Supplementary Material: Later Bedtimes Predict President Trump's Performance

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Contents

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1 Additional Figures on Diurnal Cycle

In Figure S1, we add day of week and month fixed effects in the diurnal cyle. The number of tweets posted at every half hour looks similar with and without these fixed effects, suggesting that his tweeting pattern is relatively unaffected by day of week and month.

In Figure S2, we separately plot the diurnal cycle of President Trump's tweets in 2020 before and after March 1st. There is a notable peak around 11am in March and April. Besides, the late-tweeting pattern does not differ a lot before and after the COVID-19 outbreak, consistent with our results in Table 1, the imprecise estimate for $MarApr * Y2020_t$.

In Figure S3, we plot the cycle on late-tweeting and other days. We separate days before and after the 23rd week of 2019, the first week when the moving average of weekly fraction of late-tweeting night is greater than 0.3 (in Figure 2). We find a larger number of tweets posted between 11pm and 2am after 2019w23 and the time range of late tweeting is wider.

Figure S1: Diurnal cycle every half hour over 24 hours with day of week and month fixed effects

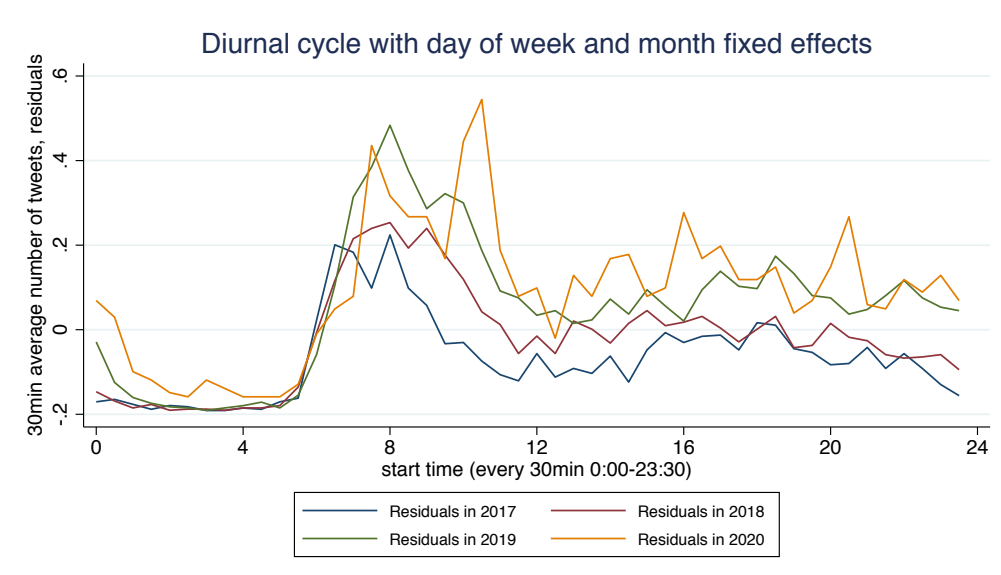


Figure S2: Diurnal cycle every half hour over 24 hours (top) and over sleep hours (bottom) in 2020 before and after March 1st

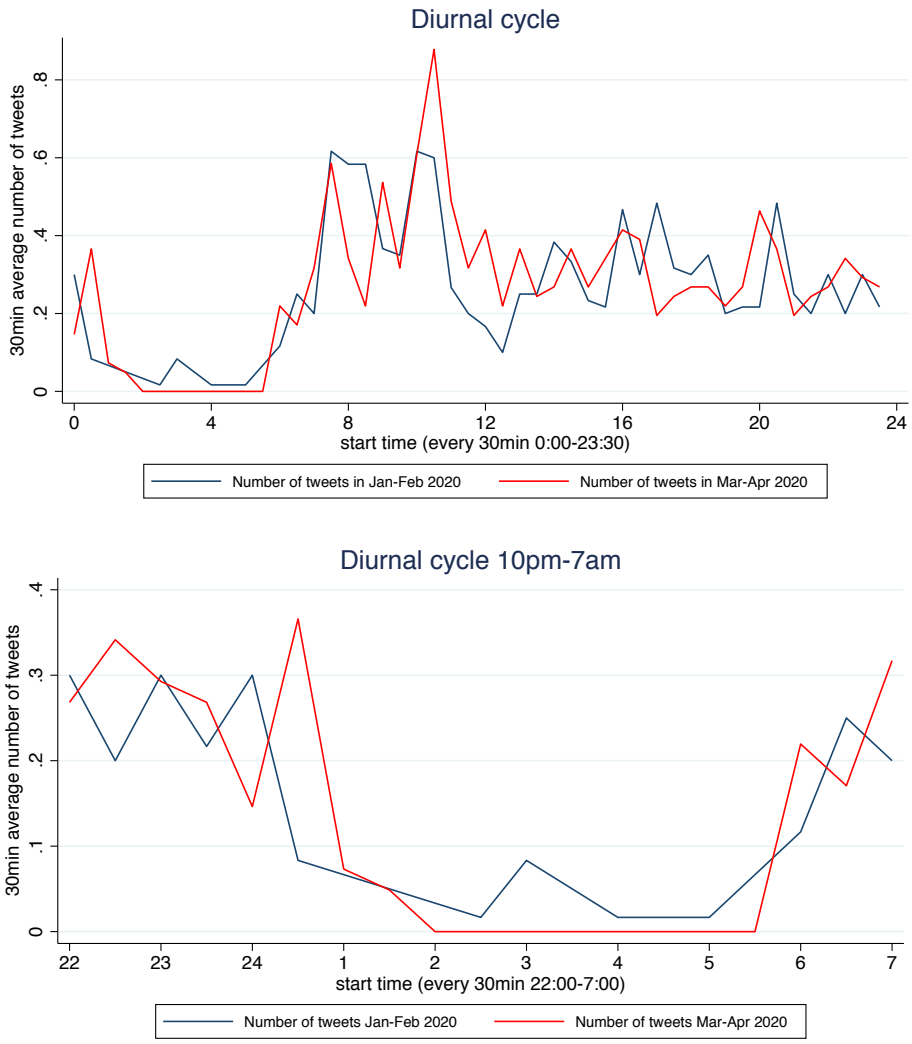
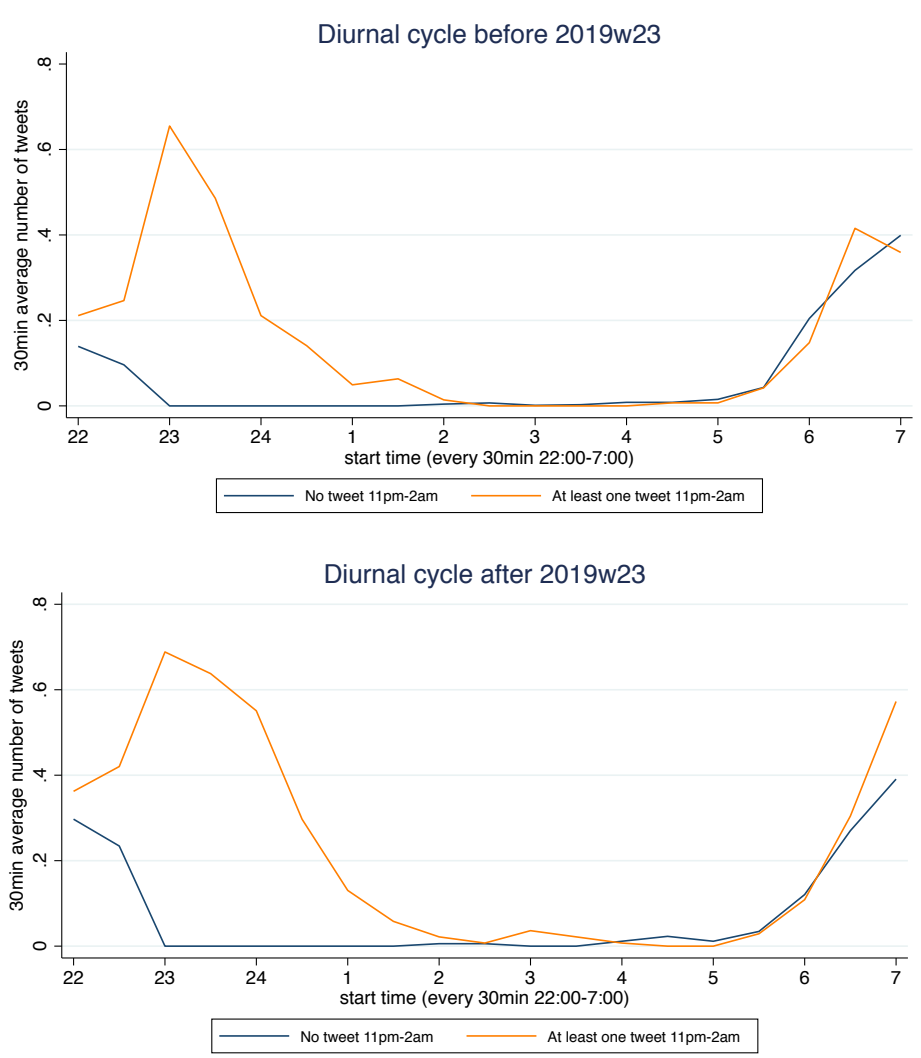


Figure S3: Diurnal cycle every half hour over sleep hours on late-tweeting and non late-tweeting days. We separate days before (top) and after (bottom) 2019w23 when the fraction of late-tweeting night in Figure 2 started to exceed 0.3.



2 Additional Tables

2.1 Daytime Tweeting Frequency

In Table S1 Panel A, the coefficient on $Late_t$ indicates that his tweeting frequency is unaffected by the occurrence or a larger number of late tweets. The positive β_2 coefficient on $\#Tweets_t$ (around .12) in Panel A indicates a modest degree of persistence and could be interpreted as the correlation coefficient between $\#Tweets_{t+1}$ and $\#Tweets_t$, i.e. the number of daytime tweets and its first lag. Additionally, coefficients on $Y2018$, $Y2019$ and$Y2020$ dummies indicate the President posts 2 more daytime tweets on average in 2018 than 2017, and 5 and 7 more tweets per day in 2019 and 2020 as compared with 2017.

Late night does not make him post more false tweets, shown in Panel B. False tweets coming from the President may be confusing or disruptive, and these are not associated with a late night. The coefficients on $Y2018$, $Y2019$ and$Y2020$ dummies suggest he posts more false tweets after 2017, 85% to 130% increase relative to the 2017 mean. Though this rise over years comes hand in hand with the rise of late night, we show the additional false tweets are not from the channel of his bedtime tweeting.

Table S1: Predicting daytime tweets after sleep

	Panel A: # of daytime tweets after sleep							
	OLS			Poisson	OLS			Poisson
Late dummy	0.193	0.176	0.197	0.013				
	(0.334)	(0.332)	(0.335)	(0.024)				
Late count					0.042	0.032	0.045	0.000
					(0.134)	(0.133)	(0.135)	(0.009)
# daytime tweets		0.122***				0.122***		
before sleep		(0.031)				(0.031)		
Y2018	2.12***	1.86***	1.83***	.273***	2.12***	1.87***	1.83***	.274***
	(.351)	(.355)	(.358)	(.0302)	(.351)	(.355)	(.358)	(.0302)
Y2019	5.32***	4.73***	4.7***	.589***	5.34***	4.75***	4.72***	.592***
	(.359)	(.387)	(.389)	(.0306)	(.36)	(.388)	(.39)	(.0306)
Y2020	7.62***	6.74***	6.52***	.853***	7.65***	6.77***	6.54***	.858***
	(.593)	(.631)	(.636)	(.0477)	(.599)	(.635)	(.64)	(.0478)
Observations	1172	1172	1172	1172	1172	1172	1172	1172
R-square	0.277	0.287	0.310	0.147	0.277	0.286	0.310	0.147
Y-mean	8.503	8.503	8.503	8.503	8.503	8.503	8.503	8.503
Y-mean 2017	5.789	5.789	5.789	5.789	5.789	5.789	5.789	5.789
	Panel B: # of daytime false tweets after sleep							
	OLS			Poisson	OLS			Poisson
Late dummy	0.074	0.071	0.045	0.007				
	(0.155)	(0.155)	(0.156)	(0.044)				
Late count					0.066	0.064	0.069	0.016
					(0.062)	(0.062)	(0.063)	(0.016)
# daytime tweets		0.023				0.023		
before sleep		(0.014)				(0.014)		
Y2018	1.34***	1.29***	1.33***	.847***	1.33***	1.29***	1.32***	.845***
	(.163)	(.166)	(.167)	(.0655)	(.163)	(.165)	(.167)	(.0655)
Y2019	2.74***	2.63***	2.68***	1.3***	2.72***	2.61***	2.65***	1.29***
	(.166)	(.181)	(.181)	(.0653)	(.167)	(.181)	(.181)	(.0653)
Y2020	1.78***	1.61***	1.59***	.998***	1.73***	1.57***	1.54***	.983***
	(.275)	(.294)	(.296)	(.0993)	(.278)	(.296)	(.298)	(.0994)
Observations	1172	1172	1172	1172	1172	1172	1172	1172
R-square	0.226	0.227	0.256	0.139	0.226	0.228	0.257	0.139
Y-mean	2.409	2.409	2.409	2.409	2.409	2.409	2.409	2.409
Y-mean 2017	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997
DOW FEs	Y	Y	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y	Y			Y	Y

Notes: Pseudo R-square is reported for poisson regression. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.2 False Claims

False tweets takes account of 18% false claims President Trump made on all the platforms. Here we test whether the total number of false claims are affected by his sleep deprivation. Results in Table S2 show late tweeting does not increase the number of false claims he makes on the day after sleep. Besides, he makes a substantially larger number of false claims in 2020, a three times increase relative to the 2017 mean.

There are some problems with this false claim measure and we don't include it in our main results. The false claim database is constructed at EDT time zone at daily level, but we need local time to merge with Trump's sleep schedule. Besides, unlike tweets, we don't have a denominator for false claims, namely we don't know how many claims in total he made on each day and the proportion of false ones. In addition, since we don't have hourly measure, it is likely that we include late night false claims in the dependent variable.

Table S2: Late-tweeting and daily false claims

	# of false claims					
Late dummy	1.337	1.265	1.091			
	(4.375)	(4.374)	(4.402)			
Late count				-0.107	-0.153	-0.143
				(1.754)	(1.754)	(1.772)
# daytime tweets		0.520			0.522	
before sleep		(0.408)			(0.408)	
Y2018	28.9***	27.9***	26.3***	29***	28***	26.3***
	(4.59)	(4.67)	(4.71)	(4.59)	(4.67)	(4.71)
Y2019	31***	28.5***	27.2***	31.4***	28.8***	27.5***
	(4.69)	(5.1)	(5.11)	(4.71)	(5.11)	(5.12)
Y2020	44.2***	40.5***	39***	44.9***	41.1***	39.5***
	(7.76)	(8.3)	(8.37)	(7.83)	(8.36)	(8.42)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.109	0.111	0.141	0.109	0.111	0.141
Y-mean	33.98	33.98	33.98	33.98	33.98	33.98
Y-mean 2017	12.62	12.62	12.62	12.62	12.62	12.62
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.3 Distribution of Effects

We use quantile regression to study the distribution of late night effects. In Table S3, late tweeting shifts the lower deciles more than the higher deciles. This suggests President Trump has more tweets with poor performances after a late night.

Table S3: Late-tweeting and likes, retweets, replies after sleep

	Panel A: Likes after sleep (in thousands)				
	OLS	Quantile			
		0.1	0.2	0.3	0.4
Late dummy	-7.394***	-3.997**	-5.261***	-3.672**	-3.700**
	(2.278)	(1.817)	(1.660)	(1.750)	(1.675)
Y2018	10.530***	12.147***	11.162***	9.495***	10.404***
	(2.450)	(1.954)	(1.785)	(1.882)	(1.802)
Y2019	19.341***	13.036***	14.777***	15.010***	17.021***
	(2.647)	(2.111)	(1.929)	(2.033)	(1.947)
Y2020	42.251***	11.054***	17.709***	17.716***	21.346***
	(4.338)	(3.460)	(3.161)	(3.332)	(3.190)
Observations	1153	1153	1153	1153	1153
R-square	0.243	0.142	0.142	0.153	0.167
Y-stat	91.67	61.14	67.63	72.86	78.36
	Quantile				
	0.5	0.6	0.7	0.8	0.9
Late dummy	-5.469***	-3.463	-3.188	-4.696*	-8.046
	(2.012)	(2.360)	(2.201)	(2.779)	(5.701)
Y2018	10.893***	8.880***	6.351***	6.717**	10.273*
	(2.164)	(2.538)	(2.367)	(2.989)	(6.132)
Y2019	18.851***	18.664***	16.700***	16.999***	22.128***
	(2.338)	(2.742)	(2.557)	(3.229)	(6.624)
Y2020	26.967***	34.686***	50.101***	52.668***	77.475***
	(3.832)	(4.493)	(4.191)	(5.292)	(10.857)
Observations	1153	1153	1153	1153	1153
R-square	0.172	0.177	0.189	0.202	0.209
Y-stat	84.31	91.57	99.13	109.2	127.7
	Panel B: Retweets after sleep (in thousands)				
	OLS	Quantile			
		0.1	0.2	0.3	0.4
Late dummy	-1.321**	-0.918**	-1.064***	-0.909**	-1.190***
	(0.530)	(0.456)	(0.316)	(0.406)	(0.402)
Y2018	2.881***	3.756***	3.418***	3.466***	3.163***
	(0.570)	(0.490)	(0.339)	(0.437)	(0.432)
Y2019	4.678***	4.163***	4.695***	4.669***	4.566***

	(0.616)	(0.529)	(0.367)	(0.472)	(0.467)
Y2020	8.578***	5.125***	5.174***	5.641***	5.784***
	(1.010)	(0.867)	(0.601)	(0.774)	(0.766)
Observations	1153	1153	1153	1153	1153
R-square	0.191	0.176	0.160	0.147	0.140
Y-stat	20.46	13.09	15.11	16.41	17.74
			Quantile		
	0.5	0.6	0.7	0.8	0.9
Late dummy	-1.186***	-1.272**	-0.970*	-0.771	-2.619*
	(0.433)	(0.545)	(0.585)	(0.629)	(1.402)
Y2018	3.164***	3.163***	2.142***	1.952***	2.695*
	(0.466)	(0.586)	(0.629)	(0.677)	(1.508)
Y2019	4.459***	5.105***	4.347***	4.480***	5.289***
	(0.503)	(0.633)	(0.680)	(0.731)	(1.629)
Y2020	5.152***	8.902***	8.932***	10.576***	12.151***
	(0.825)	(1.037)	(1.114)	(1.198)	(2.670)
Observations	1153	1153	1153	1153	1153
R-square	0.143	0.140	0.144	0.150	0.151
Y-stat	19.05	20.59	22.28	24.61	28.16
	Panel C: Replies after sleep (in thousands)				
	OLS		Quantile		
		0.1	0.2	0.3	0.4
Late dummy	-1.405**	-1.496***	-1.483***	-1.184**	-1.401**
	(0.699)	(0.567)	(0.552)	(0.588)	(0.658)
Y2018	-0.533	0.460	0.141	0.339	-0.194
	(0.751)	(0.610)	(0.593)	(0.632)	(0.708)
Y2019	-3.410***	-0.431	-1.223*	-1.751**	-2.677***
	(0.812)	(0.659)	(0.641)	(0.683)	(0.764)
Y2020	-6.366***	-5.531***	-6.937***	-7.626***	-8.183***
	(1.330)	(1.080)	(1.051)	(1.119)	(1.253)
Observations	1153	1153	1153	1153	1153
R-square	0.208	0.090	0.108	0.118	0.131
Y-stat	19.81	9.577	11.70	13.59	15.41
			Quantile		
	0.5	0.6	0.7	0.8	0.9
Late dummy	-1.342*	-1.937***	-2.034**	-0.691	0.189
	(0.718)	(0.728)	(0.937)	(1.190)	(1.670)
Y2018	-0.289	-0.179	-0.696	-2.429*	-1.557
	(0.772)	(0.783)	(1.007)	(1.280)	(1.796)
Y2019	-3.040***	-3.529***	-3.750***	-5.986***	-6.870***
	(0.834)	(0.846)	(1.088)	(1.383)	(1.940)
Y2020	-7.788***	-7.436***	-6.208***	-6.692***	-1.888
	(1.367)	(1.386)	(1.784)	(2.266)	(3.180)

Observations	1153	1153	1153	1153	1153
R-square	0.140	0.149	0.155	0.170	0.185
Y-stat	17.70	19.74	22.52	25.93	33.05
DOW FEs	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Mean and deciles are reported in Y-stat. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.4 Sentiment of Tweets

Table S4: Late-tweeting and sentiment of tweets after sleep

	Sentiment after sleep					
Late dummy	0.062***	0.062***	0.062***			
	(0.021)	(0.021)	(0.021)			
Late count				0.025***	0.025***	0.025***
				(0.008)	(0.008)	(0.008)
# daytime tweets		0.002			0.001	
before sleep		(0.002)			(0.002)	
Y2018	.00112	-.00207	.00861	.00129	-.0018	.00894
	(.0217)	(.0221)	(.0225)	(.0217)	(.0221)	(.0224)
Y2019	.0444**	.0369	.0395	.0433*	.0361	.0389
	(.0221)	(.024)	(.0243)	(.0222)	(.024)	(.0243)
Y2020	.315***	.304***	.304***	.311***	.3***	.301***
	(.0366)	(.0392)	(.0398)	(.0369)	(.0394)	(.04)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.122	0.123	0.141	0.123	0.123	0.141
Y-mean	0.2626	0.2626	0.2626	0.2626	0.2626	0.2626
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.5 Late-Night Tweeting by Hour

In Table 2 and 3, we use tweets 11pm-2am to code $Late_t$ and assign treatment (i.e. flag poor sleep days). The coefficient on $Late_t$ compares performance on days in the treated and control group. The treated group simply includes all days with tweets 11pm-2am. The control group is supposed to represent better sleep, but it also includes days with tweets after 2am but no tweets 11pm-2am. These unincluded days (poor sleep in the control group) mitigate the difference between two groups and may affect our estimates. We show this kind of isolated late-tweeting is rare in Table S5. From Column 1, there are only 8 out of 1172 days when he tweeted 2-3am but didn't tweet 11pm-2am or 3-5am. This suggests that Trump tends to tweet in multiple hours before eventually falling asleep rather than post an isolated tweet 2-5am. Column 2 reports the number of days he tweets in each hour interval regardless of other intervals. It also shows he is less active 2-5am relative to 11pm-2am.

Table S5: Late-night tweeting by hour

	Exclusive tweeting days	Tweeting days
11pm-12am	155	208
12am-1am	55	106
1am-2am	9	33
2am-3am	8	14
3am-4am	2	4
4am-5am	7	10

Notes: Exclusive tweeting: the number of days when he tweeted in that hour interval but did not tweet in the other five intervals. Tweeting days: the number of days when he tweeted in that hour interval regardless of the other five intervals.

We move our late time window from 11pm-2am to 11pm-5am hour by hour and re-estimate equation (2). This practice helps to check the robustness of results given the concern described above. In Table S6 and S7, Column 1 and 5 are original results in Table 2 and 3. Other columns report results with gradually extended time window. All the estimates remain robust, suggesting the concern above does not change our results.

Furthermore, we interpret the change in magnitude as heterogeneous effects of late night tweeting in different hours. With a binary indicator for *Late*, the magnitude on likes and retweets slightly goes down. Adding the occurrence of isolated tweets 2-5am, the larger treated group does not result in more notable change. When we use the number of late tweets as control, the marginal tweet 11pm-5am is more powerful than that 11pm-2am. This indicates the extremely late tweets 2-5am is even more powerful than the increased estimates. More numerous tweets 2-5am result in larger effects on Trump's tweeting activity and popularity on the following day.

Table S6: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-7.394***	-6.618***	-6.383***	-6.219***				
	(2.278)	(2.249)	(2.244)	(2.234)				
Late count					-2.364**	-2.398***	-2.637***	-2.595***
					(0.917)	(0.908)	(0.886)	(0.869)
Y2018	10.530***	10.415***	10.410***	10.441***	10.395***	10.366***	10.421***	10.442***
	(2.450)	(2.451)	(2.452)	(2.453)	(2.454)	(2.453)	(2.451)	(2.451)
Y2019	19.341***	19.160***	19.113***	19.098***	19.067***	19.090***	19.270***	19.339***
	(2.647)	(2.648)	(2.648)	(2.650)	(2.656)	(2.655)	(2.653)	(2.658)
Y2020	42.3***	41.9***	41.8***	41.8***	42***	42.1***	42.6***	42.6***
	(4.34)	(4.34)	(4.34)	(4.34)	(4.37)	(4.37)	(4.39)	(4.39)
Observations	1153	1153	1153	1153	1153	1153	1153	1153
R-square	0.243	0.241	0.241	0.241	0.240	0.240	0.241	0.241
Y-mean	91.67	91.67	91.67	91.67	91.67	91.67	91.67	91.67
	Panel B: Retweets after sleep (in thousands)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-1.321**	-1.274**	-1.227**	-1.171**				
	(0.530)	(0.523)	(0.522)	(0.520)				
Late count					-0.449**	-0.473**	-0.508**	-0.500**
					(0.213)	(0.211)	(0.206)	(0.202)
Y2018	2.881***	2.866***	2.865***	2.869***	2.861***	2.858***	2.867***	2.871***
	(0.570)	(0.570)	(0.570)	(0.571)	(0.571)	(0.570)	(0.570)	(0.570)
Y2019	4.678***	4.665***	4.656***	4.648***	4.644***	4.658***	4.687***	4.700***
	(0.616)	(0.616)	(0.616)	(0.616)	(0.618)	(0.617)	(0.617)	(0.618)
Y2020	8.58***	8.56***	8.54***	8.53***	8.56***	8.59***	8.68***	8.69***
	(1.01)	(1.01)	(1.01)	(1.01)	(1.02)	(1.02)	(1.02)	(1.02)
Observations	1153	1153	1153	1153	1153	1153	1153	1153
R-square	0.191	0.191	0.190	0.190	0.190	0.190	0.191	0.191
Y-mean	20.46	20.46	20.46	20.46	20.46	20.46	20.46	20.46
	Panel C: Replies after sleep (in thousands)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-1.405**	-1.466**	-1.417**	-1.206*				
	(0.699)	(0.689)	(0.687)	(0.684)				
Late count					-0.383	-0.445	-0.490*	-0.465*
					(0.281)	(0.278)	(0.271)	(0.266)
Y2018	-0.533	-0.543	-0.543	-0.548	-0.569	-0.566	-0.556	-0.554
	(0.751)	(0.751)	(0.751)	(0.752)	(0.752)	(0.751)	(0.751)	(0.751)
Y2019	-3.410***	-3.398***	-3.408***	-3.450***	-3.500***	-3.463***	-3.430***	-3.428***
	(0.812)	(0.811)	(0.811)	(0.812)	(0.814)	(0.813)	(0.813)	(0.815)
Y2020	-6.37***	-6.35***	-6.37***	-6.43***	-6.49***	-6.41***	-6.31***	-6.33***

	(1.33)	(1.33)	(1.33)	(1.33)	(1.34)	(1.34)	(1.34)	(1.35)
Observations	1153	1153	1153	1153	1153	1153	1153	1153
R-square	0.208	0.208	0.208	0.207	0.206	0.207	0.207	0.207
Y-mean	19.81	19.81	19.81	19.81	19.81	19.81	19.81	19.81
	Panel D: Proportion of false tweets after sleep (in percentage)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-0.160	-0.703	-0.585	-0.071				
	(1.525)	(1.504)	(1.500)	(1.493)				
Late count					0.416	0.304	0.400	0.364
					(0.613)	(0.607)	(0.592)	(0.581)
Y2018	13.186***	13.217***	13.211***	13.180***	13.110***	13.132***	13.115***	13.117***
	(1.640)	(1.639)	(1.639)	(1.640)	(1.639)	(1.639)	(1.639)	(1.639)
Y2019	17.137***	17.256***	17.230***	17.117***	16.863***	16.927***	16.865***	16.873***
	(1.772)	(1.771)	(1.771)	(1.771)	(1.775)	(1.774)	(1.774)	(1.777)
Y2020	1.45	1.66	1.61	1.41	.931	1.04	.899	.929
	(2.9)	(2.9)	(2.9)	(2.9)	(2.92)	(2.92)	(2.93)	(2.93)
Observations	1153	1153	1153	1153	1153	1153	1153	1153
R-square	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
Y-mean	26.90	26.90	26.90	26.90	26.90	26.90	26.90	26.90
DOW FEs	Y	Y	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S7: Late-tweeting and dominant emotion of transcripts after sleep

	Panel A: Proportion of happy emotion in transcripts after sleep (in percentage)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-4.618**	-4.514*	-4.132*	-3.384				
	(2.347)	(2.334)	(2.321)	(2.317)				
Late count					-1.476*	-1.739**	-2.046**	-1.916**
					(0.865)	(0.860)	(0.821)	(0.811)
Y2018	1.638	1.578	1.585	1.580	1.547	1.567	1.671	1.706
	(3.045)	(3.044)	(3.046)	(3.049)	(3.046)	(3.043)	(3.040)	(3.042)
Y2019	-2.650	-2.720	-2.815	-2.949	-2.789	-2.636	-2.390	-2.359
	(3.135)	(3.131)	(3.130)	(3.134)	(3.136)	(3.133)	(3.129)	(3.138)
Y2020	-3.89	-3.97	-4.14	-4.33	-4.06	-3.69	-3.02	-3.04
	(4.15)	(4.15)	(4.15)	(4.16)	(4.16)	(4.17)	(4.18)	(4.2)
Observations	837	837	837	837	837	837	837	837
R-square	0.087	0.087	0.087	0.085	0.086	0.088	0.090	0.089
Y-mean	88.71	88.71	88.71	88.71	88.71	88.71	88.71	88.71

	Panel B: Proportion of fear emotion in transcripts after sleep (in percentage)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	-1.438*	-1.403*	-1.342*	-1.418*				
	(0.792)	(0.788)	(0.784)	(0.781)				
Late count					-0.768***	-0.438	0.168	0.272
					(0.291)	(0.291)	(0.278)	(0.275)
Y2018	0.256	0.238	0.243	0.261	0.264	0.223	0.150	0.127
	(1.028)	(1.028)	(1.028)	(1.028)	(1.025)	(1.028)	(1.030)	(1.030)
Y2019	1.301	1.279	1.262	1.286	1.442	1.244	0.879	0.798
	(1.058)	(1.057)	(1.057)	(1.057)	(1.056)	(1.059)	(1.060)	(1.062)
Y2020	4.4***	4.37***	4.34***	4.41***	4.69***	4.34***	3.62**	3.46**
	(1.4)	(1.4)	(1.4)	(1.4)	(1.4)	(1.41)	(1.42)	(1.42)
Observations	837	837	837	837	837	837	837	837
R-square	0.140	0.140	0.139	0.140	0.144	0.139	0.137	0.137
Y-mean	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780	0.8780
	Panel C: Proportion of angry emotion in transcripts after sleep (in percentage)							
	11-2am	3am	4am	5am	2am	3am	4am	5am
Late dummy	2.986***	2.879***	2.873***	2.811***				
	(0.820)	(0.816)	(0.811)	(0.809)				
Late count					0.454	0.424	0.359	0.331
					(0.304)	(0.303)	(0.289)	(0.286)
Y2018	0.077	0.118	0.101	0.076	0.195	0.201	0.196	0.190
	(1.064)	(1.064)	(1.064)	(1.065)	(1.071)	(1.071)	(1.072)	(1.072)
Y2019	1.194	1.247	1.259	1.254	1.582	1.601	1.629	1.626
	(1.095)	(1.094)	(1.094)	(1.095)	(1.103)	(1.103)	(1.103)	(1.106)
Y2020	1.92	1.99	2.01	1.95	2.58*	2.6*	2.61*	2.62*
	(1.45)	(1.45)	(1.45)	(1.45)	(1.46)	(1.47)	(1.48)	(1.48)
Observations	837	837	837	837	837	837	837	837
R-square	0.125	0.124	0.124	0.124	0.113	0.113	0.112	0.112
Y-mean	1.087	1.087	1.087	1.087	1.087	1.087	1.087	1.087
DOW FEs	Y	Y	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.6 Interactions at Late Time

If President Trump's followers interact with him at a certain amount on each day, one concern is that the lower interactions the following day may result from the interactions his followers have already given between 11pm to 2am. Namely the interactions are capped within a budget set, and last-night tweets consume some interactions that come out of today's ones. Thus, we add interactions at late time, $Interactions_t$ as an additional control and re-estimate equation (2). If the budget constraint hypothesis is true, we expect a negative coefficient on $Interactions_t$ and the coefficient on $Late_t$ has a smaller magnitude.

Column 1 and 4 in Table S8 provide the same results as those in Table 2. We add the total number of $Interactions_t$ in Column 2 and 5 and the mean in Column 3 and 6. The values are zero for non-late nights. First, the positive and significant coefficients on $Interactions_t$ indicate the hypothesis of interaction budget is not true. In contrast, Trump receives a similar level of interactions in the short term. Besides, the effect of late night is not absorbed but even more notable after accounting for his popularity at late time. We conclude that Trump's lower tweet quality following a late night is not driven by his consumed interactions at late time.

2.7 Interactions and Approval Rates

We evaluate how interactions received by Trump's tweets move together with his approval and disapproval rates. For analysis, we collapse daily approval rates[1] and tweet interactions into weekly average, as we expect approval rate does not show an immediate next-day response. We use a similar design as equation (2), with weekly approval on the left hand side and $Late_t$ replaced by $Interaction_t$. We control for year and month fixed effects and add a linear control for daytime tweeting activity.

In Table S9 Column 1, the number of likes received by Trump's tweet goes hand in hand with Trump's approval rate this week. Specifically, 1,000,000 more likes per tweet is associated with an increase in approval rate by 18.7%, 45.4% relative to the mean. In Table S10 Column 1 to 3, we find likes this week help to predict disapproval rate this week and next two weeks. When he receives 1,000,000 more likes per tweet, we expect a decreased disapproval rate by 32%, 18% and 16% in the recent three weeks. Both results show likes received by President Trump could capture his popularity among the public.

Apart from likes, we find retweets are also negatively correlated with disapproval rate. We do not detect any relationship between replies and approval. Besides, we conduct a placebo check by using approval last week and earlier as dependent variable and find no effect of this week's interactions on earlier rates. Taking all these three interactions together, our observed effect from late tweeting, i.e. fewer likes, fewer retweets and fewer replies the following day, is not only a matter of lower tweet quality, but could also implicate lower approval rates and higher disapproval rates in recent weeks.

[1] Data is from FiveThirtyEight: https://data.fivethirtyeight.com/

Table S8: Late-tweeting and likes, retweets, replies after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-7.394***	-18.305***	-26.902***			
	(2.278)	(3.469)	(4.192)			
Late count				-2.364**	-10.880***	-3.749***
				(0.917)	(1.875)	(1.131)
Total likes		0.069***			0.117***	
at late time		(0.017)			(0.022)	
Average likes			0.221***			0.056**
at late time			(0.040)			(0.027)
Y2018	10.5***	9.94***	9.46***	10.4***	9.48***	10***
	(2.45)	(2.44)	(2.43)	(2.45)	(2.43)	(2.46)
Y2019	19.3***	18.4***	19***	19.1***	18.4***	18.7***
	(2.65)	(2.64)	(2.61)	(2.66)	(2.63)	(2.66)
Y2020	42.3***	38.9***	39.3***	42***	38.5***	40.8***
	(4.34)	(4.38)	(4.32)	(4.37)	(4.37)	(4.4)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.243	0.254	0.263	0.240	0.258	0.243
Y-mean	91.67	91.67	91.67	91.67	91.67	91.67
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-1.321**	-3.351***	-5.432***			
	(0.530)	(0.804)	(0.983)			
Late count				-0.449**	-2.557***	-0.809***
				(0.213)	(0.473)	(0.267)
Total retweets		0.057***			0.124***	
at late time		(0.017)			(0.025)	
Average retweets			0.209***			0.064**
at late time			(0.042)			(0.029)
Y2018	2.88***	2.76***	2.61***	2.86***	2.63***	2.75***
	(.57)	(.569)	(.567)	(.571)	(.566)	(.572)
Y2019	4.68***	4.5***	4.58***	4.64***	4.5***	4.55***
	(.616)	(.616)	(.61)	(.618)	(.612)	(.618)
Y2020	8.58***	8.02***	8.12***	8.56***	7.93***	8.32***
	(1.01)	(1.02)	(1)	(1.02)	(1.01)	(1.02)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.191	0.199	0.209	0.190	0.207	0.193
Y-mean	20.46	20.46	20.46	20.46	20.46	20.46
	Panel C: Replies after sleep (in thousands)					
Late dummy	-1.405**	-5.082***	-4.847***			
	(0.699)	(0.951)	(0.949)			
Late count				-0.383	-1.791***	-0.849***
				(0.281)	(0.392)	(0.312)
Total replies		0.131***			0.122***	

at late time		(0.023)			(0.024)	
Average replies			0.203***			0.106***
at late time			(0.039)			(0.031)
Y2018	-.533	-.912	-.876	-.569	-.936	-.798
	(.751)	(.744)	(.745)	(.752)	(.747)	(.751)
Y2019	-3.41***	-3.47***	-3.24***	-3.5***	-3.5***	-3.54***
	(.812)	(.801)	(.803)	(.814)	(.805)	(.81)
Y2020	-6.37***	-6.5***	-5.98***	-6.49***	-6.41***	-6.48***
	(1.33)	(1.31)	(1.32)	(1.34)	(1.32)	(1.33)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.208	0.230	0.227	0.206	0.224	0.214
Y-mean	19.81	19.81	19.81	19.81	19.81	19.81
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` and those at late time are divided by 1000. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S9: Tweet characteristics and approval rate

	Approval rate (in percentage)					
	This week	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
#Likes	18.704**	11.526	13.866**	9.814	6.018	4.036
	(8.253)	(7.638)	(6.941)	(6.640)	(6.236)	(6.721)
#daytime tweets	0.212***	0.125**	0.102*	0.075	0.057	0.059
	(0.065)	(0.057)	(0.053)	(0.053)	(0.051)	(0.050)
Y2018	1.023***	1.408***	1.615***	1.795***	1.968***	2.084***
	(0.333)	(0.309)	(0.289)	(0.284)	(0.281)	(0.276)
Y2019	0.815*	1.461***	1.718***	1.988***	2.229***	2.348***
	(0.463)	(0.409)	(0.379)	(0.372)	(0.372)	(0.370)
Y2020	1.47**	2.6***	3.05***	3.51***	3.91***	4.11***
	(.738)	(.634)	(.588)	(.577)	(.573)	(.56)
Observations	168	167	166	165	164	163
R-square	0.460	0.496	0.556	0.570	0.593	0.617
#Retweets	39.486	14.887	31.143	16.819	1.492	-9.756
	(37.901)	(35.121)	(32.034)	(30.428)	(28.799)	(30.297)
#daytime tweets	0.176***	0.121**	0.106**	0.082	0.056	0.053
	(0.065)	(0.057)	(0.054)	(0.053)	(0.051)	(0.050)
Y2018	1.138***	1.458***	1.625***	1.801***	1.999***	2.140***
	(0.345)	(0.318)	(0.297)	(0.289)	(0.286)	(0.283)
Y2019	1.068**	1.558***	1.749***	2.004***	2.292***	2.452***
	(0.474)	(0.419)	(0.390)	(0.378)	(0.379)	(0.380)
Y2020	1.96***	2.76***	3.11***	3.51***	3.95***	4.2***
	(.731)	(.64)	(.598)	(.582)	(.578)	(.568)
Observations	168	167	166	165	164	163
R-square	0.446	0.489	0.547	0.565	0.590	0.617
#Replies	-11.866	-44.576*	-34.234	-34.010	-32.623	-32.188
	(26.713)	(25.444)	(23.962)	(23.880)	(23.070)	(23.640)
#daytime tweets	0.144**	0.117**	0.099*	0.083	0.052	0.047
	(0.061)	(0.057)	(0.054)	(0.052)	(0.051)	(0.050)
Y2018	1.281***	1.453***	1.655***	1.786***	1.963***	2.089***
	(0.319)	(0.304)	(0.290)	(0.285)	(0.279)	(0.271)
Y2019	1.281***	1.425***	1.726***	1.912***	2.188***	2.330***
	(0.420)	(0.410)	(0.385)	(0.381)	(0.372)	(0.358)
Y2020	2.26***	2.35***	2.88***	3.13***	3.55***	3.77***
	(.663)	(.671)	(.633)	(.644)	(.637)	(.622)
Observations	168	167	166	165	164	163
R-square	0.442	0.499	0.550	0.570	0.595	0.621
	This week	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
#Likes	18.704**	7.115	-3.668	-11.995	-10.367	-8.016

	(8.253)	(7.480)	(7.919)	(8.213)	(7.751)	(7.749)
#daytime tweets	0.212***	0.158***	0.161***	0.160***	0.157**	0.149**
	(0.065)	(0.060)	(0.060)	(0.060)	(0.061)	(0.062)
Y2018	1.023***	1.205***	1.282***	1.370***	1.361***	1.352***
	(0.333)	(0.327)	(0.325)	(0.325)	(0.329)	(0.336)
Y2019	0.815*	1.179***	1.294***	1.414***	1.394***	1.407***
	(0.463)	(0.435)	(0.426)	(0.425)	(0.432)	(0.450)
Y2020	1.47**	2.05***	1.98***	2.01***	1.97***	2.13***
	(.738)	(.687)	(.694)	(.701)	(.75)	(.803)
Observations	168	167	166	165	164	163
R-square	0.460	0.436	0.425	0.418	0.411	0.408
#Retweets	39.486	2.303	-46.443	-69.445*	-54.117	-43.380
	(37.901)	(34.697)	(36.223)	(37.370)	(35.648)	(35.306)
#daytime tweets	0.176***	0.151**	0.163***	0.156***	0.155**	0.149**
	(0.065)	(0.060)	(0.060)	(0.059)	(0.060)	(0.062)
Y2018	1.138***	1.268***	1.363***	1.442***	1.407***	1.386***
	(0.345)	(0.332)	(0.328)	(0.330)	(0.334)	(0.339)
Y2019	1.068**	1.292***	1.394***	1.500***	1.441***	1.439***
	(0.474)	(0.438)	(0.428)	(0.429)	(0.436)	(0.449)
Y2020	1.96***	2.23***	2.08***	2.08***	2***	2.15***
	(.731)	(.682)	(.689)	(.699)	(.747)	(.789)
Observations	168	167	166	165	164	163
R-square	0.446	0.433	0.430	0.423	0.413	0.410
#Replies	-11.866	-1.962	-9.164	-26.969	-26.909	-28.766
	(26.713)	(26.722)	(27.211)	(27.336)	(26.586)	(26.624)
#daytime tweets	0.144**	0.151**	0.162***	0.159***	0.165***	0.157**
	(0.061)	(0.060)	(0.060)	(0.060)	(0.061)	(0.061)
Y2018	1.281***	1.273***	1.244***	1.244***	1.241***	1.254***
	(0.319)	(0.320)	(0.318)	(0.316)	(0.318)	(0.318)
Y2019	1.281***	1.291***	1.200***	1.117**	1.083**	1.110**
	(0.420)	(0.435)	(0.439)	(0.437)	(0.443)	(0.432)
Y2020	2.26***	2.22***	1.81**	1.51**	1.43*	1.62**
	(.663)	(.714)	(.743)	(.738)	(.76)	(.753)
Observations	168	167	166	165	164	163
R-square	0.442	0.433	0.424	0.413	0.408	0.408
Y-mean	41.18	41.18	41.18	41.18	41.18	41.18
Month FEs	Y	Y	Y	Y	Y	Y

Notes: `likes`, `retweets` and `replies` are divided by 1000,000. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S10: Tweet characteristics and disapproval rate

	Disapproval rate (in percentage)					
	This week	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
#Likes	-32.489***	-18.336**	-15.830**	-8.407	-5.265	-6.596
	(10.273)	(8.611)	(6.994)	(6.626)	(6.272)	(6.669)
#daytime tweets	-0.294***	-0.131**	-0.095*	-0.065	-0.048	-0.053
	(0.081)	(0.064)	(0.054)	(0.053)	(0.052)	(0.050)
Y2018	0.003	-0.742**	-1.142***	-1.366***	-1.518***	-1.626***
	(0.415)	(0.349)	(0.291)	(0.284)	(0.283)	(0.274)
Y2019	1.305**	0.073	-0.437	-0.775**	-0.986***	-1.073***
	(0.576)	(0.461)	(0.382)	(0.371)	(0.374)	(0.367)
Y2020	1.6*	-.536	-1.41**	-1.97***	-2.32***	-2.51***
	(.919)	(.715)	(.592)	(.576)	(.576)	(.556)
Observations	168	167	166	165	164	163
R-square	0.250	0.292	0.419	0.429	0.445	0.482
#Retweets	-83.846*	-38.179	-38.523	-10.362	4.199	-0.668
	(47.594)	(39.791)	(32.345)	(30.324)	(28.944)	(30.134)
#daytime tweets	-0.240***	-0.126*	-0.099*	-0.072	-0.048	-0.048
	(0.081)	(0.065)	(0.054)	(0.053)	(0.052)	(0.050)
Y2018	-0.143	-0.787**	-1.147***	-1.379***	-1.557***	-1.673***
	(0.433)	(0.360)	(0.300)	(0.288)	(0.287)	(0.282)
Y2019	0.958	-0.029	-0.463	-0.798**	-1.059***	-1.170***
	(0.595)	(0.475)	(0.394)	(0.377)	(0.381)	(0.378)
Y2020	.881	-.729	-1.47**	-1.98***	-2.37***	-2.59***
	(.918)	(.725)	(.604)	(.58)	(.581)	(.565)
Observations	168	167	166	165	164	163
R-square	0.216	0.275	0.404	0.423	0.442	0.478
#Replies	5.735	40.573	28.809	32.301	31.532	32.280
	(33.786)	(29.004)	(24.284)	(23.798)	(23.199)	(23.502)
#daytime tweets	-0.182**	-0.120*	-0.093*	-0.071	-0.044	-0.039
	(0.078)	(0.065)	(0.054)	(0.052)	(0.051)	(0.050)
Y2018	-0.442	-0.842**	-1.198***	-1.355***	-1.511***	-1.650***
	(0.403)	(0.346)	(0.294)	(0.284)	(0.281)	(0.269)
Y2019	0.461	0.003	-0.483	-0.697*	-0.940**	-1.093***
	(0.531)	(0.467)	(0.391)	(0.380)	(0.374)	(0.356)
Y2020	.14	-.468	-1.32**	-1.61**	-1.97***	-2.2***
	(.838)	(.765)	(.642)	(.642)	(.64)	(.619)
Observations	168	167	166	165	164	163
R-square	0.200	0.280	0.404	0.430	0.449	0.485
	This week	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
#Likes	-32.489***	-13.464	1.543	7.874	3.789	1.356

	(10.273)	(9.411)	(10.027)	(10.461)	(9.868)	(9.857)
#daytime tweets	-0.294***	-0.201***	-0.198**	-0.196**	-0.201**	-0.201**
	(0.081)	(0.076)	(0.076)	(0.076)	(0.077)	(0.079)
Y2018	0.003	-0.303	-0.420	-0.487	-0.435	-0.409
	(0.415)	(0.411)	(0.412)	(0.414)	(0.419)	(0.427)
Y2019	1.305**	0.691	0.501	0.407	0.490	0.522
	(0.576)	(0.547)	(0.539)	(0.541)	(0.549)	(0.572)
Y2020	1.6*	.602	.595	.616	.84	.798
	(.919)	(.864)	(.878)	(.893)	(.954)	(1.02)
Observations	168	167	166	165	164	163
R-square	0.250	0.205	0.192	0.186	0.183	0.183
#Retweets	-83.846*	-20.756	50.852	58.691	26.831	15.231
	(47.594)	(43.788)	(45.902)	(47.655)	(45.432)	(44.961)
#daytime tweets	-0.240***	-0.190**	-0.200***	-0.193**	-0.199**	-0.198**
	(0.081)	(0.076)	(0.076)	(0.076)	(0.077)	(0.079)
Y2018	-0.143	-0.381	-0.531	-0.569	-0.473	-0.441
	(0.433)	(0.418)	(0.416)	(0.420)	(0.426)	(0.431)
Y2019	0.958	0.542	0.361	0.305	0.447	0.479
	(0.595)	(0.553)	(0.542)	(0.547)	(0.555)	(0.572)
Y2020	.881	.354	.444	.511	.786	.731
	(.918)	(.861)	(.873)	(.892)	(.952)	(1.01)
Observations	168	167	166	165	164	163
R-square	0.216	0.196	0.198	0.191	0.184	0.184
#Replies	5.735	-1.909	16.316	25.718	18.282	22.900
	(33.786)	(33.749)	(34.421)	(34.686)	(33.744)	(33.826)
#daytime tweets	-0.182**	-0.187**	-0.199***	-0.196**	-0.204***	-0.198**
	(0.078)	(0.076)	(0.076)	(0.076)	(0.077)	(0.077)
Y2018	-0.442	-0.435	-0.396	-0.401	-0.391	-0.401
	(0.403)	(0.404)	(0.402)	(0.401)	(0.403)	(0.404)
Y2019	0.461	0.452	0.607	0.644	0.652	0.649
	(0.531)	(0.549)	(0.556)	(0.555)	(0.562)	(0.549)
Y2020	.14	.232	.799	1.02	1.12	.991
	(.838)	(.901)	(.939)	(.937)	(.965)	(.957)
Observations	168	167	166	165	164	163
R-square	0.200	0.195	0.193	0.186	0.184	0.185
Y-mean	53.43	53.43	53.43	53.43	53.43	53.43
Month FEs	Y	Y	Y	Y	Y	Y

Notes: `likes`, `retweets` and `replies` are divided by 1000,000. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

2.8 Results with Quadratic Trends

Table S11: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-7.021***	-6.974***	-7.002***			
	(2.283)	(2.256)	(2.280)			
Late count				-2.201**	-2.161**	-2.140**
				(0.919)	(0.908)	(0.921)
# daytime tweets		-1.127***			-1.125***	
before sleep		(0.211)			(0.211)	
Days ($\times 10^{-3}$)	-41.009	-45.480	-31.302	-44.181	-48.512	-31.881
	(106.890)	(105.614)	(107.289)	(107.118)	(105.848)	(107.518)
Days^2 ($\times 10^{-6}$)	-51.9***	-43.8***	-38.8**	-51.3***	-43.3***	-38.4**
	(16.1)	(16)	(16.2)	(16.2)	(16.1)	(16.3)
Y2018	37.4	39.3	32	38.3	40.1	32
	(38.4)	(38)	(38.5)	(38.5)	(38.1)	(38.6)
Y2019	84.2	86.6	72	85.8	88.1	71.8
	(76.6)	(75.7)	(76.7)	(76.7)	(75.8)	(76.9)
Y2020	149	151	129	152	153	129
	(115)	(113)	(115)	(115)	(114)	(115)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.207	0.227	0.247	0.205	0.224	0.244
Y-mean	91.67	91.67	91.67	91.67	91.67	91.67
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-1.265**	-1.256**	-1.215**			
	(0.527)	(0.523)	(0.530)			
Late count				-0.418**	-0.410*	-0.389*
				(0.212)	(0.210)	(0.214)
# daytime tweets		-0.217***			-0.216***	
before sleep		(0.049)			(0.049)	
Days ($\times 10^{-3}$)	-8.102	-8.962	-4.173	-8.764	-9.597	-4.346
	(24.673)	(24.473)	(24.956)	(24.706)	(24.506)	(24.985)
Days^2 ($\times 10^{-6}$)	-12.7***	-11.1***	-10.4***	-12.6***	-11***	-10.3***
	(3.72)	(3.71)	(3.77)	(3.74)	(3.72)	(3.79)
Y2018	8.87	9.23	7.11	9.06	9.4	7.13
	(8.87)	(8.8)	(8.96)	(8.88)	(8.81)	(8.97)
Y2019	19.4	19.9	15.7	19.7	20.2	15.7
	(17.7)	(17.5)	(17.8)	(17.7)	(17.6)	(17.9)
Y2020	33.1	33.5	27.4	33.6	34	27.4
	(26.5)	(26.3)	(26.7)	(26.5)	(26.3)	(26.8)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.167	0.182	0.197	0.166	0.180	0.196

Y-mean	20.46	20.46	20.46	20.46	20.46	20.46
	Panel C: Replies after sleep (in thousands)					
Late dummy	-1.256*	-1.247*	-1.204*			
	(0.691)	(0.688)	(0.697)			
Late count				-0.306	-0.298	-0.267
				(0.278)	(0.277)	(0.281)
# daytime tweets		-0.227***			-0.227***	
before sleep		(0.064)			(0.064)	
Days ($\times 10^{-3}$)	46.154	45.254	48.771	45.962	45.090	49.088
	(32.364)	(32.202)	(32.778)	(32.410)	(32.248)	(32.819)
Days^2 ($\times 10^{-6}$)	-21.3***	-19.7***	-18.5***	-21.4***	-19.8***	-18.7***
	(4.88)	(4.88)	(4.95)	(4.9)	(4.9)	(4.97)
Y2018	-12.1	-11.8	-13.5	-12.1	-11.7	-13.6
	(11.6)	(11.6)	(11.8)	(11.7)	(11.6)	(11.8)
Y2019	-21.8	-21.3	-24.7	-21.7	-21.2	-25
	(23.2)	(23.1)	(23.4)	(23.2)	(23.1)	(23.5)
Y2020	-29.6	-29.2	-34.4	-29.5	-29.1	-34.7
	(34.7)	(34.6)	(35.1)	(34.8)	(34.6)	(35.1)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.191	0.200	0.218	0.190	0.199	0.216
Y-mean	19.81	19.81	19.81	19.81	19.81	19.81
	Panel D: Proportion of false tweets after sleep (in percentage)					
Late dummy	0.217	0.217	-0.061			
	(1.507)	(1.507)	(1.530)			
Late count				0.512	0.512	0.479
				(0.605)	(0.605)	(0.617)
# daytime tweets		-0.006			-0.007	
before sleep		(0.141)			(0.141)	
Days ($\times 10^{-3}$)	9.304	9.280	6.568	11.308	11.281	8.617
	(70.542)	(70.575)	(71.997)	(70.555)	(70.588)	(72.000)
Days^2 ($\times 10^{-6}$)	-10.7	-10.6	-9.53	-11.6	-11.5	-10.5
	(10.6)	(10.7)	(10.9)	(10.7)	(10.7)	(10.9)
Y2018	12.4	12.4	13.3	11.8	11.8	12.7
	(25.4)	(25.4)	(25.9)	(25.4)	(25.4)	(25.9)
Y2019	18.1	18.1	19.7	17	17	18.6
	(50.5)	(50.6)	(51.5)	(50.5)	(50.6)	(51.5)
Y2020	5.66	5.67	7.28	4.19	4.21	5.78
	(75.7)	(75.8)	(77.1)	(75.7)	(75.8)	(77.1)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.160	0.160	0.175	0.161	0.161	0.176
Y-mean	26.90	26.90	26.90	26.90	26.90	26.90
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y

#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S12: Late-tweeting and dominant emotion of transcripts after sleep

	Proportion of dominant emotion in transcripts after sleep (in percentage)					
	Happy	Fear	Angry	Happy	Fear	Angry
Late dummy	-3.822	-1.404*	2.904***			
	(2.326)	(0.796)	(0.823)			
Late count				-1.115	-0.750**	0.418
				(0.858)	(0.293)	(0.306)
Days ($\times 10^{-3}$)	328***	4.78	-43.2	333***	3.75	-50.5
	(116)	(39.8)	(41.1)	(116)	(39.6)	(41.4)
Days^2 ($\times 10^{-6}$)	-81.3***	-6.08	5.63	-81***	-5.37	6.15
	(18.8)	(6.42)	(6.65)	(18.8)	(6.42)	(6.7)
Y2018	-97.471**	0.048	14.405	-99.427**	0.252	17.053
	(41.498)	(14.196)	(14.686)	(41.479)	(14.149)	(14.769)
Y2019	-179.228**	2.493	28.340	-183.221**	2.834	33.652
	(82.171)	(28.109)	(29.081)	(82.128)	(28.015)	(29.242)
Y2020	-250**	7.59	41.4	-256**	8.01	49.3
	(123)	(42.1)	(43.5)	(123)	(41.9)	(43.8)
Observations	837	837	837	837	837	837
R-square	0.112	0.141	0.127	0.111	0.145	0.115
Y-mean	88.18	0.8727	1.080	88.18	0.8727	1.080
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S13: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)					
Late dummy	-0.235	-0.238	-0.167			
	(0.247)	(0.246)	(0.250)			
Late count				-0.031	-0.034	-0.025
				(0.099)	(0.099)	(0.101)

# daytime tweets		0.053**			0.053**	
before sleep		(0.023)			(0.023)	
Days ($\times 10^{-3}$)	-19.3*	-19.3*	-17	-19.3*	-19.2*	-16.9
	(11.5)	(11.5)	(11.7)	(11.5)	(11.5)	(11.7)
Days^2 ($\times 10^{-6}$)	28.4***	28.1***	28.3***	28.4***	28***	28.3***
	(1.74)	(1.75)	(1.78)	(1.75)	(1.75)	(1.79)
Y2018	6.344	6.299	5.356	6.328	6.285	5.330
	(4.146)	(4.138)	(4.213)	(4.148)	(4.141)	(4.214)
Y2019	5.79	5.75	3.88	5.76	5.73	3.83
	(8.26)	(8.24)	(8.38)	(8.26)	(8.25)	(8.39)
Y2020	10.7	10.8	7.87	10.7	10.7	7.8
	(12.4)	(12.3)	(12.6)	(12.4)	(12.4)	(12.6)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.845	0.846	0.849	0.845	0.846	0.849
Y-mean	36.27	36.27	36.27	36.27	36.27	36.27
	Panel B: Competitor's implied probability (in percentage)					
Late dummy	0.399	0.400	0.363			
	(0.264)	(0.264)	(0.265)			
Late count				0.063	0.063	0.060
				(0.106)	(0.106)	(0.107)
# daytime tweets		-0.011			-0.011	
before sleep		(0.025)			(0.025)	
Days ($\times 10^{-3}$)	-7.43	-7.45	-9.04	-7.5	-7.51	-9.2
	(12.3)	(12.3)	(12.5)	(12.4)	(12.4)	(12.5)
Days^2 ($\times 10^{-6}$)	20.1***	20.2***	20.6***	20.2***	20.3***	20.7***
	(1.87)	(1.87)	(1.89)	(1.87)	(1.88)	(1.9)
Y2018	-2.341	-2.332	-1.868	-2.324	-2.315	-1.817
	(4.438)	(4.440)	(4.474)	(4.443)	(4.444)	(4.478)
Y2019	-3.54	-3.53	-2.74	-3.51	-3.5	-2.64
	(8.84)	(8.84)	(8.91)	(8.85)	(8.85)	(8.91)
Y2020	.0568	.0513	1.3	.0838	.0773	1.43
	(13.2)	(13.2)	(13.3)	(13.3)	(13.3)	(13.3)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.721	0.721	0.732	0.721	0.721	0.731
Y-mean	12.24	12.24	12.24	12.24	12.24	12.24
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

3 Robustness

3.1 Results Only in DC

In case we capture the effect of location and time zone change rather than that of late tweeting, we restrict our sample only using days when President Trump was in Washington DC and rerun the regressions. We use the dominant location as his location on each day, namely he doesn't need to be in DC for 24 hours, but in DC for a longer time than other cities. Results in Table S14, S15 and S17 are similar to the main results in Table 1-4.

3.2 Retweets without Text

In the main analysis, we consider Trump stays up late if he types something on Twitter, captured by original tweets and retweets with text. In this section, we add back retweets without text and use all his tweets to infer the timing of sleep. We re-construct $Late_t$ variable, both the binary indicator and the number of late tweets. Other variables are the same as before, including $\#Tweets_{t+1}$ as outcome, $\#Tweets_t$ as control, the absolute number and the proportion of false tweets, the average sentiment of daytime tweets and the average number of likes, retweets and replies received by each tweet.

When using binary indicator as $Late_t$, results in Table S18 to S21 are similar with those in Table 1-4. He receives 6% fewer likes, 5.4% retweets and 7% replies per tweet after a late night. However, the tweeting quality is not significantly affected by the number of late tweets (original tweets and retweets together) the night before. We interpret this different result with Table 2 as little contribution of retweets without text to sleep deprivation. The impact of tweets with text at late night is absorbed by adding all tweets together.

Table S14: Predicting late-tweeting with daytime tweets before sleep, year, etc.

	Panel A: Late dummy				
	OLS				Logit
Y2020	0.459***	0.452***	0.470***	0.456***	2.829***
	(0.058)	(0.064)	(0.086)	(0.065)	(0.426)
Y2019	0.257***	0.252***	0.251***	0.251***	1.763***
	(0.037)	(0.041)	(0.042)	(0.042)	(0.312)
Y2018	0.110***	0.108***	0.106***	0.106***	0.962***
	(0.037)	(0.038)	(0.039)	(0.039)	(0.310)
# daytime tweets		.000903			
before sleep		(.00339)			
MarApr*Y2020			-.0263		
			(.108)		
Observations	795	795	795	795	795
R-square	0.137	0.137	0.171	0.171	0.155
Y-mean	0.2340	0.2340	0.2340	0.2340	0.2340
Y-mean 2017	0.0798	0.0798	0.0798	0.0798	0.0798
	Panel B: Late count				
	OLS				Poisson
Y2020	1.211***	1.142***	1.123***	1.142***	2.813***
	(0.134)	(0.147)	(0.197)	(0.149)	(0.291)
Y2019	0.587***	0.540***	0.534***	0.535***	1.772***
	(0.086)	(0.096)	(0.097)	(0.097)	(0.239)
Y2018	0.199**	0.177**	0.166*	0.167*	0.984***
	(0.086)	(0.088)	(0.089)	(0.089)	(0.248)
# daytime tweets		.00901			
before sleep		(.00781)			
MarApr*Y2020			.0375		
			(.249)		
Observations	795	795	795	795	795
R-square	0.156	0.157	0.196	0.196	0.206
Y-mean	0.4503	0.4503	0.4503	0.4503	0.4503
Y-mean 2017	0.1033	0.1033	0.1033	0.1033	0.1033
DOW FEs	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y
#Tweets FEs			Y	Y	Y

Notes: Pseudo R-square is reported for logit and poisson regression. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S15: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-10.470***	-10.403***	-9.932***			
	(2.626)	(2.615)	(2.675)			
Late count				-4.297***	-4.175***	-4.007***
				(1.140)	(1.137)	(1.166)
# daytime tweets		-0.667***			-0.639***	
before sleep		(0.246)			(0.247)	
Y2018	11.6***	13.2***	12.9***	11.3***	12.8***	12.5***
	(2.74)	(2.79)	(2.85)	(2.73)	(2.79)	(2.85)
Y2019	13.9***	17.4***	17.2***	13.8***	17***	16.8***
	(2.82)	(3.09)	(3.14)	(2.82)	(3.08)	(3.14)
Y2020	35.6***	40.7***	41.6***	36***	40.8***	41.6***
	(4.42)	(4.79)	(4.89)	(4.48)	(4.83)	(4.92)
Observations	794	794	794	794	794	794
R-square	0.210	0.218	0.242	0.209	0.215	0.240
Y-mean	90.00	90.00	90.00	90.00	90.00	90.00
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-2.104***	-2.088***	-1.975***			
	(0.588)	(0.585)	(0.599)			
Late count				-0.850***	-0.821***	-0.766***
				(0.255)	(0.254)	(0.261)
# daytime tweets		-0.154***			-0.148***	
before sleep		(0.055)			(0.055)	
Y2018	3.42***	3.79***	3.75***	3.36***	3.71***	3.67***
	(.612)	(.624)	(.639)	(.612)	(.623)	(.639)
Y2019	4.14***	4.94***	4.96***	4.1***	4.86***	4.87***
	(.631)	(.691)	(.705)	(.632)	(.69)	(.703)
Y2020	7.83***	9.02***	9.24***	7.9***	9.01***	9.22***
	(.989)	(1.07)	(1.1)	(1)	(1.08)	(1.1)
Observations	794	794	794	794	794	794
R-square	0.181	0.189	0.211	0.179	0.187	0.209
Y-mean	20.13	20.13	20.13	20.13	20.13	20.13
	Panel C: Replies after sleep (in thousands)					
Late dummy	-2.064**	-2.039**	-1.890**			
	(0.848)	(0.843)	(0.863)			
Late count				-0.681*	-0.635*	-0.541
				(0.368)	(0.367)	(0.376)
# daytime tweets		-0.249***			-0.245***	
before sleep		(0.079)			(0.080)	
Y2018	-.628	-.0254	-.144	-.72	-.133	-.254
	(.884)	(.9)	(.921)	(.883)	(.899)	(.92)

Y2019	-4.37***	-3.07***	-3.07***	-4.5***	-3.24***	-3.26***
	(.911)	(.996)	(1.01)	(.912)	(.995)	(1.01)
Y2020	-7.43***	-5.51***	-5.46***	-7.55***	-5.7***	-5.7***
	(1.43)	(1.55)	(1.58)	(1.45)	(1.56)	(1.59)
Observations	794	794	794	794	794	794
R-square	0.171	0.181	0.206	0.168	0.178	0.203
Y-mean	19.72	19.72	19.72	19.72	19.72	19.72
	Panel D: Proportion of false tweets after sleep (in percentage)					
Late dummy	0.704	0.704	0.173			
	(1.790)	(1.792)	(1.834)			
Late count				1.039	1.041	0.929
				(0.776)	(0.777)	(0.798)
# daytime tweets		-0.001			-0.010	
before sleep		(0.169)			(0.169)	
Y2018	12.1***	12.1***	12.4***	12***	12***	12.2***
	(1.87)	(1.91)	(1.96)	(1.86)	(1.9)	(1.95)
Y2019	17.5***	17.6***	18.2***	17.1***	17.2***	17.8***
	(1.92)	(2.12)	(2.16)	(1.92)	(2.11)	(2.15)
Y2020	-.204	-.195	.436	-1.14	-1.07	-.546
	(3.01)	(3.28)	(3.35)	(3.05)	(3.3)	(3.37)
Observations	794	794	794	794	794	794
R-square	0.185	0.185	0.209	0.187	0.187	0.211
Y-mean	26.75	26.75	26.75	26.75	26.75	26.75
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S16: Late-tweeting and dominant emotion of transcripts after sleep

	Proportion of dominant emotion in transcripts after sleep (in percentage)					
	Happy	Fear	Angry	Happy	Fear	Angry
Late dummy	-3.129	-0.768	1.614*			
	(2.811)	(0.988)	(0.920)			
Late count				0.033	-0.786**	0.268
				(1.079)	(0.377)	(0.353)
Y2018	5.144	0.951	-1.041	4.762	1.018	-0.901
	(3.597)	(1.264)	(1.177)	(3.592)	(1.257)	(1.177)
Y2019	-2.372	3.719***	0.572	-3.341	4.043***	0.870
	(3.706)	(1.302)	(1.213)	(3.691)	(1.291)	(1.209)
Y2020	-4.76	5.74***	2.55	-6.35	6.44***	2.98*
	(4.74)	(1.67)	(1.55)	(4.77)	(1.67)	(1.56)
Observations	611	611	611	611	611	611
R-square	0.131	0.166	0.131	0.129	0.171	0.127
Y-mean	88.71	0.8127	1.006	88.71	0.8127	1.006
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S17: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)					
Late dummy	-0.044	-0.045	-0.042			
	(0.370)	(0.370)	(0.373)			
Late count				-0.091	-0.094	-0.075
				(0.160)	(0.161)	(0.162)
# daytime tweets		0.013			0.013	
before sleep		(0.035)			(0.035)	
Y2018	0.072	0.041	0.061	0.085	0.053	0.069
	(0.385)	(0.394)	(0.398)	(0.384)	(0.393)	(0.397)
Y2019	6.77***	6.71***	6.65***	6.82***	6.75***	6.68***
	(.397)	(.437)	(.439)	(.397)	(.436)	(.437)
Y2020	21.5***	21.4***	21.6***	21.6***	21.5***	21.7***
	(.623)	(.679)	(.682)	(.63)	(.683)	(.686)
Observations	795	795	795	795	795	795
R-square	0.711	0.711	0.728	0.711	0.711	0.728
Y-mean	36.04	36.04	36.04	36.04	36.04	36.04
	Panel B: Competitor's implied probability (in percentage)					
Late dummy	0.713**	0.699**	0.815**			
	(0.353)	(0.350)	(0.358)			
Late count				0.383**	0.358**	0.373**
				(0.153)	(0.152)	(0.156)
# daytime tweets		0.136***			0.133***	
before sleep		(0.033)			(0.033)	
Y2018	6.156***	5.829***	5.844***	6.158***	5.840***	5.868***
	(0.368)	(0.373)	(0.381)	(0.367)	(0.371)	(0.380)
Y2019	12.3***	11.6***	11.6***	12.2***	11.6***	11.6***
	(.38)	(.413)	(.42)	(.379)	(.411)	(.419)
Y2020	27.2***	26.2***	26.1***	27.1***	26.1***	26.1***
	(.595)	(.641)	(.653)	(.601)	(.645)	(.657)
Observations	795	795	795	795	795	795
R-square	0.785	0.790	0.797	0.786	0.790	0.797
Y-mean	12.63	12.63	12.63	12.63	12.63	12.63
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S18: Predicting late-tweeting with daytime tweets before sleep, year, etc.

	Panel A: Late dummy				
	OLS				Logit
Y2020	0.477***	0.466***	0.443***	0.476***	2.502***
	(0.053)	(0.056)	(0.072)	(0.057)	(0.319)
Y2019	0.304***	0.297***	0.297***	0.297***	1.643***
	(0.032)	(0.035)	(0.035)	(0.035)	(0.212)
Y2018	0.071**	0.068**	0.065**	0.065**	0.486**
	(0.032)	(0.032)	(0.033)	(0.033)	(0.215)
# daytime tweets		.00153			
before sleep		(.00283)			
MarApr*Y2020			.0743		
			(.0993)		
Observations	1172	1172	1172	1172	1172
R-square	0.139	0.139	0.158	0.157	0.133
Y-mean	0.2790	0.2790	0.2790	0.2790	0.2790
Y-mean 2017	0.1290	0.1290	0.1290	0.1290	0.1290
	Panel B: Late count				
	OLS				Poisson
Y2020	5.069***	5.291***	4.491***	5.253***	4.204***
	(0.446)	(0.479)	(0.606)	(0.483)	(0.166)
Y2019	1.720***	1.870***	1.856***	1.873***	2.449***
	(0.270)	(0.294)	(0.296)	(0.296)	(0.135)
Y2018	0.297	0.361	0.351	0.367	0.937***
	(0.270)	(0.274)	(0.277)	(0.277)	(0.152)
# daytime tweets		-.0304			
before sleep		(.024)			
MarApr*Y2020			1.74**		
			(.837)		
Observations	1172	1172	1172	1172	1172
R-square	0.140	0.141	0.169	0.166	0.345
Y-mean	1.156	1.156	1.156	1.156	1.156
Y-mean 2017	0.1848	0.1848	0.1848	0.1848	0.1848
DOW FEs	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y
#Tweets FEs			Y	Y	Y

Notes: Pseudo R-square is reported for logit and poisson regression. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S19: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-5.404**	-5.240**	-5.535**			
	(2.226)	(2.197)	(2.215)			
Late count				-0.210	-0.268	-0.262
				(0.262)	(0.259)	(0.262)
# daytime tweets		-1.185***			-1.200***	
before sleep		(0.211)			(0.212)	
Y2018	8.83***	11.3***	10.4***	8.49***	11***	10.1***
	(2.42)	(2.43)	(2.45)	(2.42)	(2.43)	(2.46)
Y2019	14***	19.7***	19.4***	12.7***	18.6***	18.2***
	(2.5)	(2.67)	(2.69)	(2.45)	(2.64)	(2.66)
Y2020	32.6***	41.1***	42***	31***	40.1***	40.8***
	(4.11)	(4.34)	(4.39)	(4.2)	(4.44)	(4.49)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.196	0.217	0.240	0.192	0.214	0.236
Y-mean	91.67	91.67	91.67	91.67	91.67	91.67
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-1.093**	-1.061**	-1.108**			
	(0.514)	(0.509)	(0.515)			
Late count				-0.069	-0.080	-0.075
				(0.060)	(0.060)	(0.061)
# daytime tweets		-0.231***			-0.235***	
before sleep		(0.049)			(0.049)	
Y2018	2.59***	3.07***	2.87***	2.53***	3.02***	2.82***
	(.558)	(.562)	(.571)	(.558)	(.562)	(.571)
Y2019	3.65***	4.76***	4.72***	3.43***	4.6***	4.53***
	(.577)	(.618)	(.625)	(.565)	(.61)	(.617)
Y2020	6.77***	8.44***	8.6***	6.59***	8.37***	8.47***
	(.948)	(1)	(1.02)	(.968)	(1.03)	(1.04)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.156	0.173	0.190	0.154	0.171	0.188
Y-mean	20.46	20.46	20.46	20.46	20.46	20.46
	Panel C: Replies after sleep (in thousands)					
Late dummy	-1.327**	-1.293*	-1.384**			
	(0.675)	(0.671)	(0.678)			
Late count				-0.059	-0.072	-0.075
				(0.079)	(0.079)	(0.080)
# daytime tweets		-0.251***			-0.255***	
before sleep		(0.064)			(0.065)	
Y2018	-.88	-.361	-.534	-.961	-.428	-.602
	(.734)	(.741)	(.751)	(.733)	(.741)	(.751)

Y2019	-4.56***	-3.35***	-3.31***	-4.86***	-3.6***	-3.58***
	(.758)	(.815)	(.822)	(.743)	(.805)	(.812)
Y2020	-8.37***	-6.55***	-6.24***	-8.7***	-6.78***	-6.51***
	(1.25)	(1.32)	(1.34)	(1.27)	(1.35)	(1.37)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.177	0.188	0.208	0.175	0.186	0.205
Y-mean	19.81	19.81	19.81	19.81	19.81	19.81
	Panel D: Proportion of false tweets after sleep (in percentage)					
Late dummy	-0.306	-0.303	-0.560			
	(1.459)	(1.460)	(1.480)			
Late count				0.194	0.193	0.171
				(0.171)	(0.171)	(0.174)
# daytime tweets		-0.019			-0.013	
before sleep		(0.140)			(0.140)	
Y2018	13***	13***	13.2***	12.9***	12.9***	13.1***
	(1.59)	(1.61)	(1.64)	(1.58)	(1.61)	(1.64)
Y2019	16.7***	16.8***	17.3***	16.3***	16.3***	16.8***
	(1.64)	(1.77)	(1.79)	(1.6)	(1.75)	(1.77)
Y2020	1.33	1.47	1.65	.193	.293	.477
	(2.69)	(2.88)	(2.93)	(2.74)	(2.94)	(2.99)
Observations	1153	1153	1153	1153	1153	1153
R-square	0.160	0.160	0.175	0.160	0.160	0.175
Y-mean	26.90	26.90	26.90	26.90	26.90	26.90
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S20: Late-tweeting and dominant emotion of transcripts after sleep

	Proportion of dominant emotion in transcripts after sleep (in percentage)					
	Happy	Fear	Angry	Happy	Fear	Angry
Late dummy	-6.036***	-1.709**	3.303***			
	(2.313)	(0.782)	(0.808)			
Late count				-0.792***	-0.108	0.036
				(0.193)	(0.066)	(0.069)
Y2018	1.738	0.277	0.049	1.816	0.234	0.228
	(3.040)	(1.027)	(1.062)	(3.019)	(1.028)	(1.072)
Y2019	-1.963	1.467	0.919	-1.882	1.227	1.772
	(3.154)	(1.066)	(1.102)	(3.097)	(1.055)	(1.100)
Y2020	-2.98	4.61***	1.6	-.696	4.52***	2.86*
	(4.18)	(1.41)	(1.46)	(4.2)	(1.43)	(1.49)
Observations	837	837	837	837	837	837
R-square	0.091	0.141	0.129	0.102	0.139	0.111
Y-mean	88.18	0.8727	1.080	88.18	0.8727	1.080
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S21: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)					
Late dummy	0.125	0.111	0.180			
	(0.265)	(0.264)	(0.268)			
Late count				-0.004	0.000	0.006
				(0.031)	(0.031)	(0.032)
# daytime tweets		0.087***			0.087***	
before sleep		(0.025)			(0.025)	
Y2018	6.696***	6.516***	6.528***	6.706***	6.524***	6.538***
	(0.286)	(0.290)	(0.295)	(0.286)	(0.290)	(0.295)
Y2019	13.7***	13.3***	13.2***	13.7***	13.3***	13.3***
	(.297)	(.32)	(.324)	(.291)	(.316)	(.32)
Y2020	28.6***	28***	27.9***	28.7***	28***	28***
	(.489)	(.52)	(.529)	(.498)	(.531)	(.54)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.809	0.811	0.814	0.809	0.811	0.814
Y-mean	36.27	36.27	36.27	36.27	36.27	36.27
	Panel B: Competitor's implied probability (in percentage)					
Late dummy	0.576**	0.574**	0.544**			
	(0.268)	(0.269)	(0.270)			
Late count				0.117***	0.118***	0.114***
				(0.032)	(0.032)	(0.032)
# daytime tweets		0.014			0.018	
before sleep		(0.026)			(0.026)	
Y2018	0.189	0.160	0.215	0.195	0.157	0.208
	(0.290)	(0.295)	(0.298)	(0.288)	(0.293)	(0.296)
Y2019	6.58***	6.51***	6.51***	6.55***	6.46***	6.46***
	(.301)	(.326)	(.327)	(.293)	(.32)	(.322)
Y2020	19.5***	19.4***	19.6***	19.2***	19***	19.2***
	(.495)	(.529)	(.534)	(.502)	(.538)	(.542)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.692	0.692	0.702	0.695	0.695	0.705
Y-mean	12.24	12.24	12.24	12.24	12.24	12.24
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

3.3 Drop Tweets with Hashtag

Table S22: Predicting late-tweeting with daytime tweets before sleep, year, etc.

	Panel A: Late dummy				
	OLS				Logit
Y2020	0.410***	0.407***	0.393***	0.425***	2.607***
	(0.049)	(0.053)	(0.067)	(0.054)	(0.347)
Y2019	0.250***	0.248***	0.246***	0.246***	1.681***
	(0.030)	(0.033)	(0.034)	(0.033)	(0.243)
Y2018	0.089***	0.088***	0.089***	0.089***	0.797***
	(0.030)	(0.031)	(0.031)	(0.031)	(0.243)
# daytime tweets		.000415			
before sleep		(.00278)			
MarApr*Y2020			.0736		
			(.0929)		
Observations	1172	1172	1172	1172	1172
R-square	0.114	0.114	0.147	0.146	0.140
Y-mean	0.2235	0.2235	0.2235	0.2235	0.2235
Y-mean 2017	0.0909	0.0909	0.0909	0.0909	0.0909
	Panel B: Late count				
	OLS				Poisson
Y2020	1.088***	1.077***	1.103***	1.119***	2.829***
	(0.123)	(0.132)	(0.164)	(0.131)	(0.237)
Y2019	0.641***	0.632***	0.613***	0.613***	1.897***
	(0.074)	(0.083)	(0.082)	(0.082)	(0.186)
Y2018	0.195***	0.191**	0.187**	0.187**	0.987***
	(0.074)	(0.076)	(0.075)	(0.075)	(0.195)
# daytime tweets		.00163			
before sleep		(.00688)			
MarApr*Y2020			.0353		
			(.226)		
Observations	1172	1172	1172	1172	1172
R-square	0.121	0.121	0.183	0.183	0.196
Y-mean	0.4369	0.4369	0.4369	0.4369	0.4369
Y-mean 2017	0.1085	0.1085	0.1085	0.1085	0.1085
DOW FEs	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y
#Tweets FEs			Y	Y	Y

Notes: Pseudo R-square is reported for logit and poisson regression. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S23: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-6.868***	-6.931***	-7.383***			
	(2.493)	(2.464)	(2.509)			
Late count				-2.409**	-2.392**	-2.704***
				(1.003)	(0.991)	(1.028)
# daytime tweets		-1.223***			-1.218***	
before sleep		(0.234)			(0.234)	
Y2018	8.74***	11.5***	10.6***	8.6***	11.3***	10.5***
	(2.59)	(2.61)	(2.65)	(2.59)	(2.61)	(2.65)
Y2019	12.7***	19***	18***	12.6***	18.8***	17.8***
	(2.65)	(2.87)	(2.9)	(2.65)	(2.88)	(2.91)
Y2020	32.7***	41.3***	42.7***	32.5***	41.1***	42.6***
	(4.33)	(4.59)	(4.65)	(4.35)	(4.6)	(4.67)
Observations	1130	1130	1130	1130	1130	1130
R-square	0.177	0.196	0.218	0.175	0.195	0.217
Y-mean	93.59	93.59	93.59	93.59	93.59	93.59
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-1.248**	-1.260**	-1.321**			
	(0.544)	(0.538)	(0.550)			
Late count				-0.448**	-0.444**	-0.496**
				(0.219)	(0.216)	(0.225)
# daytime tweets		-0.253***			-0.253***	
before sleep		(0.051)			(0.051)	
Y2018	2.72***	3.29***	3.14***	2.7***	3.27***	3.12***
	(.565)	(.571)	(.581)	(.565)	(.571)	(.58)
Y2019	3.49***	4.79***	4.62***	3.47***	4.75***	4.6***
	(.577)	(.628)	(.636)	(.579)	(.629)	(.637)
Y2020	6.61***	8.39***	8.68***	6.59***	8.36***	8.67***
	(.945)	(1)	(1.02)	(.949)	(1.01)	(1.02)
Observations	1130	1130	1130	1130	1130	1130
R-square	0.150	0.168	0.186	0.149	0.167	0.185
Y-mean	20.78	20.78	20.78	20.78	20.78	20.78
	Panel C: Replies after sleep (in thousands)					
Late dummy	-0.880	-0.893	-0.953			
	(0.732)	(0.728)	(0.742)			
Late count				-0.303	-0.300	-0.369
				(0.294)	(0.293)	(0.304)
# daytime tweets		-0.250***			-0.249***	
before sleep		(0.069)			(0.069)	
Y2018	-1.71**	-1.15	-1.41*	-1.73**	-1.17	-1.43*
	(.761)	(.772)	(.784)	(.76)	(.772)	(.783)

Y2019	-5.93***	-4.65***	-4.91***	-5.95***	-4.68***	-4.91***
	(.777)	(.849)	(.859)	(.779)	(.85)	(.86)
Y2020	-9.6***	-7.84***	-7.36***	-9.63***	-7.88***	-7.35***
	(1.27)	(1.35)	(1.37)	(1.28)	(1.36)	(1.38)
Observations	1130	1130	1130	1130	1130	1130
R-square	0.179	0.188	0.208	0.178	0.188	0.207
Y-mean	20.47	20.47	20.47	20.47	20.47	20.47
	Panel D: Proportion of false tweets after sleep (in percentage)					
Late dummy	0.887	0.888	0.953			
	(1.631)	(1.631)	(1.669)			
Late count				0.544	0.543	0.462
				(0.655)	(0.656)	(0.683)
# daytime tweets		0.025			0.024	
before sleep		(0.155)			(0.155)	
Y2018	11***	11***	11***	11***	11***	11***
	(1.7)	(1.73)	(1.76)	(1.69)	(1.73)	(1.76)
Y2019	14***	13.8***	13.7***	13.8***	13.7***	13.7***
	(1.73)	(1.9)	(1.93)	(1.73)	(1.91)	(1.93)
Y2020	-3.72	-3.89	-3.18	-3.95	-4.12	-3.3
	(2.83)	(3.04)	(3.09)	(2.85)	(3.05)	(3.1)
Observations	1130	1130	1130	1130	1130	1130
R-square	0.134	0.134	0.149	0.134	0.134	0.149
Y-mean	28.51	28.51	28.51	28.51	28.51	28.51
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. It is even smaller than that in Table 2 due to the restricted sample, i.e. all daytime tweets have hashtag on 23 days. `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S24: Late-tweeting and dominant emotion of transcripts after sleep

	Proportion of dominant emotion in transcripts after sleep (in percentage)					
	Happy	Fear	Angry	Happy	Fear	Angry
Late dummy	-5.213**	-0.957	3.100***			
	(2.388)	(0.784)	(0.840)			
Late count				-1.969**	-0.648**	0.359
				(0.908)	(0.298)	(0.322)
Y2018	1.106	0.132	0.462	1.161	0.197	0.586
	(3.053)	(1.003)	(1.074)	(3.054)	(1.001)	(1.083)
Y2019	-2.979	1.733*	1.011	-2.779	1.962*	1.435
	(3.194)	(1.049)	(1.123)	(3.211)	(1.052)	(1.138)
Y2020	-4.52	2.83**	2.03	-4.35	3.17**	2.81*
	(4.12)	(1.35)	(1.45)	(4.14)	(1.36)	(1.47)
Observations	837	837	837	837	837	837
R-square	0.100	0.197	0.126	0.100	0.201	0.112
Y-mean	88.71	0.8780	1.087	88.71	0.8780	1.087
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S25: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)					
Late dummy	0.081	0.077	0.104			
	(0.282)	(0.280)	(0.287)			
Late count				0.168	0.165	0.193
				(0.113)	(0.113)	(0.118)
# daytime tweets		0.091***			0.091***	
before sleep		(0.026)			(0.026)	
Y2018	6.698***	6.486***	6.505***	6.672***	6.462***	6.478***
	(0.287)	(0.292)	(0.299)	(0.286)	(0.292)	(0.298)
Y2019	13.7***	13.2***	13.2***	13.6***	13.1***	13.1***
	(.294)	(.324)	(.33)	(.295)	(.324)	(.33)
Y2020	28.6***	28***	27.9***	28.5***	27.8***	27.7***
	(.486)	(.519)	(.53)	(.488)	(.52)	(.532)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.809	0.811	0.813	0.809	0.811	0.814
Y-mean	36.27	36.27	36.27	36.27	36.27	36.27
	Panel B: Competitor's implied probability (in percentage)					
Late dummy	0.613**	0.612**	0.507*			
	(0.285)	(0.285)	(0.288)			
Late count				0.165	0.164	0.089
				(0.115)	(0.115)	(0.118)
# daytime tweets		0.032			0.032	
before sleep		(0.027)			(0.027)	
Y2018	0.176	0.102	0.123	0.198	0.125	0.151
	(0.290)	(0.297)	(0.299)	(0.291)	(0.297)	(0.300)
Y2019	6.6***	6.44***	6.36***	6.65***	6.48***	6.43***
	(.298)	(.33)	(.331)	(.299)	(.33)	(.332)
Y2020	19.5***	19.3***	19.5***	19.6***	19.4***	19.6***
	(.492)	(.528)	(.532)	(.495)	(.53)	(.535)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.692	0.693	0.704	0.691	0.692	0.704
Y-mean	12.24	12.24	12.24	12.24	12.24	12.24
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

3.4 Alternative Late Hours 10pm-5am

Table S26: Predicting late-tweeting with daytime tweets before sleep, year, etc.

	Panel A: Late dummy				
	OLS				Logit
Y2020	0.377***	0.326***	0.264***	0.321***	1.436***
	(0.058)	(0.062)	(0.079)	(0.063)	(0.288)
Y2019	0.276***	0.242***	0.244***	0.246***	1.100***
	(0.035)	(0.038)	(0.039)	(0.039)	(0.181)
Y2018	0.041	0.026	0.028	0.030	0.150
	(0.035)	(0.036)	(0.036)	(0.036)	(0.174)
# daytime tweets		.00712**			
before sleep		(.00311)			
MarApr*Y2020			.129		
			(.109)		
Observations	1172	1172	1172	1172	1172
R-square	0.121	0.125	0.145	0.144	0.099
Y-mean	0.3976	0.3976	0.3976	0.3976	0.3976
Y-mean 2017	0.2786	0.2786	0.2786	0.2786	0.2786
	Panel B: Late count				
	OLS				Poisson
Y2020	1.688***	1.566***	1.465***	1.527***	1.791***
	(0.180)	(0.193)	(0.243)	(0.194)	(0.146)
Y2019	0.984***	0.902***	0.904***	0.905***	1.128***
	(0.109)	(0.119)	(0.119)	(0.119)	(0.101)
Y2018	0.190*	0.155	0.164	0.166	0.303***
	(0.109)	(0.110)	(0.111)	(0.111)	(0.110)
# daytime tweets		.0167*			
before sleep		(.00967)			
MarApr*Y2020			.143		
			(.336)		
Observations	1172	1172	1172	1172	1172
R-square	0.147	0.149	0.183	0.183	0.151
Y-mean	0.8840	0.8840	0.8840	0.8840	0.8840
Y-mean 2017	0.4252	0.4252	0.4252	0.4252	0.4252
DOW FEs	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y
#Tweets FEs			Y	Y	Y

Notes: Pseudo R-square is reported for logit and poisson regression. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S27: Late-tweeting and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes after sleep (in thousands)					
Late dummy	-5.293**	-4.602**	-4.358**			
	(2.057)	(2.037)	(2.059)			
Late count				-1.909***	-1.737***	-1.686**
				(0.660)	(0.652)	(0.666)
# daytime tweets		-1.154***			-1.157***	
before sleep		(0.217)			(0.216)	
Y2018	7.92***	10.3***	9.49***	8.07***	10.4***	9.64***
	(2.46)	(2.47)	(2.5)	(2.46)	(2.47)	(2.5)
Y2019	14.2***	19.6***	19.2***	14.6***	20***	19.6***
	(2.51)	(2.68)	(2.7)	(2.53)	(2.69)	(2.72)
Y2020	31.7***	39.8***	40.4***	33***	41.1***	41.6***
	(4.12)	(4.35)	(4.4)	(4.2)	(4.42)	(4.47)
Observations	1150	1150	1150	1150	1150	1150
R-square	0.191	0.211	0.231	0.193	0.213	0.233
Y-mean	91.65	91.65	91.65	91.65	91.65	91.65
	Panel B: Retweets after sleep (in thousands)					
Late dummy	-0.817*	-0.686	-0.625			
	(0.491)	(0.489)	(0.496)			
Late count				-0.313**	-0.280*	-0.255
				(0.158)	(0.157)	(0.160)
# daytime tweets		-0.219***			-0.219***	
before sleep		(0.052)			(0.052)	
Y2018	2.34***	2.79***	2.6***	2.36***	2.82***	2.62***
	(.587)	(.592)	(.602)	(.587)	(.592)	(.602)
Y2019	3.57***	4.59***	4.52***	3.65***	4.68***	4.6***
	(.6)	(.643)	(.651)	(.604)	(.647)	(.655)
Y2020	6.44***	7.98***	8.09***	6.66***	8.2***	8.29***
	(.984)	(1.04)	(1.06)	(1)	(1.06)	(1.08)
Observations	1150	1150	1150	1150	1150	1150
R-square	0.143	0.156	0.171	0.143	0.157	0.172
Y-mean	19.89	19.89	19.89	19.89	19.89	19.89
	Panel C: Replies after sleep (in thousands)					
Late dummy	-1.259**	-1.118*	-1.064*			
	(0.627)	(0.625)	(0.633)			
Late count				-0.388*	-0.353*	-0.325
				(0.201)	(0.200)	(0.205)
# daytime tweets		-0.235***			-0.237***	
before sleep		(0.067)			(0.066)	
Y2018	-1.23*	-.748	-.918	-1.21	-.724	-.897
	(.749)	(.758)	(.769)	(.75)	(.758)	(.769)

Y2019	-4.5***	-3.4***	-3.4***	-4.46***	-3.36***	-3.37***
	(.766)	(.822)	(.831)	(.772)	(.828)	(.837)
Y2020	-8.66***	-7***	-6.77***	-8.47***	-6.8***	-6.61***
	(1.26)	(1.34)	(1.35)	(1.28)	(1.36)	(1.37)
Observations	1150	1150	1150	1150	1150	1150
R-square	0.174	0.183	0.201	0.174	0.183	0.201
Y-mean	20.47	20.47	20.47	20.47	20.47	20.47
	Panel D: Proportion of false tweets after sleep (in percentage)					
Late dummy	0.906	0.900	0.565			
	(1.364)	(1.368)	(1.388)			
Late count				0.560	0.559	0.587
				(0.438)	(0.438)	(0.449)
# daytime tweets		0.010			0.007	
before sleep		(0.145)			(0.145)	
Y2018	12.4***	12.4***	12.6***	12.3***	12.3***	12.5***
	(1.63)	(1.66)	(1.69)	(1.63)	(1.66)	(1.69)
Y2019	16.7***	16.6***	17***	16.4***	16.3***	16.7***
	(1.67)	(1.8)	(1.82)	(1.68)	(1.81)	(1.83)
Y2020	.639	.565	.738	.0214	-.0302	.00822
	(2.73)	(2.92)	(2.97)	(2.79)	(2.97)	(3.01)
Observations	1150	1150	1150	1150	1150	1150
R-square	0.153	0.153	0.168	0.154	0.154	0.169
Y-mean	26.79	26.79	26.79	26.79	26.79	26.79
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. It is even smaller than that in Table 2 as we use tweets posted 6am-10pm as daytime tweets, i.e. he tweeted 10pm-11pm but didn't tweet 6am-10pm on three days. `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S28: Late-tweeting and dominant emotion of transcripts after sleep

	Proportion of dominant emotion in transcripts after sleep (in percentage)					
	Happy	Fear	Angry	Happy	Fear	Angry
Late dummy	-0.496	-1.020	1.122			
	(2.159)	(0.728)	(0.758)			
Late count				-1.464**	-0.036	-0.014
				(0.581)	(0.197)	(0.205)
Y2018	1.407	0.241	0.174	1.649	0.181	0.250
	(3.053)	(1.029)	(1.071)	(3.039)	(1.030)	(1.073)
Y2019	-3.550	1.228	1.584	-2.114	1.022	1.868*
	(3.142)	(1.059)	(1.103)	(3.148)	(1.067)	(1.111)
Y2020	-5.53	4.16***	2.73*	-3.5	3.89***	3.1**
	(4.12)	(1.39)	(1.45)	(4.14)	(1.4)	(1.46)
Observations	837	837	837	837	837	837
R-square	0.083	0.138	0.113	0.090	0.136	0.111
Y-mean	88.71	0.8780	1.087	88.71	0.8780	1.087
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs	Y	Y	Y	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S29: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)					
Late dummy	0.018	-0.038	-0.024			
	(0.241)	(0.240)	(0.243)			
Late count				0.123	0.110	0.116
				(0.077)	(0.077)	(0.079)
# daytime tweets		0.087***			0.085***	
before sleep		(0.025)			(0.025)	
Y2018	6.704***	6.525***	6.541***	6.681***	6.507***	6.521***
	(0.286)	(0.289)	(0.295)	(0.286)	(0.289)	(0.294)
Y2019	13.7***	13.3***	13.3***	13.6***	13.2***	13.2***
	(.293)	(.316)	(.32)	(.296)	(.318)	(.322)
Y2020	28.7***	28***	28***	28.5***	27.9***	27.8***
	(.481)	(.511)	(.519)	(.49)	(.519)	(.527)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.809	0.811	0.814	0.810	0.811	0.815
Y-mean	36.27	36.27	36.27	36.27	36.27	36.27
	Panel B: Competitor's implied probability (in percentage)					
Late dummy	0.548**	0.541**	0.576**			
	(0.243)	(0.244)	(0.245)			
Late count				0.173**	0.171**	0.185**
				(0.078)	(0.079)	(0.080)
# daytime tweets		0.011			0.012	
before sleep		(0.026)			(0.026)	
Y2018	0.208	0.185	0.233	0.197	0.173	0.220
	(0.289)	(0.294)	(0.297)	(0.290)	(0.295)	(0.297)
Y2019	6.6***	6.55***	6.53***	6.58***	6.53***	6.51***
	(.297)	(.321)	(.323)	(.299)	(.324)	(.325)
Y2020	19.6***	19.5***	19.6***	19.5***	19.4***	19.5***
	(.487)	(.52)	(.523)	(.496)	(.528)	(.532)
Observations	1172	1172	1172	1172	1172	1172
R-square	0.692	0.692	0.703	0.692	0.692	0.703
Y-mean	12.24	12.24	12.24	12.24	12.24	12.24
DOW FEs	Y	Y	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y	Y	Y
#Tweets FEs			Y			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

3.5 Continuous Measure of Sleep Time

We replace the discrete variable $Late_t$ with a continuous measure of sleep time. To do this, we use Trump's tweets 11pm-6am and manually add one tweet at 11pm and one at 6am. On each day, we order all late tweets (including the two virtual tweets) by time and calculate the gap between each two tweet. Then we use the longest gap to infer his sleep time. If he doesn't tweet 11pm-6am, sleep time is 7 hours, i.e. the time gap between two virtual tweets.

Results in Table S30 to S33 are similar to our main results. Trump sleeps for 40 minutes and 14 minutes shorter per night in 2020 and 2019, a 10% and 3% decrease compared with 6.8 hours per night in 2017. Like late tweeting, short sleep time is associated with fewer likes, fewer replies and more positive sentiment the following day. The effect on tweet quality scales up when sleep time becomes shorter.

Table S30: Predicting sleep time with daytime tweets before sleep, year, etc.

	Sleep time			
Y2020	-0.627***	-0.651***	-0.569***	-0.662***
	(0.080)	(0.086)	(0.110)	(0.088)
Y2019	-0.216***	-0.232***	-0.229***	-0.231***
	(0.049)	(0.053)	(0.054)	(0.054)
Y2018	-0.016	-0.023	-0.020	-0.022
	(0.049)	(0.049)	(0.050)	(0.050)
# daytime tweets		0.003		
before sleep		(0.004)		
MarApr*Y2020			-.213	
			(.152)	
Observations	1172	1172	1172	1172
R-square	0.092	0.092	0.112	0.110
Y-mean	6.696	6.696	6.696	6.696
Y-mean 2017	6.800	6.800	6.800	6.800
DOW FEs	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y
#Tweets FEs			Y	Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S31: Sleep time and likes, retweets, replies, proportion of false tweeting after sleep

	Panel A: Likes (in thousands)		
Sleep time	2.925**	3.117**	3.126**
	(1.456)	(1.436)	(1.448)
# daytime tweets		-1.202***	
before sleep		(0.211)	
Y2018	8.486***	10.986***	10.105***
	(2.416)	(2.423)	(2.452)
Y2019	12.971***	18.854***	18.438***
	(2.429)	(2.609)	(2.628)
Y2020	31.8***	40.7***	41.5***
	(4.08)	(4.32)	(4.37)
Observations	1153	1153	1153
R-square	0.194	0.217	0.239
Y-mean	91.67	91.67	91.67
	Panel B: Retweets (in thousands)		
Sleep time	0.531	0.569*	0.548
	(0.336)	(0.333)	(0.337)
# daytime tweets		-0.235***	
before sleep		(0.049)	
Y2018	2.517***	3.005***	2.805***
	(0.557)	(0.561)	(0.570)
Y2019	3.432***	4.579***	4.514***
	(0.560)	(0.604)	(0.611)
Y2020	6.58***	8.32***	8.43***
	(.941)	(1)	(1.02)
Observations	1153	1153	1153
R-square	0.155	0.172	0.188
Y-mean	20.46	20.46	20.46
	Panel C: Replies (in thousands)		
Sleep time	1.022**	1.063**	1.036**
	(0.441)	(0.438)	(0.443)
# daytime tweets		-0.256***	
before sleep		(0.064)	
Y2018	-0.958	-0.425	-0.602
	(0.731)	(0.739)	(0.749)
Y2019	-4.741***	-3.487***	-3.478***
	(0.735)	(0.796)	(0.803)
Y2020	-8.36***	-6.46***	-6.21***
	(1.24)	(1.32)	(1.34)
Observations	1153	1153	1153
R-square	0.178	0.189	0.209

Y-mean	19.81	19.81	19.81
	Panel D: Proportion of false tweets (in percentage)		
Sleep time	0.807	0.811	0.897
	(0.953)	(0.954)	(0.966)
# daytime tweets before sleep		-0.022	
		(0.140)	
Y2018	12.995***	13.041***	13.199***
	(1.582)	(1.609)	(1.636)
Y2019	16.765***	16.874***	17.311***
	(1.590)	(1.733)	(1.754)
Y2020	1.7	1.86	1.99
	(2.67)	(2.87)	(2.92)
Observations	1153	1153	1153
R-square	0.160	0.160	0.175
Y-mean	26.90	26.90	26.90
DOW FEs	Y	Y	Y
Month FEs	Y	Y	Y
#Tweets FEs			Y

Notes: The smaller sample size than that in Table 1 is due to days with no daytime tweets. `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S32: Sleep time and dominant emotion of transcripts after sleep

	Proportion of dominant emotion (in percentage)		
Sleep time	2.781*	-0.908*	-0.555
	(1.431)	(0.483)	(0.504)
Y2018	1.550	0.117	0.213
	(3.044)	(1.027)	(1.071)
Y2019	-3.134	0.809	1.746
	(3.104)	(1.048)	(1.093)
Y2020	-3.602	3.159**	2.666*
	(4.192)	(1.415)	(1.476)
Observations	837	837	837
R-square	0.087	0.140	0.112
Y-mean	88.71	0.8780	1.087
DOW FEs	Y	Y	Y
Month FEs	Y	Y	Y
#Tweets FEs	Y	Y	Y

Notes: The smaller sample size than that in Table 1 is due to days with no transcripts. `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S33: Late-tweeting and election odds after sleep

	Panel A: Trump's implied probability (in percentage)		
Sleep time	-0.007	-0.020	-0.055
	(0.173)	(0.173)	(0.175)
# daytime tweets before sleep		0.087***	
		(0.025)	
Y2018	6.705***	6.523***	6.539***
	(0.286)	(0.289)	(0.294)
Y2019	13.720***	13.291***	13.277***
	(0.288)	(0.313)	(0.317)
Y2020	28.7***	28***	28***
	(.485)	(.518)	(.526)
Observations	1172	1172	1172
R-square	0.809	0.811	0.814
Y-mean	36.27	36.27	36.27
	Panel B: Competitor's implied probability (in percentage)		
Sleep time	-0.320*	-0.322*	-0.306*
	(0.176)	(0.176)	(0.177)
# daytime tweets before sleep		0.016	
		(0.026)	
Y2018	0.225	0.192	0.243
	(0.290)	(0.295)	(0.297)
Y2019	6.686***	6.608***	6.604***
	(0.292)	(0.319)	(0.320)
Y2020	19.6***	19.5***	19.6***
	(.491)	(.527)	(.531)
Observations	1172	1172	1172
R-square	0.692	0.692	0.702
Y-mean	12.24	12.24	12.24
DOW FEs	Y	Y	Y
Month FEs	Y	Y	Y
#Tweets FEs			Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

4 Serial Correlation

Our sample is constructed with time series data. A potential problem for our estimation is that the errors may be serially correlated. To address the problem, we first use the Arellano-Bond test to check the existence of serial correlation and its order (Arellano and Bond, 1991). Table S34 reports the test statistics for $Late_t$. The small p-value (0.000) for the AR(1) test rejects the null hypothesis of no first-order serial correlation in the time series. This means we have at least the first-order serial correlation problem. The small p-values (0.051 and 0.029) for the AR(2) test also rejects the null hypothesis of no second-order serial correlation in the first-differenced residuals, suggesting that the order of serial correlation at least two.

Here we bring back our estimation equation. The test statistics for AR(1) suggest u_t is serially correlated, i.e. u_t is correlated with u_{t-1}, u_{t-1} is correlated with u_{t-2}:

$$\text{Late}_\text{t} = \alpha_0 + \beta_1 \#\text{Tweets}_\text{t} + \beta_2 \text{MarApr} * \text{Y2020}_\text{t} + \text{Year}_\text{t} + \text{Month}_\text{t} + \text{DOW}_\text{t} + u_t \tag{1}$$

$$\text{Late}_\text{t} = \alpha_0 + \beta X_t + u_t$$

$$\text{Late}_{\text{t}-1} = \alpha_0 + \beta X_{t-1} + u_{t-1}$$

$$\text{Late}_{\text{t}-2} = \alpha_0 + \beta X_{t-2} + u_{t-2}$$

We rewrite u_t as a function of u_{t-1}:

$$u_t = \gamma_0 + \gamma_1 u_{t-1} + \varepsilon_t$$

$$u_{t-1} = \gamma_0 + \gamma_1 u_{t-2} + \varepsilon_{t-1}$$

The test statistics for AR(2) suggests there is still autocorrelation in the first-differenced residuals. We have ε_t correlated with ε_{t-1}:

$$\varepsilon_t = \lambda + \gamma_2 \varepsilon_{t-1} + e_t$$

We redo the serial correlation test for for $u_t - \gamma_1 u_t$ where γ_1 is estimated from the correlation coefficient of $\hat{u}_t$ and $\hat{u}_{t-1}$. Test statistics are reported in the last two rows in Table S34. They confirm $u_t - \gamma_1 u_t$ follows AR(1) process and doesn't have the second-order serial correlation. Namely u_t has the second-order serial correlation and follows AR(2) process.

After detecting the existence and the order of serial correlation, we use the following filtering transformation to adjust all the outcomes and control variables and re-estimate our equation. This gives us an unbiased and consistent β without serial correlation.

$$u_t = \text{Late}_\text{t} - \beta X_t - \alpha_0 = \gamma_0 + \gamma_1(\text{Late}_\text{t-1} - \beta X_{t-1} - \alpha_0) + \varepsilon_t$$
$$\text{Late}_\text{t} - \gamma_1 \text{Late}_\text{t-1} = (\alpha_0 + \alpha_0\gamma_1 + \gamma_0) + \beta(X_t - \gamma_1 X_{t-1}) + \varepsilon_t$$
$$\text{Late}_\text{t-1} - \gamma_1 \text{Late}_\text{t-2} = (\alpha_0 + \alpha_0\gamma_1 + \gamma_0) + \beta(X_{t-1} - \gamma_1 X_{t-2}) + \varepsilon_{t-1}$$

$$\varepsilon_t = \lambda + \gamma_2\varepsilon_{t-1} + e_t$$
$$\text{Late}_\text{t} - \gamma_1 \text{Late}_\text{t-1} - (\alpha_0 + \alpha_0\gamma_1 + \gamma_0) - \beta(X_t - \gamma_1 X_{t-1})$$
$$= \lambda + \gamma_2[\text{Late}_\text{t-1} - \gamma_1 \text{Late}_\text{t-2} - (\alpha_0 + \alpha_0\gamma_1 + \gamma_0) - \beta(X_{t-1} - \gamma_1 X_{t-2})] + e_t$$

$$\text{Late}_\text{t} - (\gamma_1 + \gamma_2)\text{Late}_\text{t-1} + \gamma_1\gamma_2 \text{Late}_\text{t-2}$$
$$= (\alpha_0 + \alpha_0\gamma_1 - \alpha_0\gamma_2 - \alpha_0\gamma_1\gamma_2 + \gamma_0 - \gamma_0\gamma_2 + \lambda)$$
$$+\beta[X_t - (\gamma_1 + \gamma_2)X_{t-1} - \gamma_1\gamma_2 X_{t-2}] + e_t$$

We use $Late_t - (\gamma_1 + \gamma_2)Late_{t-1} + \gamma_1\gamma_2 Late_{t-2}$ for the filtering transformation. γ_1 is estimated by the correlation coefficient of $\hat{u}_t$ and $\hat{u}_{t-1}$. γ_2 is estimated by the correlation coefficient of $\hat{\varepsilon}_t$ and $\hat{\varepsilon}_{t-1}$. Table S34 reports the original results with all fixed effects in Table 1 and the results after filtering transformation. We lost two observations due to the lag transformation. The original results and adjusted ones are similar in magnitude.

We do a similar serial correlation test for other outcome variables. Test statistics are reported in Table S35. Variable $Replies_t$ follows AR(2) process, the same order as $Late_t$ and we do a similar adjustment as discussed before. The time series of likes, retweets, proportion of false tweets and sentiment follow AR(1) process, as is shown in the large p-values for the AR(2) test in Panel A, B, D and E. This suggests u_t is serially correlated, and ε_t is not. We have $\gamma_2 = 0$ for these four outcome variables, i.e. $E(\varepsilon_t) = 0$, $E(\varepsilon_t^2) = \sigma^2$. We only need the first lag and γ_1 for the filtering transformation. The original results in Table 2 and adjusted results are reported in Table S35. Using $Likes_t$ and $Sentiment_t$ as dependent variable, the point estimates on late-tweeting activity and year variables remain similar before and after the adjustment. The relatively larger change in magnitude than that in Table S34 results from the even smaller sample size. The time series is gapped because there are 19 days with no daytime tweets. Thus, we lost 19 days from the first lag transformation. The sample size of $Replies_t$ is smaller by 38 due to the second order transformation.

Table S34: Predicting late-tweeting with daytime tweets before sleep, year, etc.

	Late dummy		Late count	
	Table 1	Adjusted	Table 1	Adjusted
Y2020	0.383***	0.384***	1.083***	1.092***
	(0.056)	(0.060)	(0.138)	(0.147)
Y2019	0.220***	0.221***	0.576***	0.585***
	(0.034)	(0.037)	(0.085)	(0.090)
Y2018	0.065**	0.064*	0.152*	0.153*
	(0.032)	(0.035)	(0.079)	(0.085)
Observations	1172	1170	1172	1170
R-square	0.121	0.106	0.145	0.132
AR(1) z-stat	-12.51		-12.42	
p-value	0.000		0.000	
AR(2) z-stat	-1.95		-2.18	
p-value	0.051		0.029	
First-differenced residuals				
AR(1) z-stat	-13.62		-13.42	
p-value	0.000		0.000	
AR(2) z-stat	-0.64		-0.97	
p-value	0.522		0.333	
DOW FEs	Y	Y	Y	Y
Month FEs	Y	Y	Y	Y
Tweets FEs	Y	Y	Y	Y

Notes: * significant 10% level; ** significant at 5% level; *** significant at 1% level.

Table S35: Late-tweeting and likes, retweets, replies, proportion of false tweeting, sentiment of tweets after sleep

	Panel A: Likes after sleep (in thousands)			
	Table 2	Adjusted	Table 2	Adjusted
Late dummy	-7.394***	-5.153**		
	(2.278)	(2.103)		
Late count			-2.364**	-1.596*
			(0.917)	(0.839)
Y2018	10.530***	8.547***	10.395***	8.434***
	(2.450)	(3.052)	(2.454)	(3.070)
Y2019	19.341***	13.633***	19.067***	13.369***
	(2.647)	(3.187)	(2.656)	(3.208)
Y2020	42.3***	36.6***	42***	36.3***
	(4.34)	(5.22)	(4.37)	(5.27)
Observations	1153	1134	1153	1134
R-square	0.243	0.179	0.240	0.176
AR(1) z-stat	-10.99		-10.95	
p-value	0.000		0.000	
AR(2) z-stat	-1.21		-1.29	
p-value	0.226		0.196	
	Panel B: Retweets after sleep (in thousands)			
	Table 2	Adjusted	Table 2	Adjusted
Late dummy	-1.321**	-0.955*		
	(0.530)	(0.508)		
Late count			-0.449**	-0.333
			(0.213)	(0.203)
Y2018	2.881***	2.498***	2.861***	2.484***
	(0.570)	(0.692)	(0.571)	(0.694)
Y2019	4.678***	3.698***	4.644***	3.673***
	(0.616)	(0.726)	(0.618)	(0.730)
Y2020	8.58***	7.59***	8.56***	7.57***
	(1.01)	(1.19)	(1.02)	(1.2)
Observations	1153	1134	1153	1134
R-square	0.191	0.146	0.190	0.145
AR(1) z-stat	-12.30		-12.28	
p-value	0.000		0.000	
AR(2) z-stat	-0.18		-0.22	
p-value	0.856		0.827	
	Panel C: Replies after sleep (in thousands)			
	Table 2	Adjusted	Table 2	Adjusted
Late dummy	-1.405**	-0.974		

	(0.699)	(0.662)		
Late count			-0.383	-0.261
			(0.281)	(0.263)
Y2018	-0.533	-1.323	-0.569	-1.347
	(0.751)	(1.013)	(0.752)	(1.015)
Y2019	-3.410***	-4.744***	-3.500***	-4.812***
	(0.812)	(1.050)	(0.814)	(1.053)
Y2020	-6.37***	-7.84***	-6.49***	-7.93***
	(1.33)	(1.72)	(1.34)	(1.72)
Observations	1153	1115	1153	1115
R-square	0.208	0.144	0.206	0.143
AR(1) z-stat	-11.15		-11.12	
p-value	0.000		0.000	
AR(2) z-stat	-1.76		-1.83	
p-value	0.079		0.067	
First-differenced residuals				
AR(1) z-stat	-14.08		-14.07	
p-value	0.000		0.000	
AR(2) z-stat	0.10		0.04	
p-value	0.918		0.966	

	Panel D: Proportion of false tweets after sleep (in percentage)			
	Table 2	Adjusted	Table 2	Adjusted
Late dummy	-0.160	-0.082		
	(1.525)	(1.524)		
Late count			0.416	0.378
			(0.613)	(0.608)
Y2018	13.186***	12.837***	13.110***	12.773***
	(1.640)	(1.865)	(1.639)	(1.865)
Y2019	17.137***	17.035***	16.863***	16.794***
	(1.772)	(1.978)	(1.775)	(1.982)
Y2020	1.45	1.06	.931	.612
	(2.9)	(3.25)	(2.92)	(3.26)
Observations	1153	1134	1153	1134
R-square	0.175	0.149	0.175	0.149
AR(1) z-stat	-12.83		-12.83	
p-value	0.000		0.000	
AR(2) z-stat	0.47		0.46	
p-value	0.636		0.643	

Notes: The smaller sample size than that in Table 1 is due to days and lagged days with no daytime tweets. Dependent variable `likes`, `retweets` and `replies` are divided by 1000, `proportion` is multiplied by 100. * significant 10% level; ** significant at 5% level; *** significant at 1% level.

5 Examples of Happy, Fear and Angry Transcripts

1) Dominant emotion is coded as happy:
Press Conference: Donald Trump Delivers a Coronavirus Briefing, on March 9, 2020.

> "... We're also going to be talking about hourly wage earners getting help so that they can be in a position where they're not going to ever miss a paycheck. We're going to be working with companies and small companies, large companies – a lot of companies – so that they don't get penalized for something that's not their fault. It's not their fault, it's not our country's fault.
>
> ... This was something that we were thrown into and we're going to handle it, and we have been handling it very well. The big decision was early when we shut down our borders. We're the first ones ever to do that..."

2) Dominant emotion is coded as fear:
Press Conference: Donald Trump Provides an Update on the Coronavirus Outbreak, on February 26, 2020

> "... We're ready to adapt and we're ready to do whatever we have to as the disease spreads, if it spreads. As most of you know, the – the level that we've had in our country is very low, and those people are getting better, or we think that in almost all cases they're better, or getting. We have a total of 15.
>
> ... We're rapidly developing a vaccine, and they can speak to you – the professionals can speak to you about that. The vaccine is coming along well. And in speaking to the doctors, we think this is something that we can develop fairly rapidly, a vaccine for the future, and coordinate with the support of our partners.
>
> ... So we're at the low level. As they get better, we take them off the list, so that we're going to be pretty soon at only five people. And we could be at just one or two people over the next short period of time. So we've had very good luck..."

3) Dominant emotion is coded as angry:
Interview: Peter Doocy Interviews Donald Trump on Fox News, on January 30, 2020

> "... It's [impeachment trial] very boring. I call it the impeachment hoax, and that's what it is. It's a hoax. It should have never taken place, should have never been allowed to happen. But I have great confidence in Republican senators and probably some Democrats from what I understand.
>
> ... They're old polls. Any polls that he's [Joe Biden] leading and they're old – What's happened, you look at the new Gallup poll today just came out. We're beating them all, and Joe's going down.

> ... I'm the one that saved it [Social Security]. The Democrats wanted to do it last time. I've been here for years and I haven't touched it except making everything stronger, making our country stronger our country being strong is what saving Social Security. So I'm not touching Social Security. They're the ones that are going to destroy it with his crazy plan. You're going to destroy everything not only Social Security. They're going to destroy health care. They're going to take away health care from 180 million people. It's going to be like a catastrophe. Now, I'm the one that saved the Social Security and every year it becomes stronger because our economy is so good and now that the trade deals are kicking in, the growth will be incredible..."

References

Arellano, M. and S. Bond (1991, 04). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies 58*(2), 277–297. 4