sociological science

Supplement to:

Soderstrom, Sara B., Brian Uzzi, Derek D. Rucker, James H. Fowler and Daniel Diermeier. 2016. "Timing Matters: How Social Influence Affects Adoption Pre- and Postproduct Release." Sociological Science 3: 915-939.

APPENDIX 1. DESCRIPTIVE STATISTICS AND CORRELATIONS

	Average/ Percentage (Std. Dev.)	Min	Max	1.	2.	3.	4.	5.	6.	7.
1. 1st Week-end box office	9.0 (9.0)	0.1	75.2	1.00						
2. 2nd Week-end box office	13.7 (13.5)	0.2	66.9	0.84**	1.00					
3. Post-release WOM	.241 (.109)	0.06	0.67	0.68**	0.77**	1.00				
4. Pre-release WOM	.186 (.090)	0.04	0.62	0.63**	0.69**	0.94**	1.00			
5. Screens	2189 (730)	60	3653	0.67**	0.55**	0.49**	0.45**	1.00		
6. Budget (millions)	40.8 (30.8)	0.4	170	0.47**	0.51**	0.45**	0.46**	0.44**	1.00	
7. Critics' reviews	46.8 (17.5)	7	90	0.18**	0.31**	0.12	0.09	-0.18*	0.18*	1.00
8. Avidity	0.34 (.08)	0.14	0.64	-0.31**	-0.14*	-0.14*	-0.13	-0.32**	-0.15*	0.12
9. Holiday release	19.0			0.08	0.18*	0.12	0.16	0.04	0.24**	0.18**
10. Star power	0.37 (.58)	0	7	0.25**	0.28**	0.27**	0.25**	0.18*	0.39**	0.13
Genre										
11. Action-Adventure	26.5			0.21**	0.19**	0.17*	0.17*	0.17*	0.24**	-0.02
12. Comedy	31.9			-0.12	-0.08	-0.04	-0.04	-0.09	-0.25**	-0.13
13. Drama	25.7			-0.13	-0.14	-0.08	-0.11	-0.19*	-0.04	0.15*
14. Horror	4.8			0.04	0.03	0.07	0.06	0.00	-0.11	-0.12
15. Sci-Fi	1.4			-0.01	-0.06	-0.03	-0.04	0.06	0.07	-0.05
16. Family	9.7			0.06	0.06	-0.09	-0.04	0.15*	0.15*	0.11
Rating										
17. G	5.5			0.01	0.00	-0.11	-0.06	0.10	-0.02	0.03
18. PG	10.5			0.09	0.14	-0.03	-0.03	0.13	0.14*	0.06
19. PG-13	40.5			0.11	0.07	0.14	0.12	0.14*	0.14	-0.14
20. R	43.5			-0.16*	-0.15*	-0.07	-0.07	-0.26**	-0.21**	0.09

Descriptive statistics and correlations (continued)

	8.	9.	10.	11.	12.	13.	14.	15.	16.
8. Avidity	1.00								
9. Holiday release	-0.05	1.00							
10. Star power	-0.04	0.13	1.00						
Genre									
11. Action-Adventure	-0.02	0.05	0.03	1.00					
12. Comedy	0.08	-0.08	-0.05	-0.40	1.00				
13. Drama	0.04	-0.03	0.05	-0.35	-0.42	1.00			
14. Horror	-0.07	-0.06	-0.08	-0.12	-0.14	-0.13	1.00		
15. Sci-Fi	-0.05	0.11	0.00	-0.08	-0.09	-0.08	-0.03	1.00	
16. Family	-0.11	0.10	0.01	-0.19	-0.22	-0.20	-0.07	-0.04	1.00
Rating									
17. G	-0.06	0.05	-0.03	-0.11	-0.14	-0.14*	-0.05	-0.03	0.64**
18. PG	-0.18**	0.11	0.01	-0.08	-0.07	-0.07	-0.07	0.10	0.33**
19. PG-13	-0.05	-0.03	0.07	-0.04	0.22**	-0.02	-0.08	0.03	-0.22**
20. R	0.19**	-0.06	-0.06	0.14	-0.11	0.13	0.11	-0.08	-0.27**

	18.	19.	20.	21.
Rating				
17. G	1.00			
18. PG	-0.08	1.00		
19. PG-13	-0.19	-0.27	1.00	
20. R	-0.21	-0.30	-0.73	1.00

** p < 0.1%; * p < 1%; p < 5% (two-tailed test of significance)

APPENDIX 2. SIMULATION CODE

```
### Housekeeping functions needed for all models

# load libraries into R library(igraph) library(foreign)

# get real networks  d<-read.csv("addhealth_dyads.csv") edgelist<-
matrix(as.character(c(d$ego[ind],d$alter[ind])),ncol=2) dnet<-simplify(graph.edgelist(edgelist))

# get real movie data d2<-read.csv("WOM_sim_data.csv") attach(d2)

# create a function that removes oneself from neighbor list remove_self<-function(x) {

n<-length(x) if(n==1) NULL else x[2:n]

}

### THE HYPOTHESIZED MODEL WOM<-obo<-pbo<-NULL  for(i in dim(d2)[1]) {

## pre release

# read in observed WOM level to seed the network initial_reach<-d2$WOM[i]

# decide which friends hear about movie V(dnet)$b<-
as.numeric(runif(vcount(dnet),0,1)<initial_reach)

# draw a random variable for probability people tell each friend about movie prob_tell_friend<-
runif(1,0.01,0.05)

# create list of people connected to those who initially hear about the movie neighbor_list<-
neighborhood(dnet,1,which(V(dnet)$b>0),mode="in") XXX neighbors<-
unlist(lapply(neighbor_list,remove_self))

# create list of people who hear about the movie from friends WOMed_neighbors<-
neighbors[which(runif(length(neighbors),0,1)<prob_tell_friend)]

1

# count number of each person's friends who hear about movie WOMed_neighbors_count<-
table(WOMed_neighbors) WOMed_neighbors_index<-
as.numeric(names(WOMed_neighbors_count)) V(dnet)$b[WOMed_neighbors_index]<-
V(dnet)$b[WOMed_neighbors_index]
```

```
 WOMed_neighbors_count ## opening weekend stats

# calculate how many heard WOM WOM<-c(WOM,mean(V(dnet)$b>0))

# generate a small log-normally-distributed error to add to total fraction who see movie
error_term<-rlnorm(1,log(0.001),log(4))

# what fraction of the population went to see the movie?  # (anyone who heard about movie from
2 or more friends) # (include small random error term)  obo<-c(obo, max(0,mean(V(dnet)$b>1)
error_term))

# identify people who saw movie opening weekend V(dnet)$s<-as.numeric(V(dnet)$b>1)

## post release rec word of mouth

# set probability someone will recommend a movie they saw prob_rec_movie<-0.15

# create list of people connected to those who saw the movie neighbor_list<-
neighborhood(dnet,1,which(V(dnet)$s==1),mode="in") neighbors<-
unlist(lapply(neighbor_list,remove_self))

# create list of people who hear about the movie from friends who saw it reced_neighbors<-
neighbors[which(runif(length(neighbors),0,1)<prob_rec_movie)]

# count number of each person's friends who hear about movie reced_neighbors_count<-
table(reced_neighbors) reced_neighbors_index<-as.numeric(names(reced_neighbors_count))

# identify people who saw movie  V(dnet)$s2<-rep(0,vcount(dnet))
V(dnet)$s2[reced_neighbors_index]<-V(dnet)$s2[reced_neighbors_index]

reced_neighbors_count ## post opening weekend stats

# how many people see movie after opening weekend?  # (be sure to exclude those who already
saw it)  # (include small random error term)  pbo<-c(pbo,
max(0,mean(V(dnet)$s2>0&V(dnet)$s==0) error_term))

}
```

APPENDIX 3. REGRESSION RESULTS INCLUDING CONTROLS

Pre-Release WOM and First Week Product Adoption

	Linear Models		Threshold Piece-wise Linear Models					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
			35th percentile	40th percentile	45th percentile	55th percentile	65th percentile	70th percentile
Pre-release WOM		94.940**						
		(6.962)						
Pre-release WOM: Slope 1			39.159*	39.186**	26.726*	34.888**	37.346**	37.310**
			(17.060)	(14.621)	(13.411)	(11.135)	(8.937)	(8.772)
Pre-release WOM: Slope difference			78.423**	81.093**	94.729**	94.073**	98.588**	99.322**
			(18.994)	(17.058)	(16.180)	(14.817)	(15.633)	(16.495)
Screen (log)	6.138**	1.559*	2.750**	2.820**	2.827**	2.846**	2.946**	2.945**
	(1.273)	(0.791)	(1.012)	(1.031)	(1.053)	(1.028)	(1.066)	(1.065)
Budget (sqrt)	22.70**	9.322**	8.317**	8.459**	8.496**	8.512**	8.850**	8.809**
	(3.324)	(2.636)	(2.600)	(2.609)	(2.617)	(2.616)	(2.616)	(2.596)
Critics' reviews	0.187**	0.127**	0.131**	0.134**	0.135**	0.142**	0.144**	0.144**
	(0.037)	(0.024)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Avidity	-13.128	-12.427*	-13.440**	-13.554**	-13.569**	-14.118**	-13.838**	-13.949**
	(8.449)	(5.255)	(5.145)	(5.151)	(5.168)	(5.226)	(5.202)	(5.155)
Holiday release	0.856	0.286	0.171	0.127	0.193	0.334	0.535	0.530
	(1.651)	(1.427)	(1.362)	(1.350)	(1.361)	(1.358)	(1.373)	(1.369)
Star power	0.616	0.171	0.080	0.123	0.113	0.105	0.138	0.145
	(0.483)	(0.447)	(0.436)	(0.436)	(0.436)	(0.432)	(0.429)	(0.433)
Genre								
Comedy	-2.282	-3.339**	-3.446**	-3.443**	-3.452**	-3.371**	-3.230**	-3.202**
	(1.691)	(1.237)	(1.173)	(1.162)	(1.164)	(1.152)	(1.138)	(1.141)
Drama	-5.893*	-4.364**	-4.709**	-4.654**	-4.606**	-4.612**	-4.618**	-4.586**
	(1.691)	(1.238)	(1.173)	(1.167)	(1.174)	(1.164)	(1.143)	(1.139)
Horror	3.461	-0.121	-0.611	-0.327	-0.267	0.059	0.606	0.611
	(3.298)	(2.292)	(2.102)	(2.072)	(2.077)	(1.986)	(1.927)	(1.923)
Sci-Fi	-9.860*	-5.014	-5.394	-5.323	-4.921	-4.446	-4.056	-4.047
	(4.859)	(3.315)	(3.034)	(3.040)	(2.980)	(2.978)	(3.019)	(3.003)
Family	-7.077*	-4.317	-3.798	-3.742	-3.459	-3.515	-3.349	-3.362
	(3.196)	(2.414)	(2.399)	(2.387)	(2.442)	(2.425)	(2.424)	(2.429)
Rating								
PG	-3.151	-2.231	-1.587	-1.388	-1.762	-2.146	-2.023	-2.054
	(3.786)	(2.700)	(2.725)	(2.665)	(2.705)	(2.726)	(2.735)	(2.745)
PG-13	-1.746	-3.366	-1.900	-1.649	-1.610	-1.874	-1.748	-1.774
	(3.999)	(2.798)	(2.863)	(2.811)	(2.825)	(2.827)	(2.788)	(2.804)
R	-4.302	-6.208*	-4.781	-4.583	-4.526	-4.582	-4.456	-4.500
	(4.011)	(2.817)	(2.877)	(2.862)	(2.845)	(2.838)	(2.830)	(2.845)
Spline intercept			-3.521**	-3.271**	-1.818*	-2.382*	-0.761	-0.133
			(1.023)	(0.976)	(1.046)	(1.182)	(1.464)	(1.594)
Constant	-45.213**	-16.386**	-17.594*	-18.514*	-17.481*	-18.365*	-19.962*	-19.878*
	(11.430)	(6.864)	(8.245)	(8.285)	(8.478)	(8.188)	(8.518)	(8.515)
BIC'			23.8	27.5	26.7	31.4	34.8	34.8
R-squared	0.44	0.72	0.75	0.75	0.75	0.76	0.76	0.76

309 Observations; Robust standard errors in parentheses; VIF statistics showed there was no multicollinearity bias in the specification (VIF between 3.2 and 5.5 across all models). ** p < 1%; * p < 5% (two-tailed test of significance)
Note: The comparison value for genre is action/adventure and the comparison for rating is G. The model was also run with additional variables for sequels, studio, and alternative operationalizations of star power. The results were the same as reported.

Post-Release WOM and Second Week Product Adoption

	Linear Models		Threshold Piece-wise Linear Models					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
			35th percentile	40th percentile	45th percentile	55th percentile	65th percentile	70th percentile
Post-release WOM		26.092**						
		(7.965)						
Post-release WOM: Slope 1			20.884	24.459	25.914*	22.552*	20.287*	22.027*
			(14.866)	(13.764)	(12.443)	(10.782)	(9.815)	(9.073)
Post-release WOM: Slope difference			6.833	4.293	4.243	7.669	7.880	6.103
			(14.023)	(12.671)	(11.122)	(9.705)	(8.984)	(8.807)
Pre-release WOM		-12.747	-13.168	-13.322	-13.491	-13.531	-13.265	-13.640
		(7.893)	(7.958)	(7.962)	(7.960)	(7.965)	(7.977)	(7.978)
Box office performance (lag)	0.554**	0.460**	0.452**	0.449**	0.444**	0.443**	0.447**	0.447**
	(0.024)	(0.035)	(0.038)	(0.039)	(0.040)	(0.040)	(0.040)	(0.040)
Screen (log)	0.368	-0.367	-0.196	-0.199	-0.173	-0.118	-0.115	-0.164
	(0.728)	(0.757)	(0.820)	(0.819)	(0.816)	(0.814)	(0.812)	(0.810)
Budget (sqrt)	-1.685	-0.642	-0.717	-0.652	-0.583	-0.647	-0.752	-0.674
	(1.493)	(1.502)	(1.522)	(1.517)	(1.518)	(1.515)	(1.519)	(1.509)
Critics' reviews	0.044**	0.037*	0.038*	0.039*	0.040*	0.040*	0.039*	0.040*
	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)
Avidity	-2.126	-3.190	-3.215	-3.251	-3.240	-3.318	-3.233	-3.208
	(4.069)	(4.021)	(4.035)	(4.033)	(4.030)	(4.037)	(4.033)	(4.037)
Holiday release	2.003**	2.040**	2.040**	2.063**	2.030**	2.038**	2.022**	2.029**
	(0.621)	(0.615)	(0.619)	(0.619)	(0.617)	(0.617)	(0.617)	(0.617)
Star power	0.239	0.225	0.223	0.225	0.238	0.230	0.224	0.224
	(0.194)	(0.190)	(0.191)	(0.191)	(0.192)	(0.191)	(0.191)	(0.191)
Genre								
Comedy	0.525	0.341	0.314	0.304	0.309	0.306	0.297	0.288
	(0.687)	(0.682)	(0.687)	(0.688)	(0.687)	(0.688)	(0.686)	(0.690)
Drama	0.083	-0.161	-0.193	-0.205	-0.225	-0.219	-0.220	-0.244
	(0.688)	(0.685)	(0.693)	(0.693)	(0.694)	(0.693)	(0.692)	(0.700)
Horror	0.638	0.654	0.667	0.667	0.657	0.668	0.654	0.637
	(1.413)	(1.396)	(1.403)	(1.401)	(1.401)	(1.401)	(1.400)	(1.403)
Sci-Fi	-2.674	-2.476	-2.513	-2.554	-2.576	-2.553	-2.588	-2.600
	(1.906)	(1.884)	(1.898)	(1.896)	(1.895)	(1.895)	(1.894)	(1.902)
Family	1.219	1.559	1.577	1.552	1.542	1.549	1.604	1.546
	(1.256)	(1.247)	(1.256)	(1.252)	(1.252)	(1.259)	(1.256)	(1.252)
Rating								
PG	4.181*	3.982**	4.017**	3.970**	3.976**	3.980**	4.036**	4.013**
	(1.473)	(1.456)	(1.466)	(1.467)	(1.462)	(1.474)	(1.466)	(1.468)
PG-13	0.725	0.359	0.429	0.424	0.445	0.436	0.489	0.454
	(1.562)	(1.549)	(1.563)	(1.562)	(1.561)	(1.572)	(1.561)	(1.562)
R	0.637	0.122	0.184	0.186	0.168	0.191	0.258	0.207
	(1.574)	(1.566)	(1.578)	(1.578)	(1.578)	(1.587)	(1.580)	(1.578)
Spline intercept			-0.007	-0.343	-0.549	-0.126	0.539	0.570
			(0.891)	(0.902)	(0.863)	(0.840)	(0.841)	(0.866)
Constant	-4.892	0.474	-0.178	-0.615	-0.983	-0.966	-0.747	-0.514
	(6.043)	(6.015)	(6.252)	(6.232)	(6.249)	(6.256)	(6.265)	(6.275)
BIC'			-10.9	-10.8	-10.4	-10.5	-10.1	-10.3
R-squared	0.81	0.82	0.82	0.82	0.82	0.82	0.82	0.82

285 Observations; Robust standard errors in parentheses; VIF statistics showed there was no multicollinearity bias in the specification (VIF between 4.1 and 4.9 across all models). ** p < 1%; * p < 5% (two-tailed test of significance)
Note: The comparison value for genre is action/adventure and the comparison for rating is G. The model was also run with additional variables for sequels, studio, and alternative operationalizations of star power. The results were the same as reported.