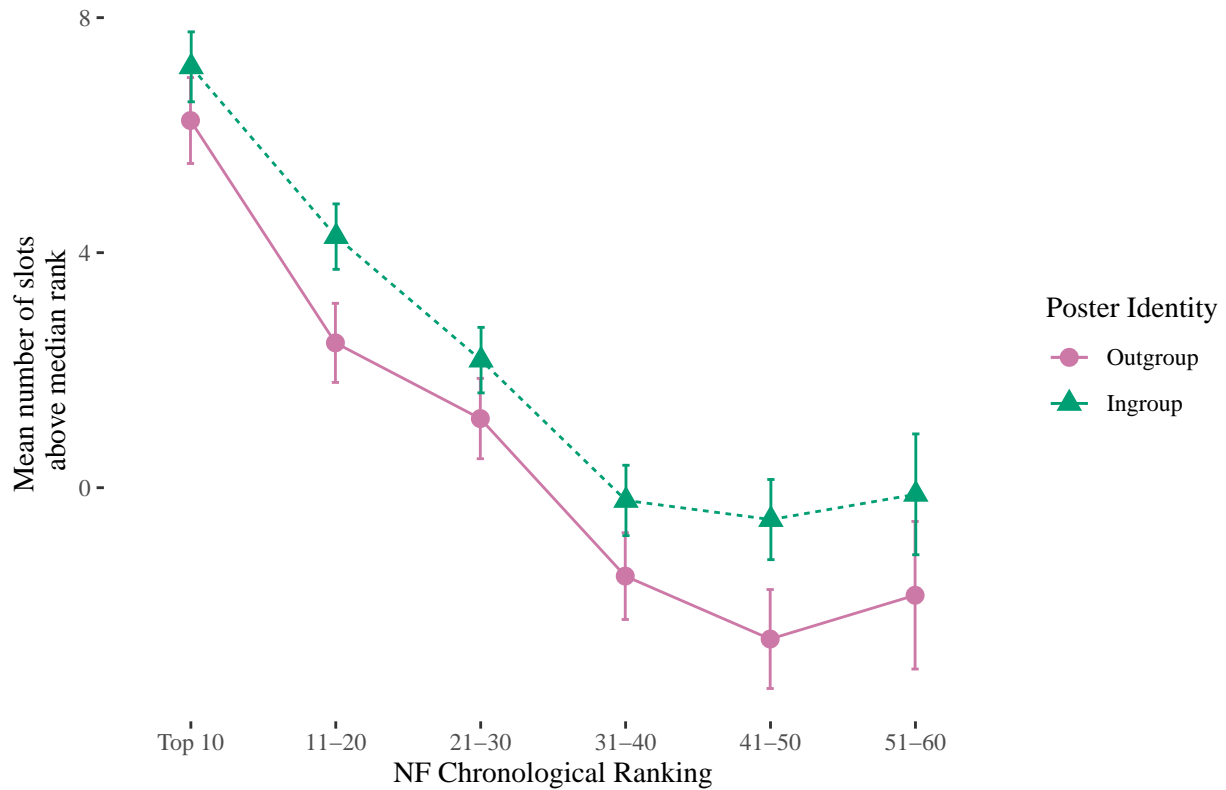




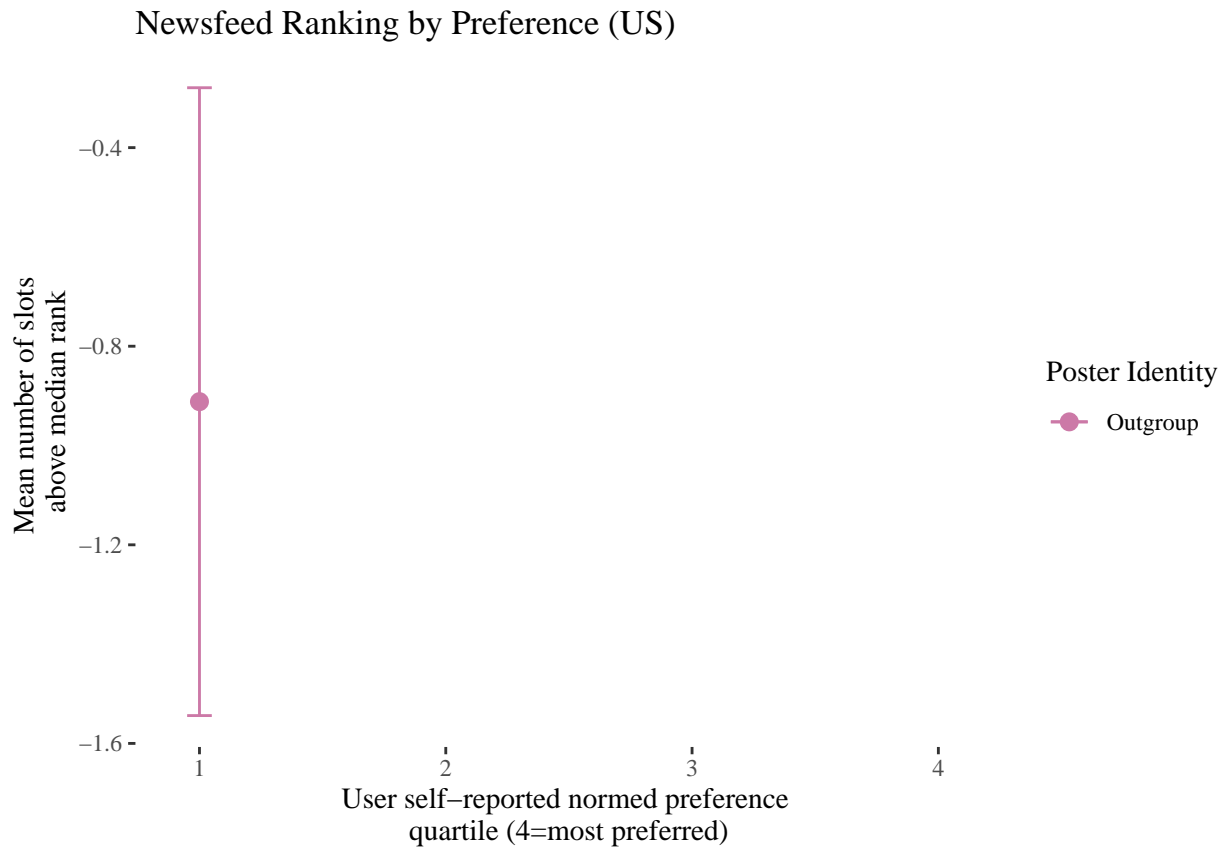
Newsfeed Ranking by Preference (US)



Newsfeed Ranking by Age of Post (US)

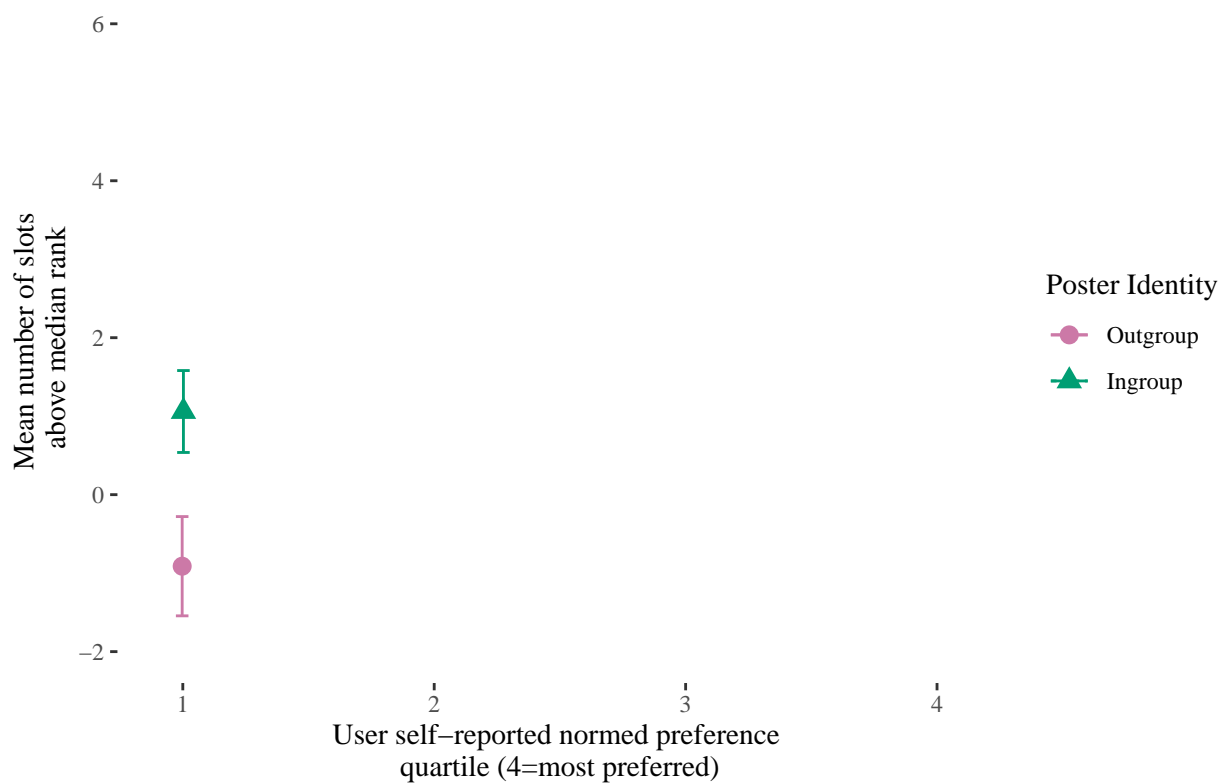


```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

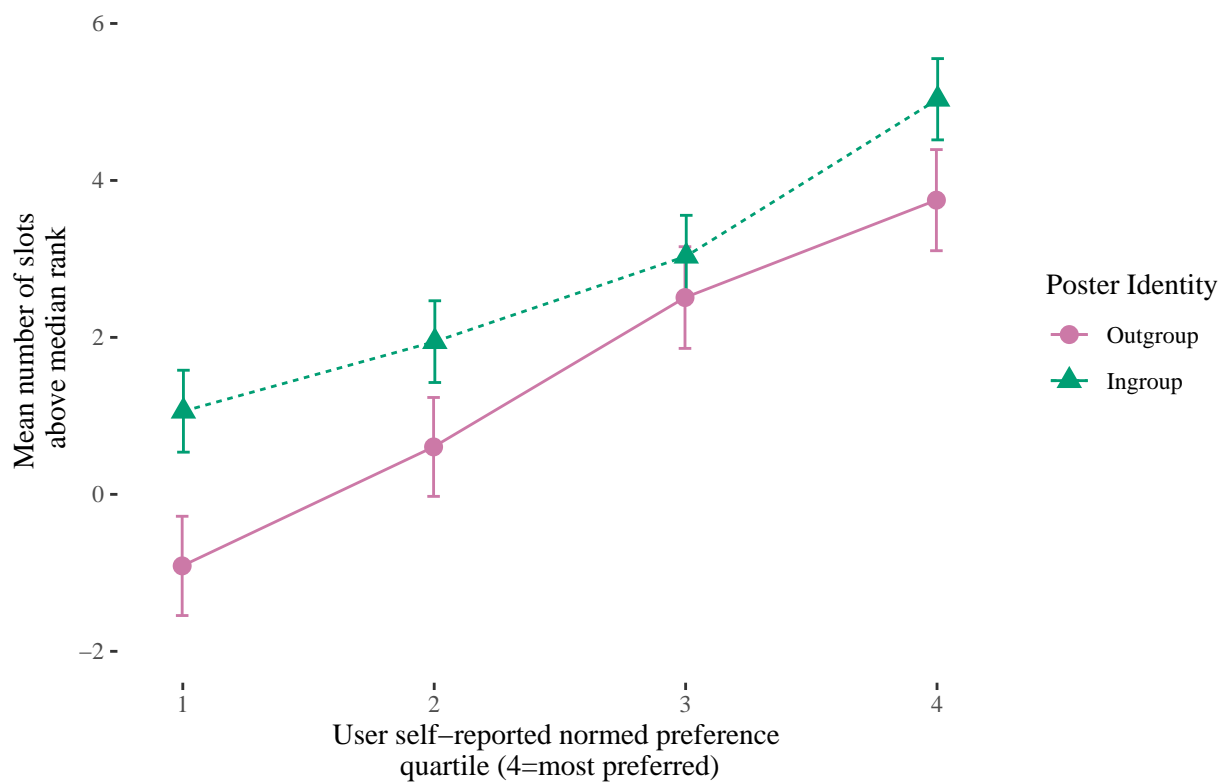


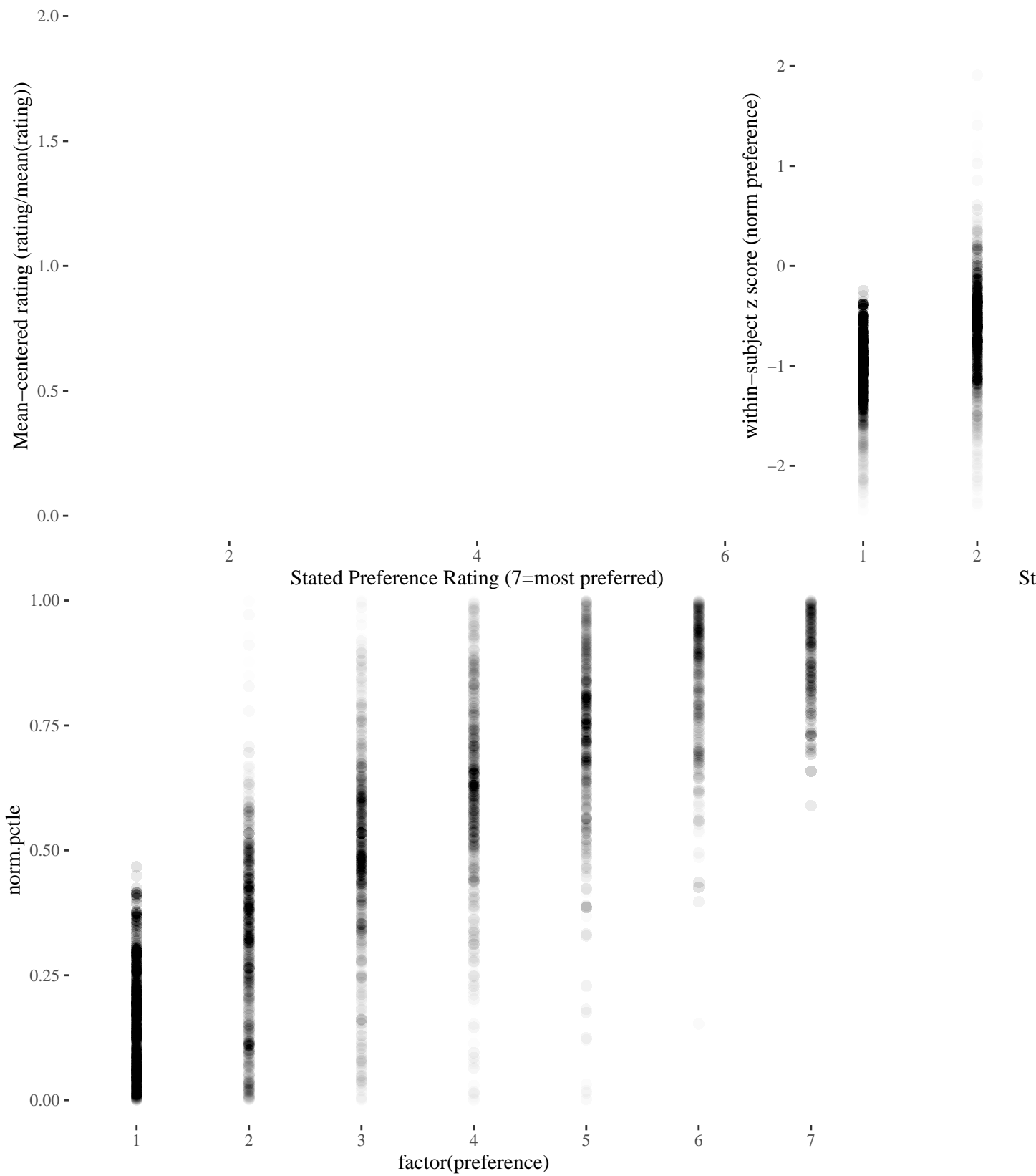
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

Newsfeed Ranking by Preference (US)



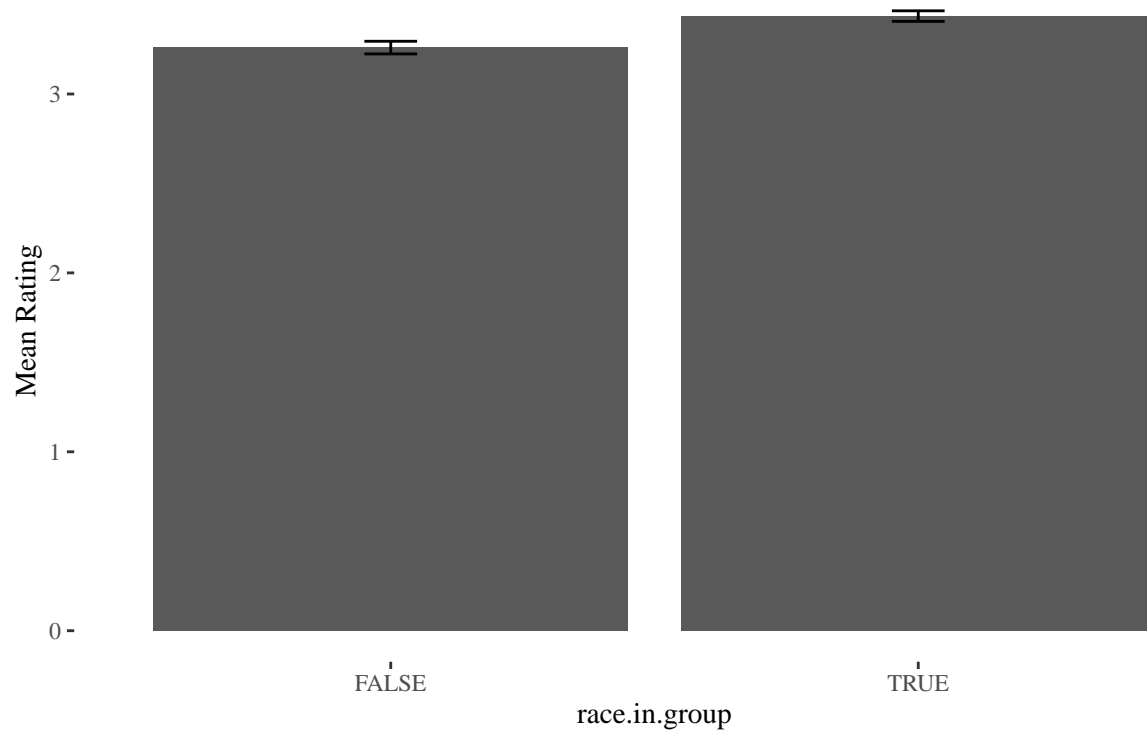
Newsfeed Ranking by Preference (US)





## Raw Reported Preference by Race Group

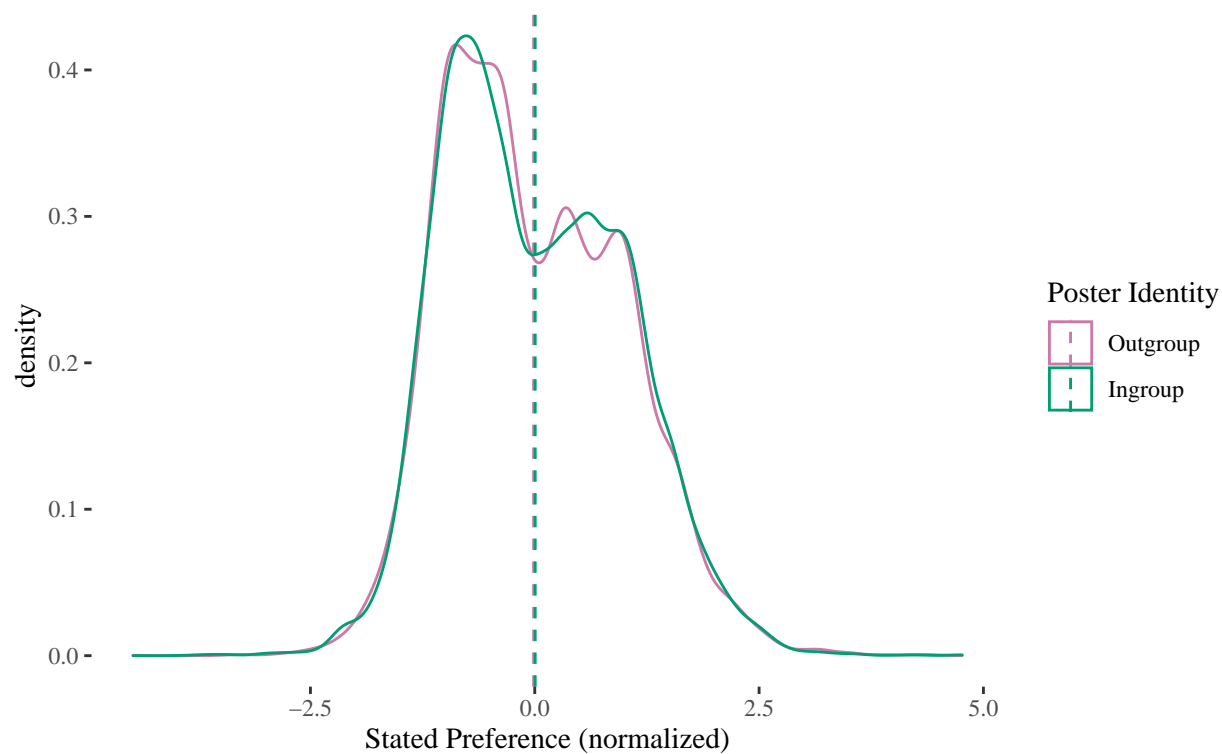
Same-race posts are slightly more preferred



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

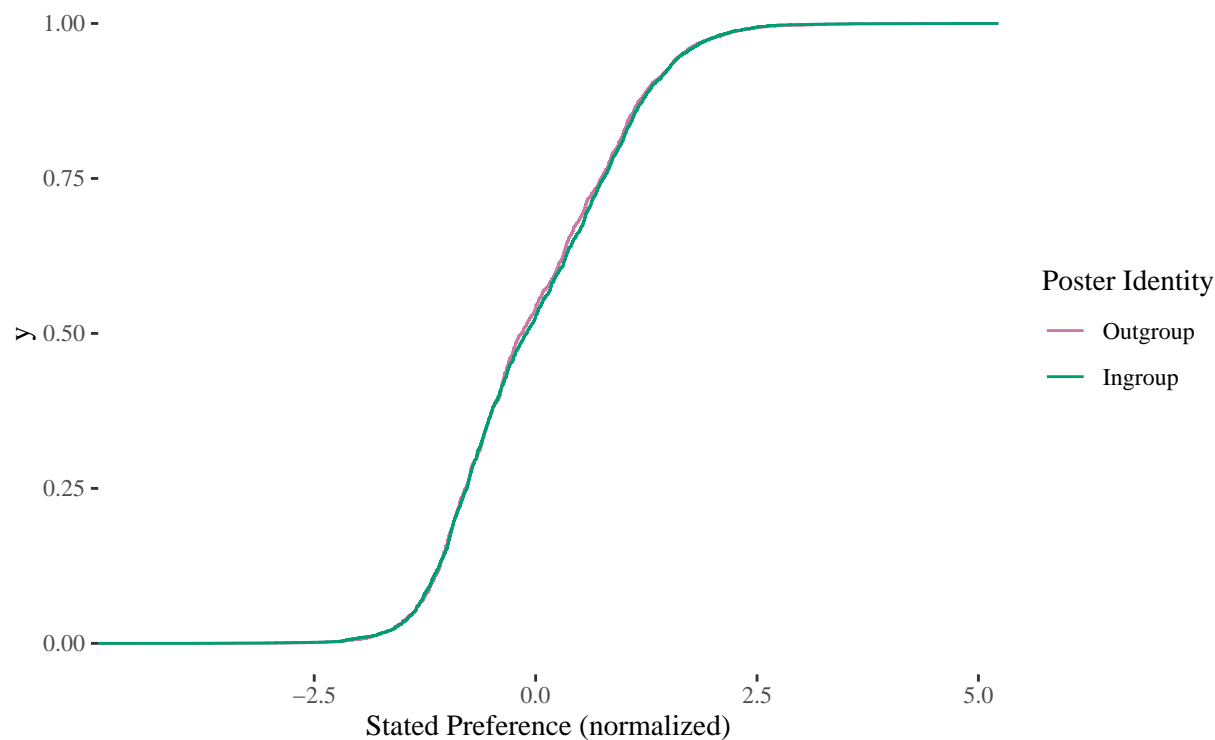
### Distribution of normalized preference by race

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



### Cumulative distribution of normalized preference by race

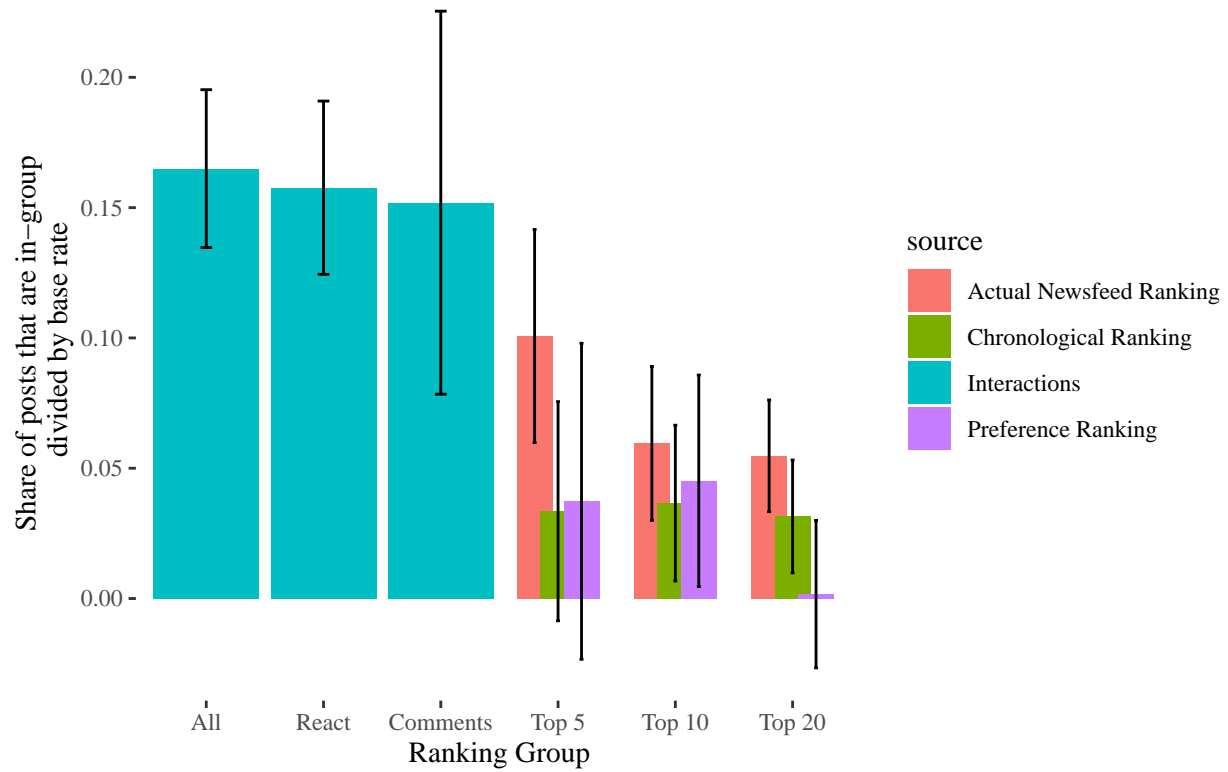
Same-race posts are not rated as more preferred by the user

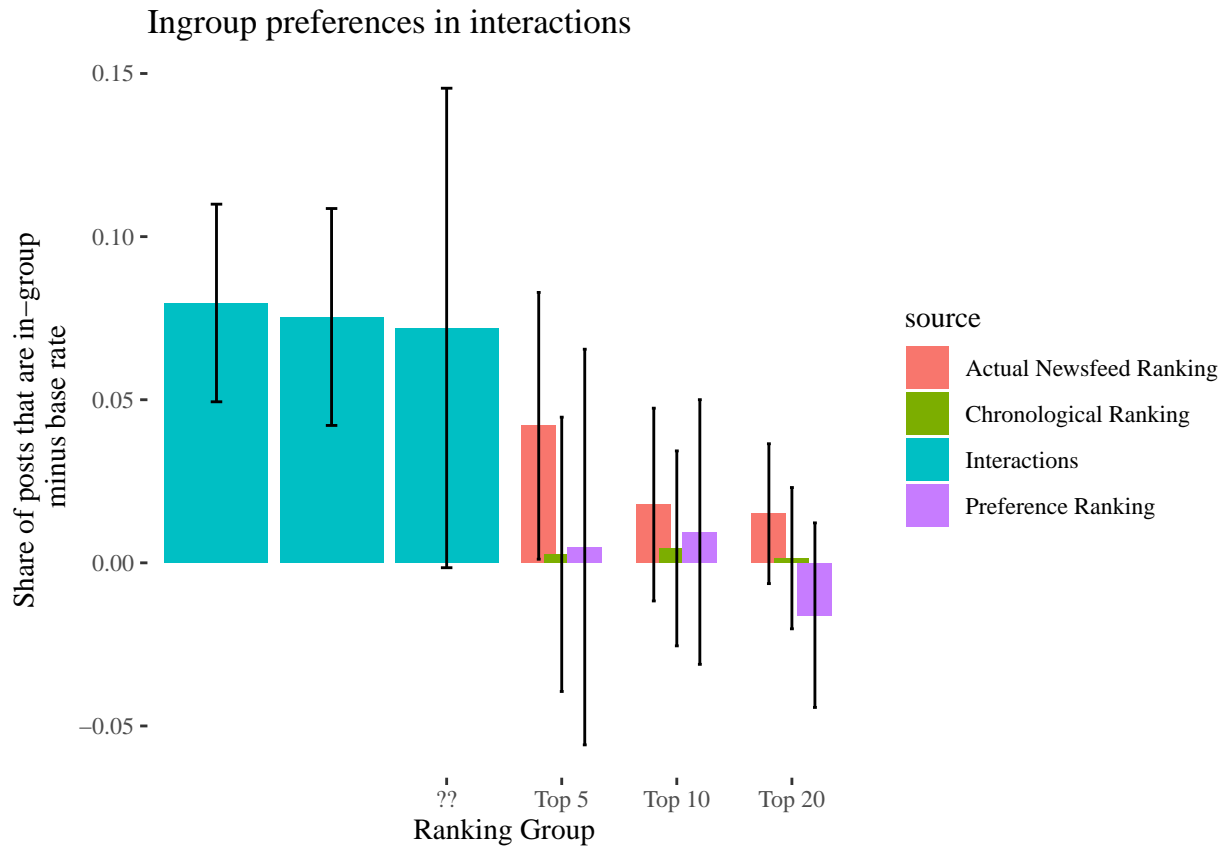




```
## Adding missing grouping variables: `dedupid`  
## Adding missing grouping variables: `dedupid`
```

### Ingroup preferences in interactions





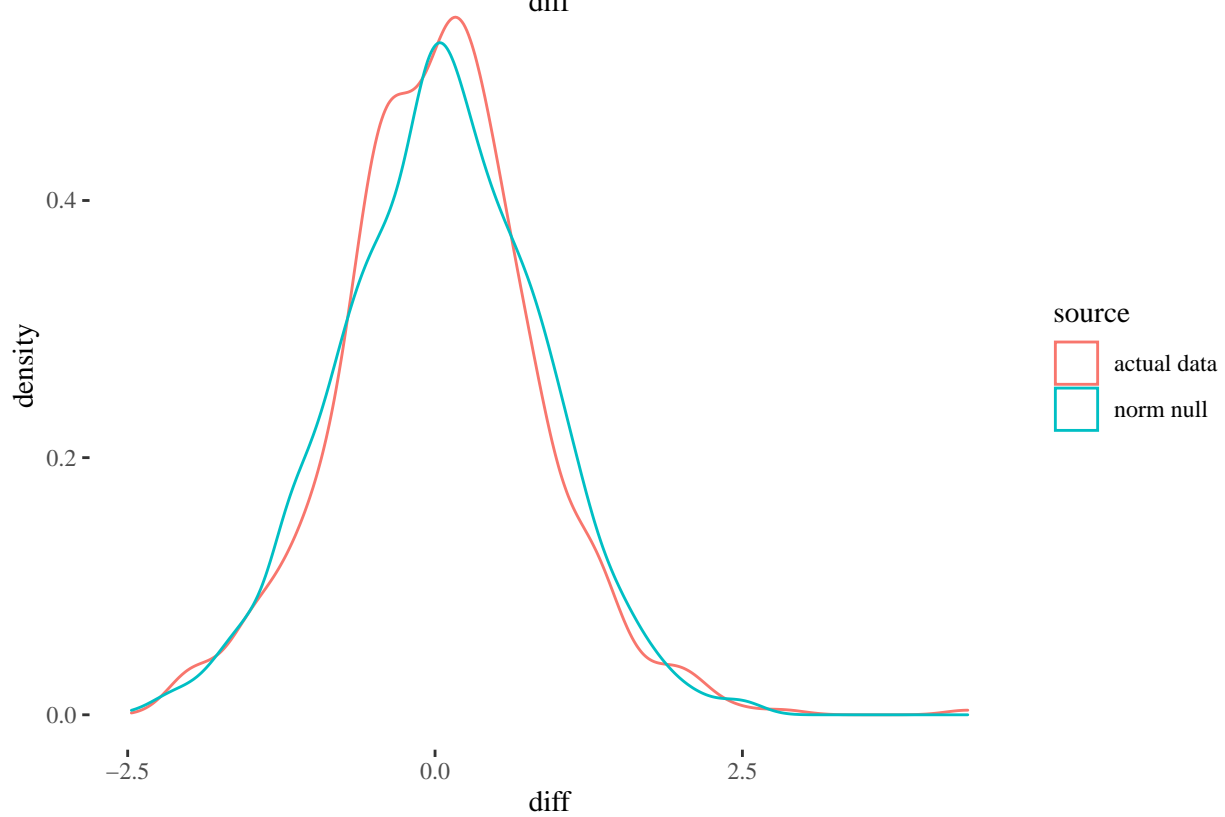
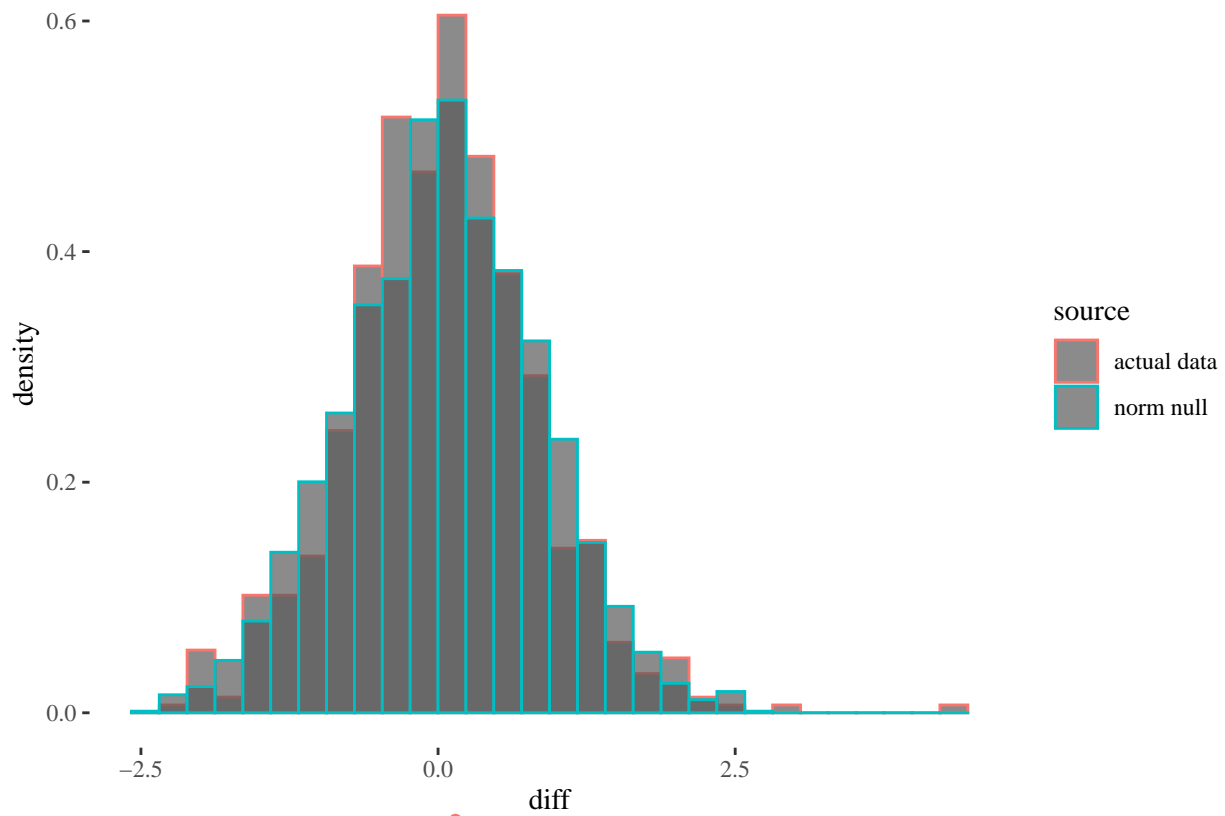
```
% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Jan 26, 2021 - 14:12:24
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

Table 6: In-group Baseline Heterogeneity Results - NF

	<i>Dependent variable:</i>		
	nf.order		
	(1) pctle	(2) qrtle	(3) med
race.in.group	−0.748* (0.447)	−0.733 (0.476)	−1.108*** (0.303)
I(100 *in.group.pctle)	0.017** (0.007)		
factor(in.group.quartile)1		0.454 (0.389)	
factor(in.group.quartile)2		0.368 (0.463)	
factor(in.group.quartile)3		1.719*** (0.650)	
factor(in.group.med.split)1			0.590 (0.380)
I(100 *norm.pctle)	−0.058*** (0.004)	−0.058*** (0.004)	−0.058*** (0.004)
race.in.groupTRUE:I(100 *in.group.pctle)	−0.015* (0.009)		
race.in.groupTRUE:factor(in.group.quartile)1		−0.747 (0.633)	
race.in.groupTRUE:factor(in.group.quartile)2		−0.779 (0.664)	
race.in.groupTRUE:factor(in.group.quartile)3		−1.662** (0.799)	
race.in.groupTRUE:factor(in.group.med.split)1			−0.546 (0.477)
Constant	31.469*** (0.328)	31.694*** (0.303)	31.868*** (0.261)
Observations	27,267	27,267	27,267
R <sup>2</sup>	0.011	0.011	0.011
Adjusted R <sup>2</sup>	0.011	0.011	0.011

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01



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Table 7: Diff in mean in-out liking Heterogeneity Results - NF

	<i>Dependent variable:</i>		
	nf.order		
	(1) pctle	(2) qtrle	(3) med
race.in.group	−0.981** (0.441)	−0.987** (0.447)	−0.769** (0.306)
I(100 *jens.pctle)	0.006 (0.006)		
factor(jens.quartile)1		0.059 (0.485)	
factor(jens.quartile)2		1.226** (0.483)	
factor(jens.quartile)3		0.285 (0.491)	
factor(jens.med.split)1			0.739** (0.332)
I(100 *norm.pctle)	−0.058*** (0.004)	−0.058*** (0.004)	−0.057*** (0.004)
race.in.groupTRUE:I(100 *jens.pctle)	−0.005 (0.008)		
race.in.groupTRUE:factor(jens.quartile)1		0.483 (0.615)	
race.in.groupTRUE:factor(jens.quartile)2		−1.082* (0.616)	
race.in.groupTRUE:factor(jens.quartile)3		−0.204 (0.620)	
race.in.groupTRUE:factor(jens.med.split)1			−0.878** (0.430)
Constant	31.708*** (0.414)	31.561*** (0.421)	31.576*** (0.311)
Observations	27,267	27,267	27,267
R <sup>2</sup>	0.011	0.011	0.011
Adjusted R <sup>2</sup>	0.011	0.011	0.011

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 8: In-group Baseline Heterogeneity Results - PYMK

	<i>Dependent variable:</i>		
	pymk.order		
	(1) pctle	(2) qrtle	(3) med
race.in.group	0.614 (0.474)	−0.008 (0.517)	0.594* (0.323)
I(100 *in.group.pctle)	−0.003 (0.007)		
factor(in.group.quartile)1		−0.793** (0.403)	
factor(in.group.quartile)2		−0.017 (0.464)	
factor(in.group.quartile)3		0.046 (0.619)	
factor(in.group.med.split)1			0.325 (0.375)
I(100 *norm.pctle)	−0.089*** (0.004)	−0.089*** (0.004)	−0.089*** (0.004)
race.in.groupTRUE:I(100 *in.group.pctle)	−0.004 (0.009)		
race.in.groupTRUE:factor(in.group.quartile)1		1.208* (0.679)	
race.in.groupTRUE:factor(in.group.quartile)2		0.124 (0.698)	
race.in.groupTRUE:factor(in.group.quartile)3		−0.256 (0.798)	
race.in.groupTRUE:factor(in.group.med.split)1			−0.680 (0.486)
Constant	33.767*** (0.344)	33.892*** (0.317)	33.574*** (0.273)
Observations	24,511	24,511	24,511
R <sup>2</sup>	0.022	0.023	0.022
Adjusted R <sup>2</sup>	0.022	0.022	0.022

Note:

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

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% Date and time: Tue, Jan 26, 2021 - 14:12:29

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% Date and time: Tue, Jan 26, 2021 - 14:12:29

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu  
% Date and time: Tue, Jan 26, 2021 - 14:12:29

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

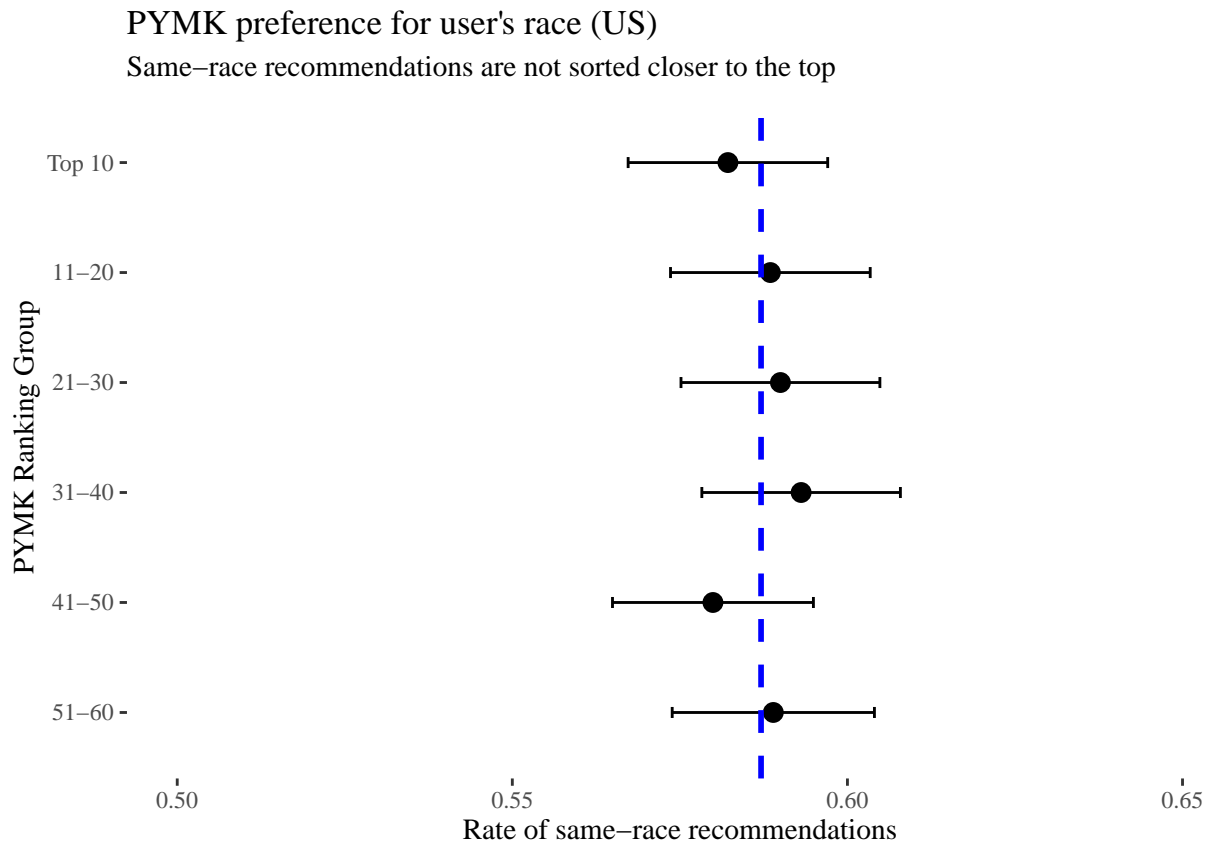


Table 9: Diff in mean in-out liking Heterogeneity Results - PYMK

	<i>Dependent variable:</i>		
	pymk.order		
	(1) pctle	(2) qrtle	(3) med
race.in.group	0.595 (0.444)	0.411 (0.440)	0.498 (0.311)
I(100 *jens.pctle)	-0.001 (0.006)		
factor(jens.quartile)1		0.110 (0.463)	
factor(jens.quartile)2		0.037 (0.473)	
factor(jens.quartile)3		0.111 (0.482)	
factor(jens.med.split)1			0.019 (0.338)
I(100 *norm.pctle)	-0.089*** (0.004)	-0.089*** (0.004)	-0.089*** (0.004)
race.in.groupTRUE:I(100 *jens.pctle)	-0.006 (0.008)		
race.in.groupTRUE:factor(jens.quartile)1		0.175 (0.622)	
race.in.groupTRUE:factor(jens.quartile)2		-0.098 (0.626)	
race.in.groupTRUE:factor(jens.quartile)3		-0.635 (0.631)	
race.in.groupTRUE:factor(jens.med.split)1			-0.458 (0.445)
Constant	33.715*** (0.399)	33.594*** (0.387)	33.647*** (0.307)
Observations	24,511	24,511	24,511
R <sup>2</sup>	0.022	0.022	0.022
Adjusted R <sup>2</sup>	0.022	0.022	0.022

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01



Table 10: Time Results - Rank

	<i>Dependent variable:</i>		
	nf.order		
	(1)	(2)	(3)
	all	all2	base
I(100 *norm.pctle)	−0.062*** (0.004)	−0.062*** (0.004)	−0.059*** (0.004)
time_rank	0.201*** (0.011)	0.192*** (0.007)	
race.in.group	−0.958** (0.391)	−1.344*** (0.207)	−1.285*** (0.210)
time_rank:race.in.group	−0.016 (0.014)		
Constant	27.327*** (0.346)	27.556*** (0.284)	31.947*** (0.241)
Observations	28,175	28,175	28,175
R <sup>2</sup>	0.038	0.038	0.011
Adjusted R <sup>2</sup>	0.038	0.038	0.011

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

Table 11: Time Results - Top 10

	<i>Dependent variable:</i>			
	nf.order			
	(1)	(2)	(3)	(4)
	all	days	hours	mins
race.in.group	−1.344*** (0.207)	−1.321*** (0.213)	−1.285*** (0.272)	−1.706*** (0.648)
I(100 *norm.pctle)	−0.062*** (0.004)	−0.062*** (0.004)	−0.063*** (0.005)	−0.076*** (0.011)
time_rank	0.192*** (0.007)	0.187*** (0.007)	0.195*** (0.012)	−0.012 (0.069)
Constant	27.556*** (0.284)	27.565*** (0.291)	27.555*** (0.360)	28.772*** (0.803)
Observations	28,175	26,724	17,557	3,323
R <sup>2</sup>	0.038	0.037	0.027	0.017
Adjusted R <sup>2</sup>	0.038	0.037	0.027	0.016

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

Table 12: Time Results - Top 10

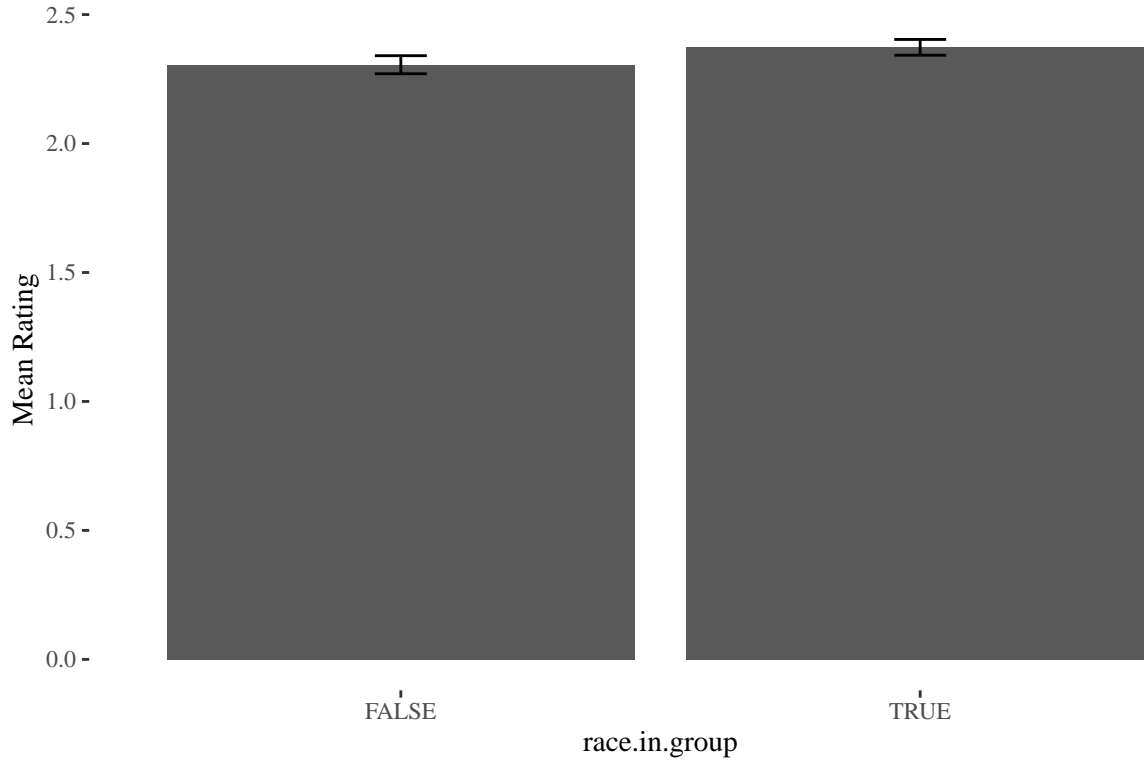
	<i>Dependent variable:</i>			
	nf.order			
	(1)	(2)	(3)	(4)
	all	recent10	recent20	recent30
race.in.group	−1.344*** (0.207)	−0.898** (0.454)	−1.416*** (0.318)	−1.196*** (0.260)
I(100 *norm.pctle)	−0.062*** (0.004)	−0.073*** (0.008)	−0.064*** (0.005)	−0.061*** (0.004)
time_rank	0.192*** (0.007)	0.160** (0.077)	0.276*** (0.027)	0.248*** (0.015)
Constant	27.556*** (0.284)	27.157*** (0.655)	26.611*** (0.454)	26.579*** (0.367)
Observations	28,175	6,540	12,882	18,689
R <sup>2</sup>	0.038	0.015	0.020	0.026
Adjusted R <sup>2</sup>	0.038	0.015	0.020	0.026

Note:

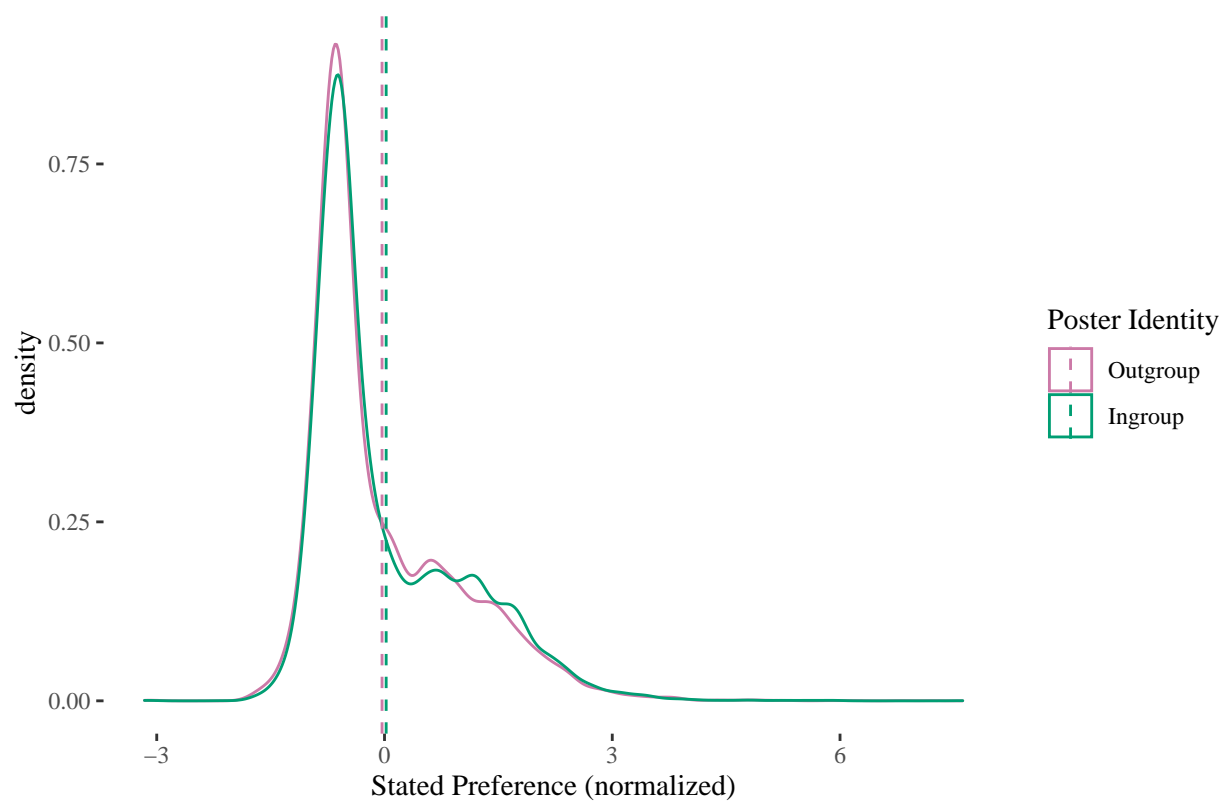
\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

### Raw Reported Preference by Race Group

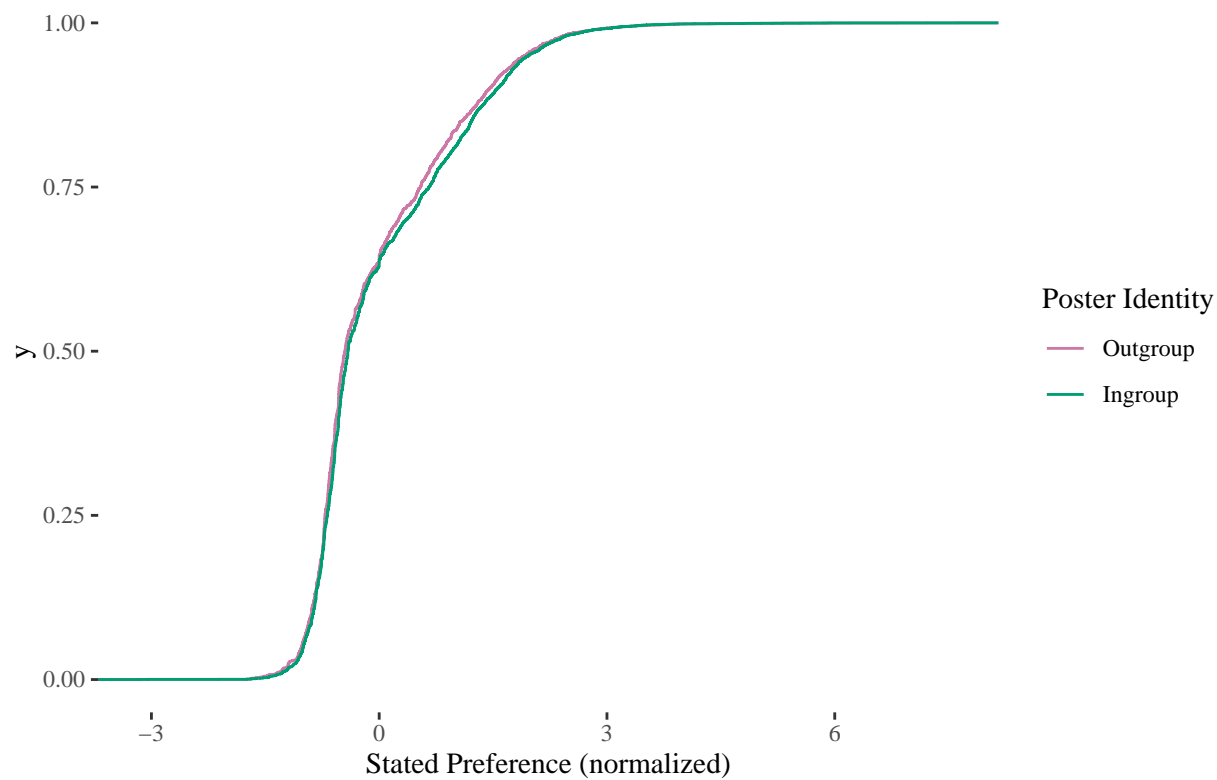
Same-race posts are slightly more preferred

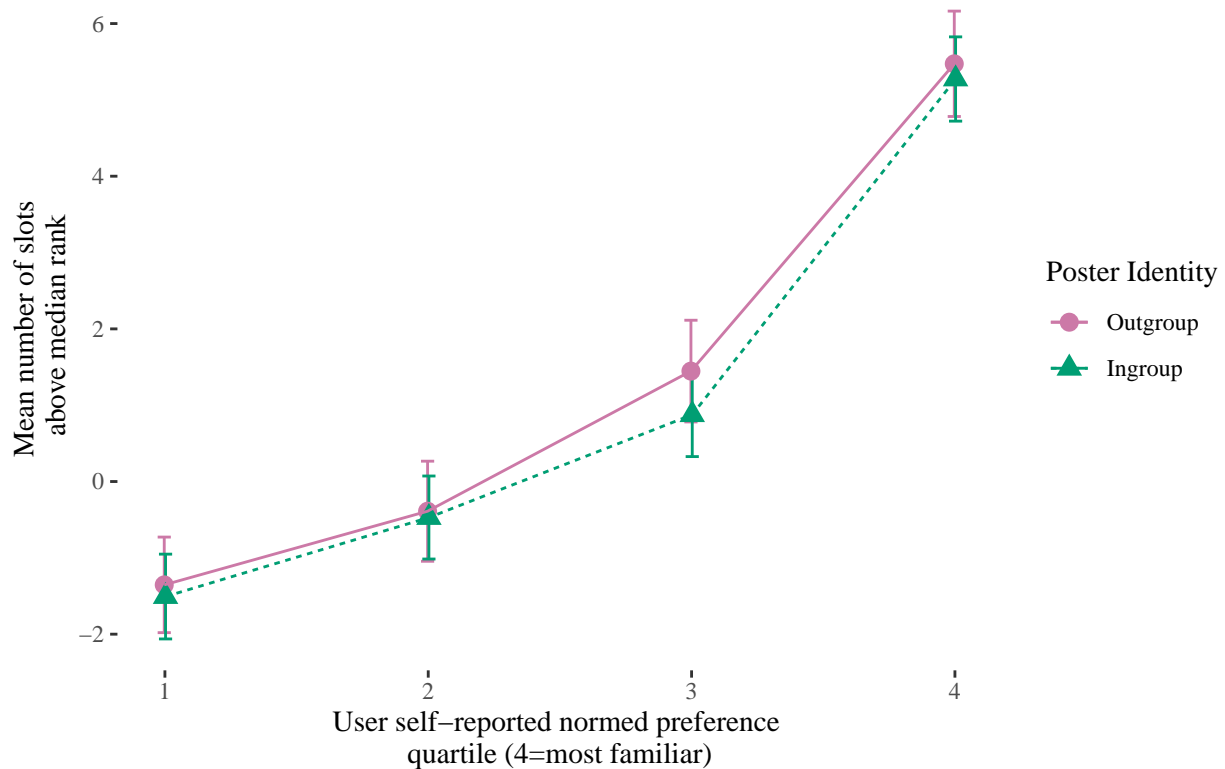
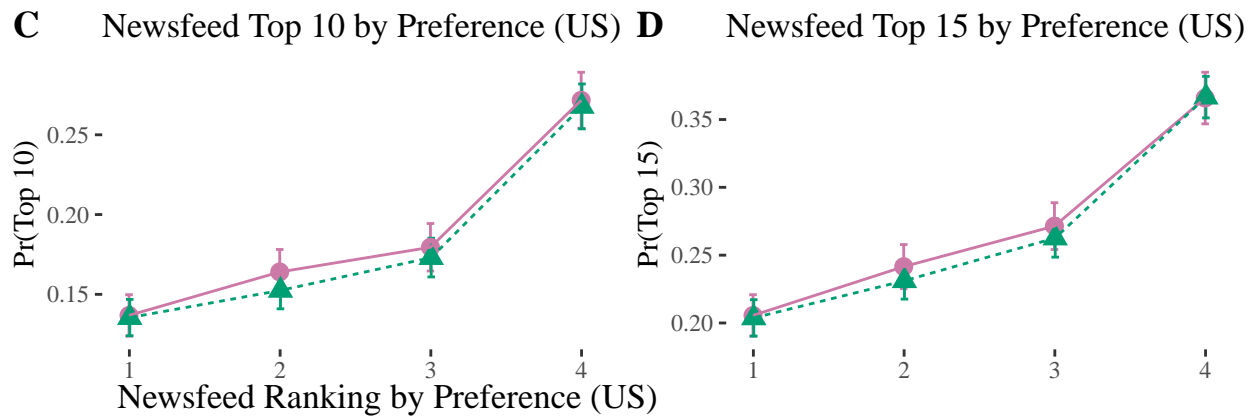
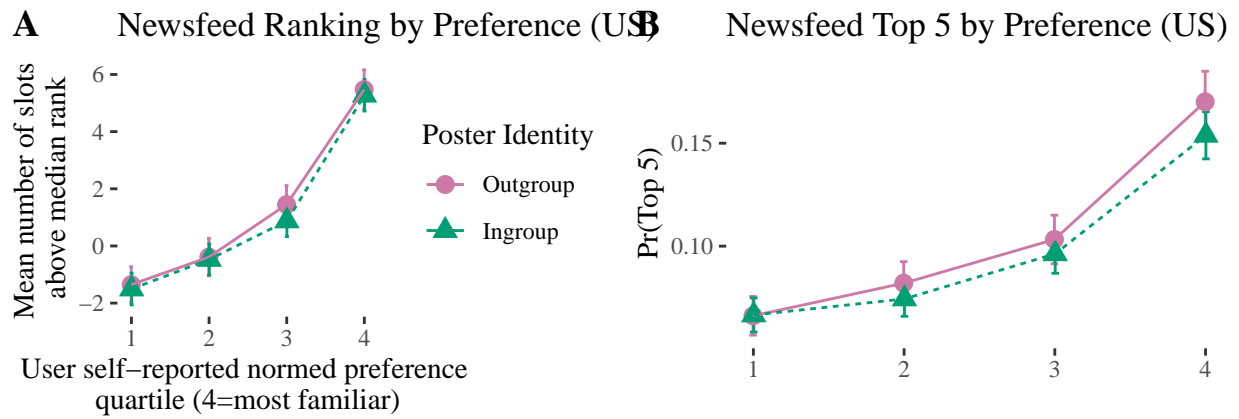


Distribution of normalized preference by race

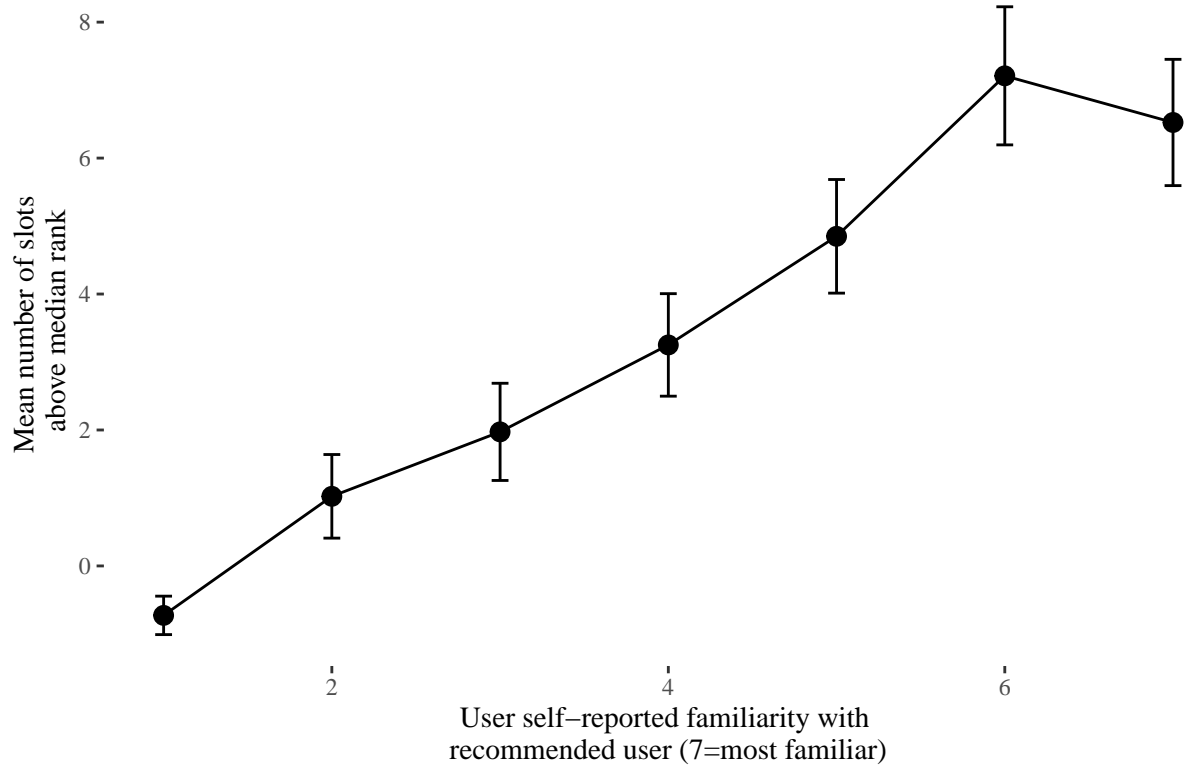


Cumulative distribution of normalized preference by race

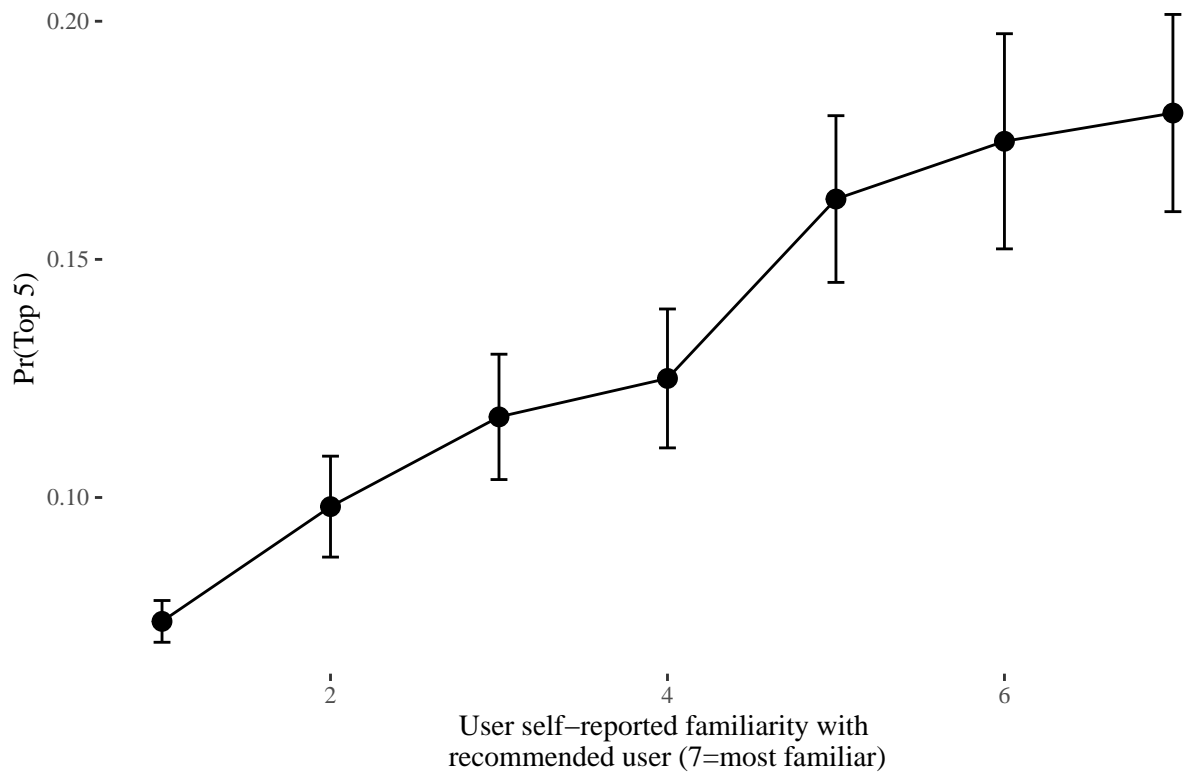




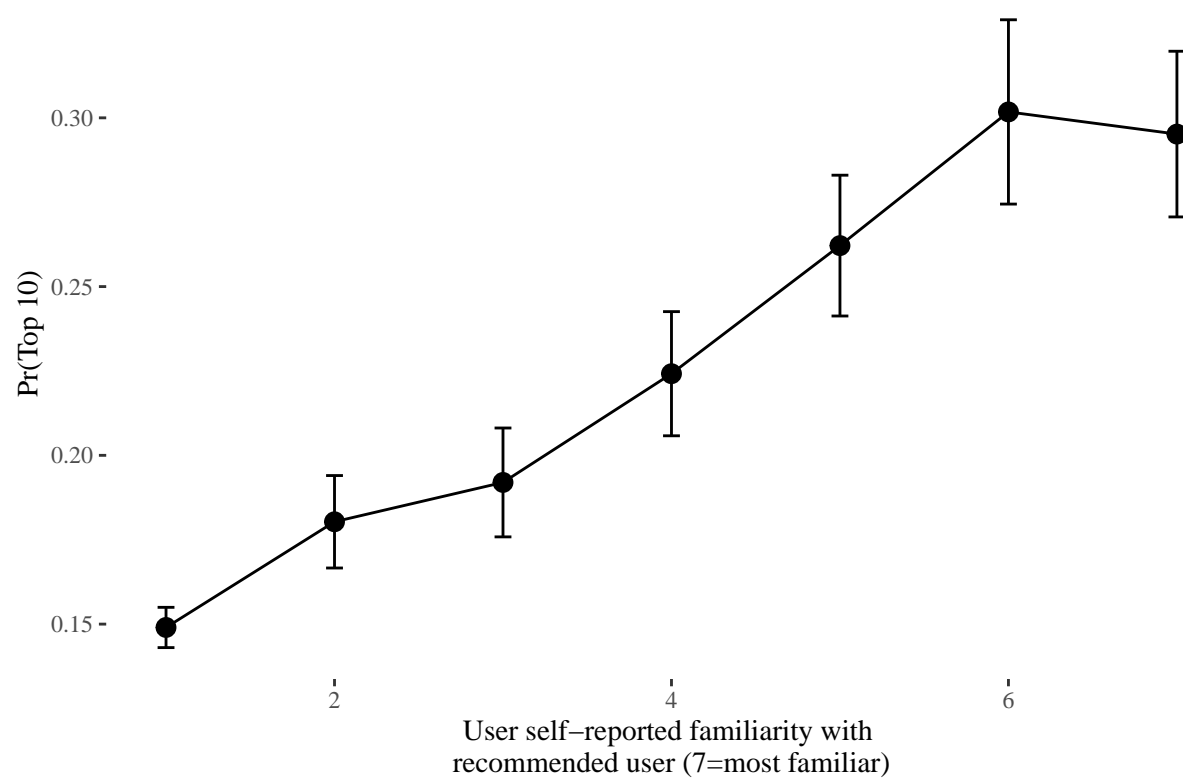
PYMK Ranking by Preference (US)



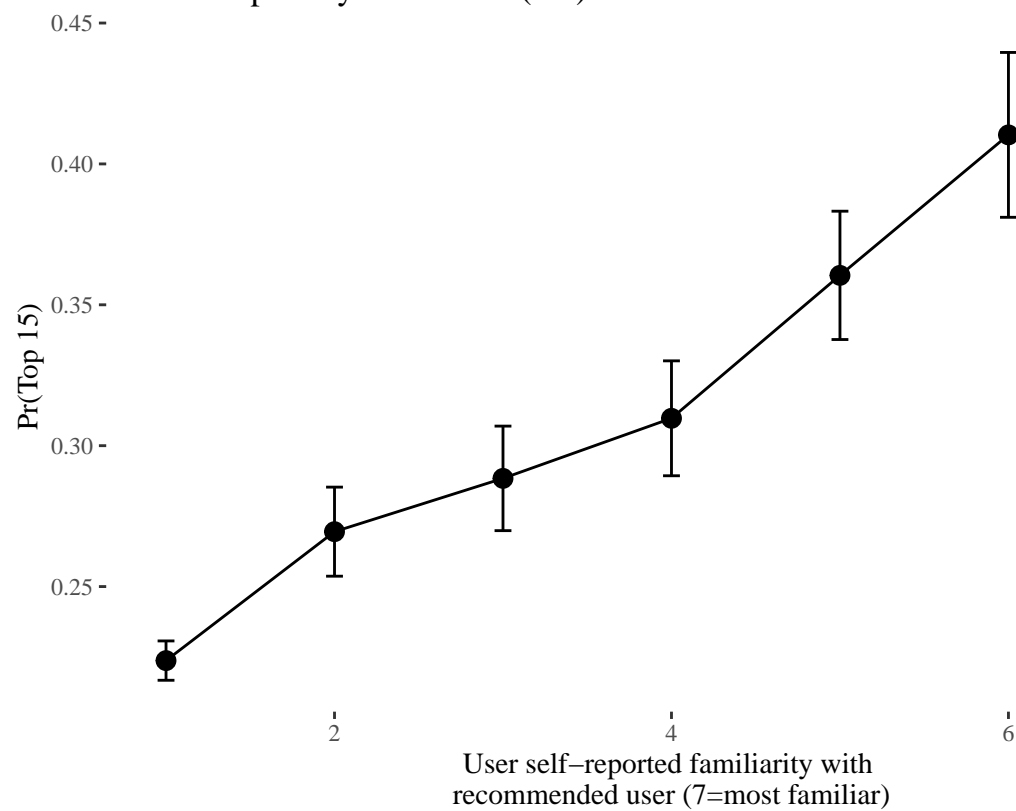
PYMK Top 5 by Preference (US)



PYMK Top 10 by Preference (US)



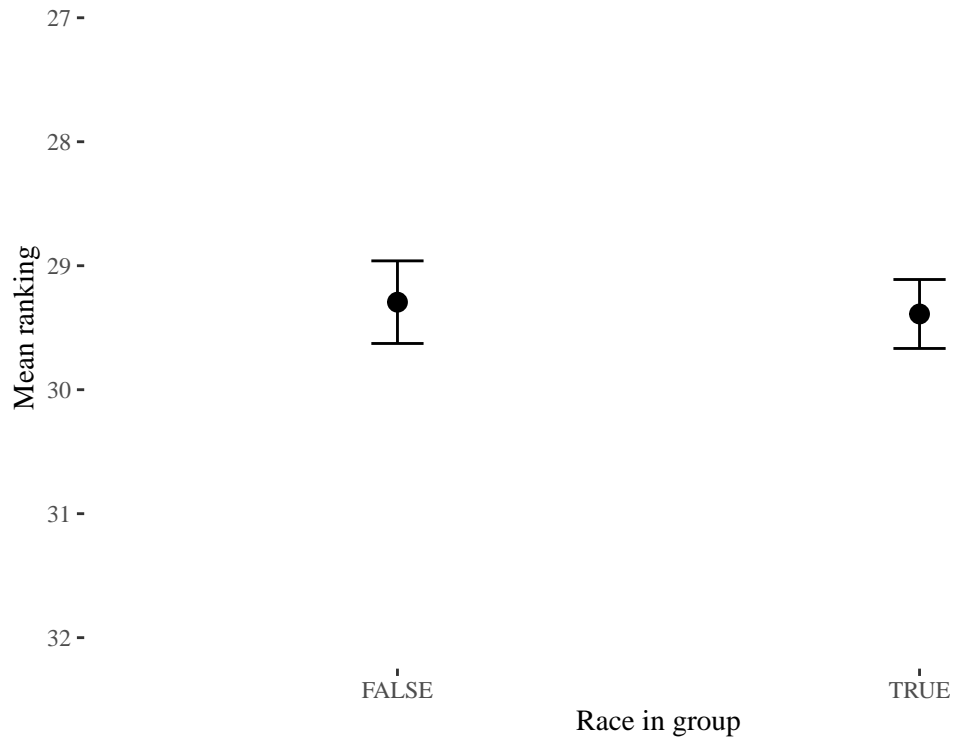
PYMK Top 15 by Preference (US)



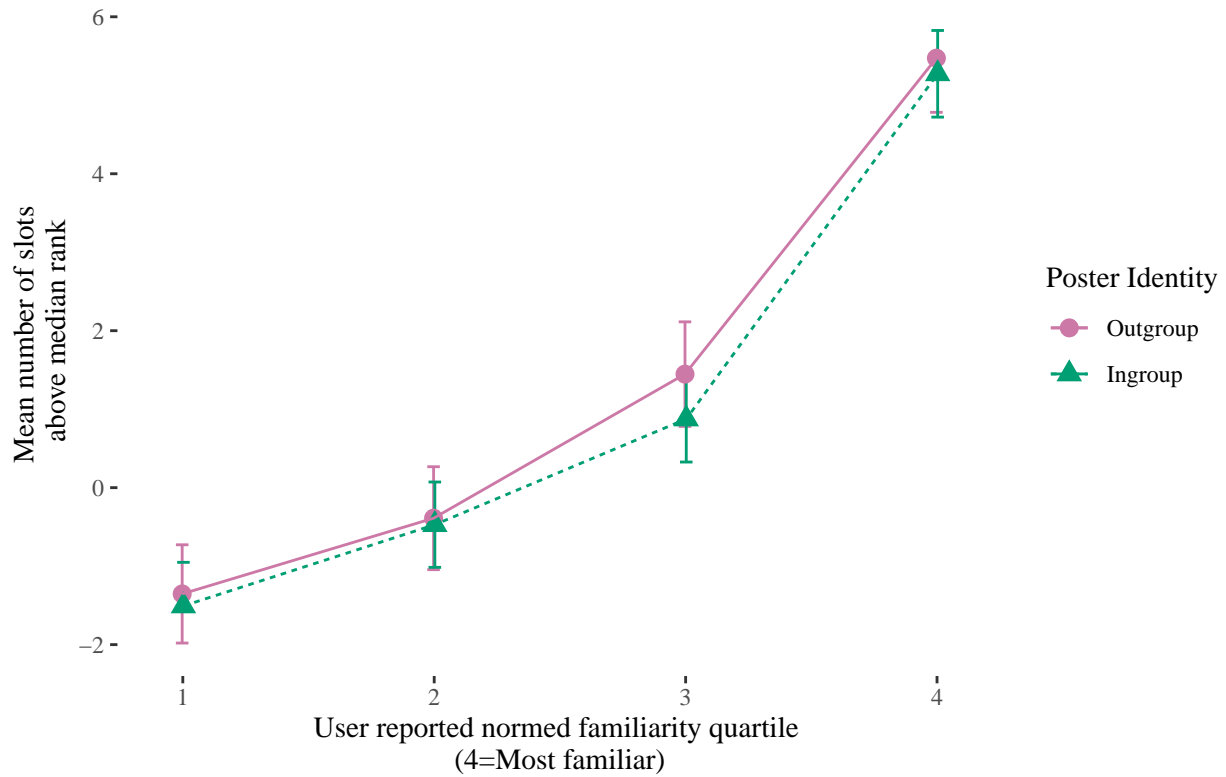
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

## PYMK Ranking by Identity

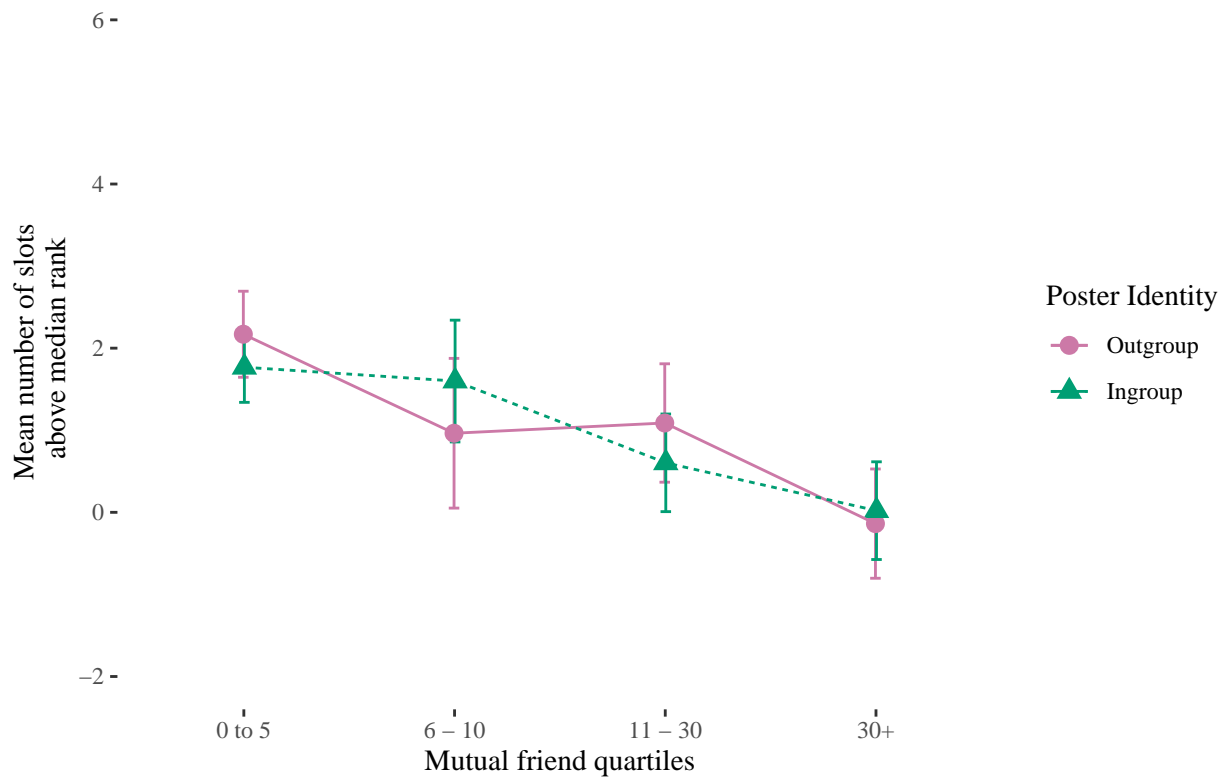
No evidence of differential treatments by race



PYMK Ranking by Familiarity (US)

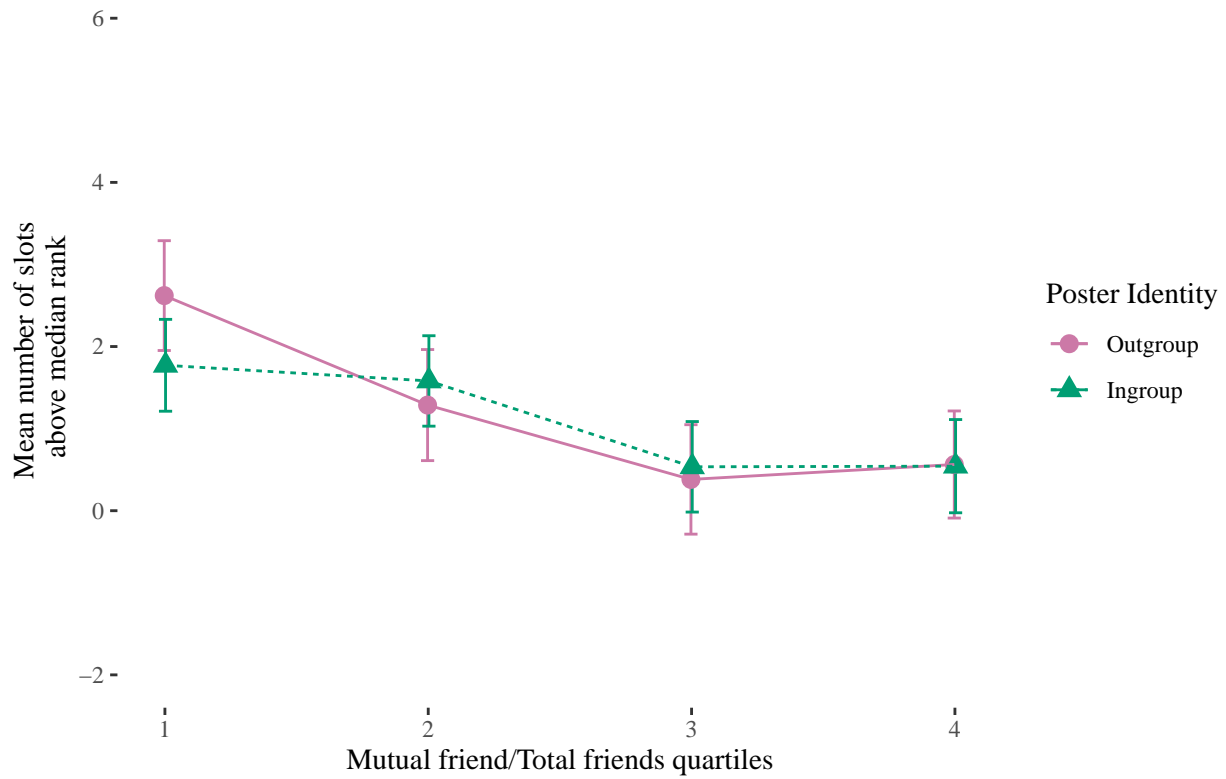


PYMK Ranking by Familiarity (US)

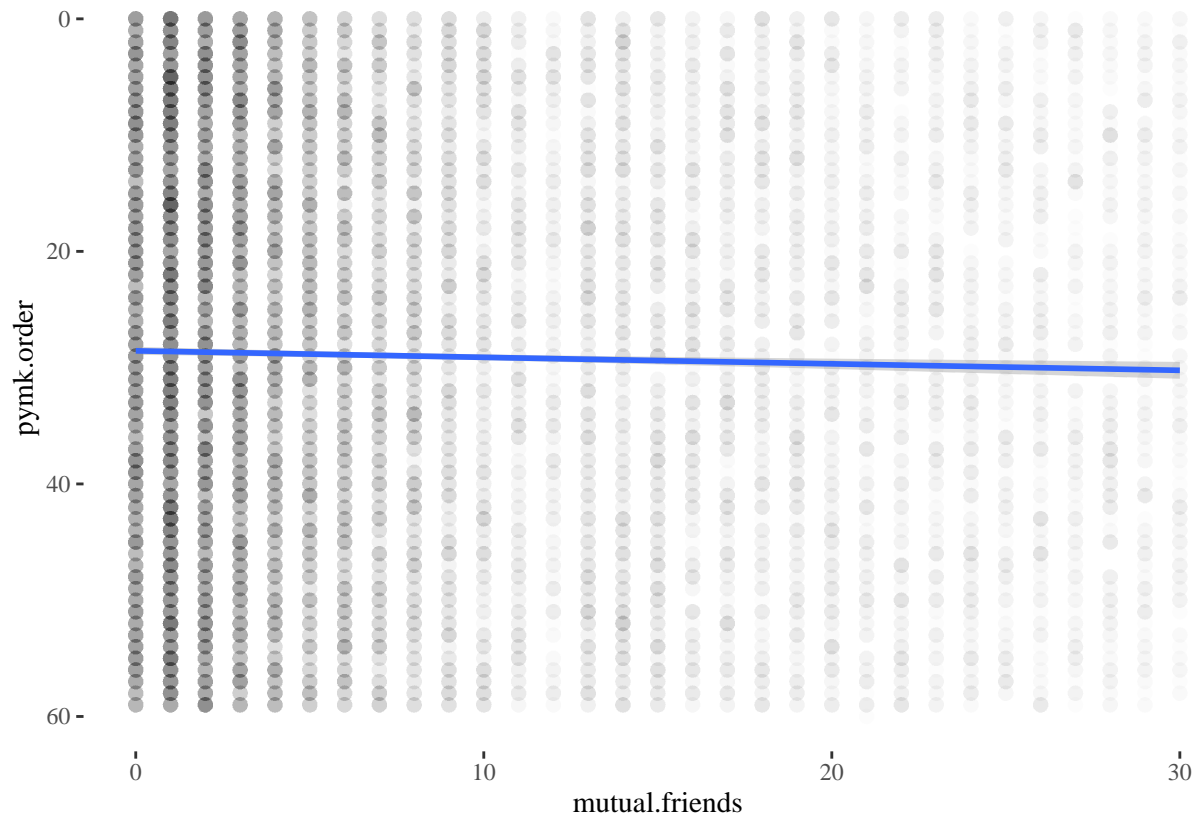


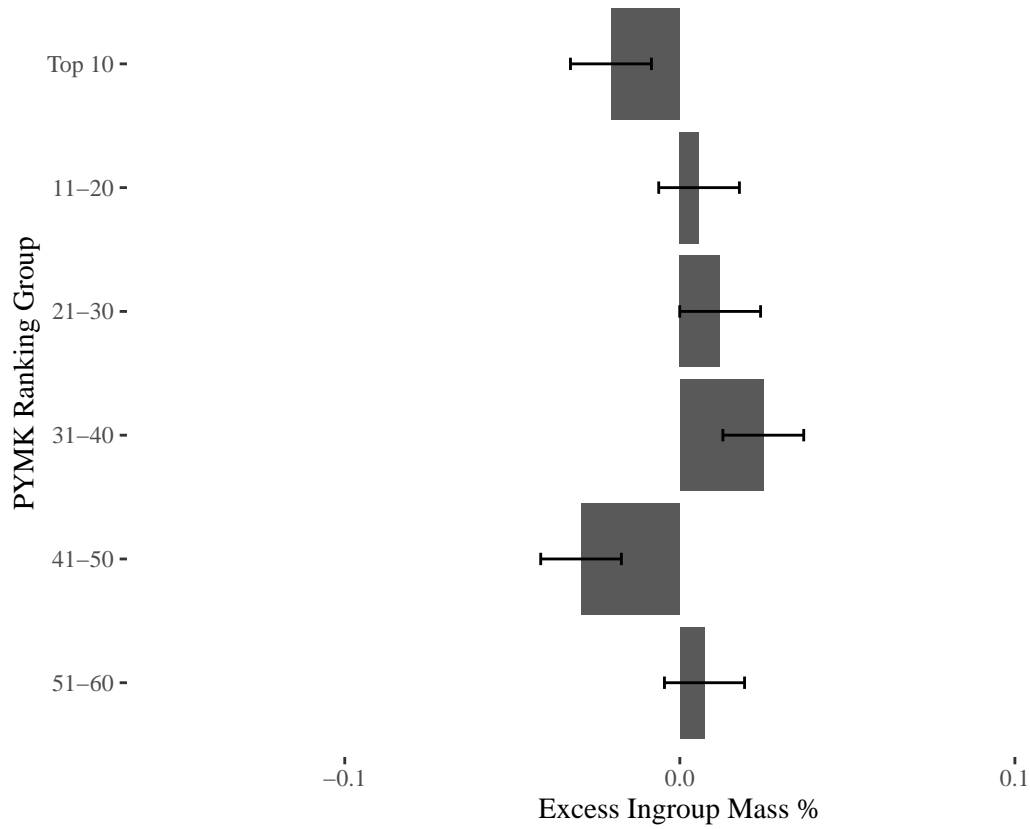


## PYMK Ranking by Familiarity (US)



## `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: Tue, Jan 26, 2021 - 14:12:45

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu  
 % Date and time: Tue, Jan 26, 2021 - 14:12:46

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 % Date and time: Tue, Jan 26, 2021 - 14:12:46

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu  
 % Date and time: Tue, Jan 26, 2021 - 14:12:46

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 % Date and time: Tue, Jan 26, 2021 - 14:12:48

Table 13: Primary NF Rank Results

	<i>Dependent variable:</i>				
	nf.order				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
race.in.group	1.285*** (0.210)	1.088*** (0.319)	0.940 (0.681)	0.809 (0.691)	1.946*** (0.383)
I(100 *norm.pctle)	0.059*** (0.004)	0.072*** (0.006)	0.039*** (0.012)	0.040*** (0.012)	0.051*** (0.006)
Constant	-31.947*** (0.241)	-32.806*** (0.355)	-29.776*** (0.766)	-30.382*** (0.770)	-32.044*** (0.438)
Observations	28,175	11,777	2,505	2,532	10,954
R <sup>2</sup>	0.011	0.015	0.005	0.005	0.010
Adjusted R <sup>2</sup>	0.011	0.015	0.004	0.004	0.009

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 14: Primary NF Top 10 Results

	<i>Dependent variable:</i>				
	top10				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
I(100 *norm.pctle)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0003)	0.001** (0.0003)	0.001*** (0.0001)
race.in.group	0.023*** (0.005)	0.017** (0.007)	0.037** (0.016)	0.016 (0.015)	0.034*** (0.009)
Constant	0.120*** (0.005)	0.109*** (0.008)	0.112*** (0.018)	0.152*** (0.017)	0.120*** (0.010)
Observations	28,175	11,777	2,505	2,532	10,954
R <sup>2</sup>	0.006	0.009	0.010	0.002	0.005
Adjusted R <sup>2</sup>	0.006	0.009	0.009	0.001	0.005

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 15: Primary PYMK Rank Results

	<i>Dependent variable:</i>				
	pymk.order				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
race.in.group	−0.258 (0.219)	−0.388 (0.320)	0.564 (0.746)	−0.237 (0.799)	−0.415 (0.390)
I(100 *norm.pctle)	0.090*** (0.004)	0.084*** (0.006)	0.112*** (0.013)	0.075*** (0.014)	0.096*** (0.006)
Constant	−33.698*** (0.248)	−33.359*** (0.358)	−35.319*** (0.839)	−33.202*** (0.855)	−33.792*** (0.438)
Observations	25,111	11,405	2,085	1,920	9,401
R <sup>2</sup>	0.022	0.020	0.033	0.015	0.026
Adjusted R <sup>2</sup>	0.022	0.020	0.033	0.014	0.026
<i>Note:</i>			*p<0.1; **p<0.05; ***p<0.01		

Table 16: Primary PYMK Top 10 Results

	<i>Dependent variable:</i>				
	top10				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
I(100 *norm.pctle)	0.002*** (0.0001)	0.002*** (0.0001)	0.002*** (0.0003)	0.001*** (0.0003)	0.002*** (0.0001)
race.in.group	−0.006 (0.005)	−0.014* (0.007)	−0.007 (0.017)	0.009 (0.018)	0.001 (0.009)
Constant	0.101*** (0.006)	0.107*** (0.008)	0.094*** (0.019)	0.107*** (0.019)	0.095*** (0.010)
Observations	25,111	11,405	2,085	1,920	9,401
R <sup>2</sup>	0.017	0.017	0.018	0.011	0.018
Adjusted R <sup>2</sup>	0.016	0.016	0.017	0.010	0.018
<i>Note:</i>			*p<0.1; **p<0.05; ***p<0.01		

Table 17: Secondary NF Rank Results (Robustness for nonlinear in preference)

	<i>Dependent variable:</i>				
	nf.order				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
race.in.group	1.296*** (0.210)	1.077*** (0.319)	0.879 (0.682)	0.804 (0.694)	1.973*** (0.383)
factor(norm.decile)0.2	0.166 (0.460)	0.536 (0.718)	2.575* (1.464)	-2.033 (1.582)	0.024 (0.734)
factor(norm.decile)0.3	0.439 (0.458)	0.179 (0.721)	2.237 (1.670)	-2.046 (1.608)	1.425** (0.716)
factor(norm.decile)0.4	0.783* (0.459)	1.163 (0.725)	0.711 (1.439)	-2.068 (1.457)	1.075 (0.749)
factor(norm.decile)0.5	1.767*** (0.459)	2.411*** (0.723)	2.661* (1.573)	0.011 (1.545)	1.507** (0.722)
factor(norm.decile)0.6	2.427*** (0.459)	3.333*** (0.730)	2.972** (1.410)	-1.647 (1.503)	2.328*** (0.735)
factor(norm.decile)0.7	2.465*** (0.458)	2.752*** (0.736)	3.545*** (1.347)	-1.399 (1.496)	2.720*** (0.734)
factor(norm.decile)0.8	2.732*** (0.461)	3.467*** (0.750)	4.324*** (1.389)	0.723 (1.621)	1.984*** (0.711)
factor(norm.decile)0.9	3.486*** (0.460)	4.630*** (0.729)	0.926 (1.409)	1.032 (1.495)	3.638*** (0.738)
factor(norm.decile)1	6.200*** (0.460)	7.426*** (0.721)	5.778*** (1.544)	3.921** (1.553)	5.616*** (0.731)
Constant	-31.067*** (0.349)	-31.786*** (0.551)	-30.289*** (1.027)	-27.987*** (1.135)	-31.523*** (0.591)
Observations	28,175	11,777	2,505	2,532	10,954
R <sup>2</sup>	0.012	0.017	0.010	0.011	0.011
Adjusted R <sup>2</sup>	0.012	0.016	0.007	0.007	0.010

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 18: Secondary NF Rank Results (Robustness for white vs not white)

	<i>Dependent variable:</i>				
	nf.order				
	(1)	(2)	(3)	(4)	(5)
	all.mdl	asian.mdl	black.mdl	hispanic.mdl	white.mdl
same.race.alt	0.887*** (0.222)	0.303 (0.331)	0.396 (0.736)	0.563 (0.734)	1.914*** (0.380)
I(100 *norm.pctle)	0.059*** (0.004)	0.073*** (0.006)	0.039*** (0.012)	0.040*** (0.012)	0.051*** (0.006)
Constant	-31.786*** (0.255)	-32.461*** (0.379)	-29.558*** (0.833)	-30.380*** (0.859)	-32.008*** (0.435)
Observations	28,175	11,777	2,505	2,532	10,954
R <sup>2</sup>	0.010	0.014	0.005	0.005	0.010
Adjusted R <sup>2</sup>	0.010	0.014	0.004	0.004	0.009

*Note:*

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