

Supplemental Online Material for “Aimed Emotions in American Presidential Politics”

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Table A1: 2016 Cycle Debates and Participants

Date	Republicans											Democrats				
	Bush	Carson	Christie	Cruz	Fiorina	Huckabee	Kasich	Paul	Rubio	Trump	Walker	Chafee	Clinton	O'Malley	Sanders	Webb
2015-08-06	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓					
2015-09-16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
2015-10-13												✓	✓	✓	✓	✓
2015-10-28	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
2015-11-10	✓	✓		✓	✓		✓	✓	✓	✓						
2015-11-14													✓	✓	✓	
2015-12-15	✓	✓	✓	✓	✓		✓	✓	✓	✓						
2015-12-19													✓	✓	✓	
2016-01-14	✓	✓	✓	✓			✓		✓	✓						
2016-01-17													✓	✓	✓	
2016-01-28	✓	✓	✓	✓			✓	✓	✓							
2016-02-04													✓		✓	
2016-02-06	✓	✓	✓	✓			✓		✓	✓						
2016-02-11													✓		✓	
2016-02-13	✓	✓		✓			✓		✓	✓						
2016-02-25		✓		✓			✓		✓	✓						
2016-03-03				✓			✓		✓	✓						
2016-03-06													✓		✓	
2016-03-09													✓		✓	
2016-03-10				✓			✓		✓	✓						
2016-04-14													✓		✓	
2016-09-26										✓			✓			
2016-10-09										✓			✓			
2016-10-19										✓			✓			

Note: Table indicates the participants in each of the nationally televised debates in the 2016 cycle included in the dataset.

Table A2: 2020 Cycle Debates and Participants

Date	Repub.	Democrats										
	Trump	Bennet	Biden	Bloomberg	Booker	Bullock	Buttigieg	Castro	De Blasio	Delaney	Gabbard	Gillibrand
2019-06-26					✓			✓	✓	✓	✓	
2019-06-27		✓	✓				✓		✓			✓
2019-07-30						✓	✓			✓		
2019-07-31		✓	✓		✓			✓	✓		✓	✓
2019-09-12			✓		✓		✓	✓				
2019-10-15			✓		✓		✓	✓			✓	
2019-11-20			✓		✓		✓				✓	
2019-12-19			✓				✓					
2020-01-14			✓				✓					
2020-02-07			✓				✓					
2020-02-19			✓	✓			✓					
2020-02-25			✓	✓			✓					
2020-03-15			✓									
2020-09-29	✓		✓									
2020-10-22	✓		✓									

Note: Table indicates the participants in each of the nationally televised debates in the 2020 cycle included in the dataset.

Table A2 (cont.): 2020 Cycle Debates and Participants

Date	Democrats (cont.)											
	Harris	Hickenlooper	Inslee	Klobuchar	O'Rourke	Ryan	Sanders	Steyer	Swalwell	Warren	Williamson	Yang
2019-06-26			✓	✓	✓	✓				✓		
2019-06-27	✓	✓					✓		✓		✓	✓
2019-07-30		✓		✓	✓	✓	✓			✓	✓	
2019-07-31	✓		✓									✓
2019-09-12	✓			✓	✓		✓			✓		✓
2019-10-15	✓			✓	✓		✓	✓		✓		✓
2019-11-20	✓			✓			✓	✓		✓		✓
2019-12-19				✓			✓	✓		✓		✓
2020-01-14				✓			✓	✓		✓		
2020-02-07				✓			✓	✓		✓		
2020-02-19				✓			✓			✓		
2020-02-25				✓			✓	✓		✓		
2020-03-15							✓					
2020-09-29												
2020-10-22												

Note: Table indicates the participants in each of the nationally televised debates in the 2020 cycle included in the dataset.

Table A3: Twitter Data Source Handles by Presidential Candidate

Candidate	Twitter Handle	2016 Cycle	2020 Cycle
Michael Bennet	@MichaelBennet		✓
Joe Biden	@JoeBiden		✓
Mike Bloomberg	@MikeBloomberg		✓
Cory Booker	@CoryBooker		✓
Steve Bullock	GovernorBullock		✓
Jeb Bush	@JebBush	✓	
Pete Buttigieg	@PeteButtigieg		✓
Ben Carson	@RealBenCarson	✓	
Julián Castro	@JulianCastro		✓
Lincoln Chafee	@LincolnChafee	✓	
Chris Christie	@ChrisChristie	✓	
Hillary Clinton	@HillaryClinton	✓	
Ted Cruz	@TedCruz	✓	
Bill de Blasio	@BilldeBlasio		✓
John Delaney	@JohnDelaney		✓
Carly Fiorina	@CarlyFiorina	✓	
Tulsi Gabbard	@TulsiGabbard		✓
Kirsten Gillibrand	@SenGillibrand		✓
Kamala Harris	@KamalaHarris		✓
John Hickenlooper	@Hickenlooper		✓
Mike Huckabee	@GovMikeHuckabee	✓	
Jay Inslee	@JayInslee		✓
John Kasich	@JohnKasich	✓	
Amy Klobuchar	@amyklobuchar		✓
Martin O'Malley	@MartinOMalley	✓	
Beto O'Rourke	@BetoORourke		✓
Rand Paul	@RandPaul	✓	
Marco Rubio	@marcorubio	✓	
Tim Ryan	@TimRyan		✓
Bernie Sanders	@BernieSanders	✓	✓
Tom Steyer	@TomSteyer		✓
Eric Swalwell	@ericswalwell		✓
Donald Trump	@realDonaldTrump	✓	✓
Elizabeth Warren	@ewarren		✓
Marianne Williamson	@marwilliamson		✓
Andrew Yang	@AndrewYang		✓

Note: Table indicates source of Twitter data for each candidate.

Table A4: Performance Metrics for Trained RoBERTa Classifiers

Debate Sentence Classifiers						
Metric	Anger		Anxiety		Enthusiasm	
	True Negative	True Positive	True Negative	True Positive	True Negative	True Positive
Precision	0.89	0.69	0.86	0.67	0.88	0.74
Recall	0.91	0.59	0.86	0.66	0.84	0.80
F1 Score	0.90	0.62	0.86	0.67	0.86	0.77
Overall Accuracy	0.84		0.80		0.82	
Twitter Message Classifiers						
Metric	Anger		Anxiety		Enthusiasm	
	True Negative	True Positive	True Negative	True Positive	True Negative	True Positive
Precision	0.92	0.57	0.88	0.69	0.71	0.81
Recall	0.90	0.62	0.86	0.73	0.67	0.84
F1 Score	0.91	0.59	0.87	0.71	0.69	0.83
Overall Accuracy	0.86		0.82		0.78	

Note: Table shows performance on out-of-sample tests of the trained classifiers compared against human coders.

Table A5: Replication of Models 1 to 3 with Day-Of and Day-After Tweets Only

<i>Dependent variable:</i>	Model 1: Baseline			Model 2: Covariates			Model 3: Candidate FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm
Tweet	-0.516*** (0.025)	-0.084*** (0.022)	0.809*** (0.024)	-0.521*** (0.025)	-0.097*** (0.022)	0.810*** (0.024)	-0.483*** (0.027)	-0.103*** (0.023)	0.773*** (0.025)
Any Emotion	17.676 (51.069)	18.157 (51.208)	19.009 (50.722)	17.699 (50.937)	18.153 (51.178)	18.991 (50.503)	18.739 (83.066)	18.144 (50.616)	19.008 (49.961)
General Election				0.386*** (0.034)	-0.021 (0.032)	-0.515*** (0.032)	0.818*** (0.114)	-0.080 (0.106)	-0.519*** (0.106)
2020 Cycle				0.106*** (0.022)	0.110*** (0.020)	0.036 (0.021)	-0.159 (0.122)	0.174 (0.110)	-0.092 (0.114)
Woman				-0.045 (0.027)	0.002 (0.024)	0.189*** (0.025)	-0.377*** (0.107)	-0.811*** (0.102)	0.550*** (0.104)
Nonwhite				0.102*** (0.028)	0.117*** (0.025)	-0.182*** (0.026)	0.634*** (0.133)	1.164*** (0.129)	-0.857*** (0.131)
Constant	-18.512 (51.069)	-18.556 (51.208)	-18.684 (50.722)	-18.637 (50.937)	-18.619 (51.178)	-18.626 (50.503)	-19.402 (83.066)	-18.109 (50.616)	-19.013 (49.961)
Observations	58,537	58,537	58,537	58,537	58,537	58,537	58,537	58,537	58,537
Log Likelihood	-24,588.920	-28,392.230	-27,166.290	-24,514.260	-28,366.240	-26,992.430	-24,023.410	-27,895.130	-26,549.030
Akaike Inf. Crit.	49,183.840	56,790.450	54,338.590	49,042.510	56,746.470	53,998.870	48,198.820	55,942.260	53,250.070

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted with 43,739 debate sentences and 14,798 tweets posted on the day of debate or the day after. See Table 1 for comparison.

Table A6: Replication of Models 4 to 6 with Day-Of and Day-After Tweets Only

<i>Dependent variable:</i>	Model 4: By Phase			Model 5: Democrats			Model 6: Republicans		
	(1) Anger	(2) Anxiety	(3) Enthusiasm	(4) Anger	(5) Anxiety	(6) Enthusiasm	(7) Anger	(8) Anxiety	(9) Enthusiasm
Tweet	-0.499*** (0.028)	-0.040 (0.024)	0.729*** (0.026)	-0.196*** (0.033)	0.327*** (0.029)	0.384*** (0.031)	-0.973*** (0.046)	-0.833*** (0.040)	1.400*** (0.043)
Any Emotion	17.637 (55.686)	18.136 (55.625)	19.079 (55.285)	17.664 (70.751)	18.154 (70.974)	19.123 (70.588)	18.829 (117.918)	19.159 (118.167)	19.954 (115.386)
General Election	0.047 (137.292)	-0.321 (137.701)	0.215 (135.956)	0.657*** (0.137)	-0.101 (0.128)	-0.460*** (0.128)	0.037 (0.120)	0.022 (0.111)	-0.008 (0.111)
2020 Cycle	0.066 (0.107)	0.288** (0.094)	-0.363*** (0.097)	-0.183 (0.124)	0.212 (0.113)	-0.088 (0.116)	0.407** (0.133)	0.052 (0.131)	-0.242 (0.129)
Woman	-0.049 (0.029)	-0.065* (0.026)	0.144*** (0.028)	-0.344** (0.106)	-0.765*** (0.102)	0.501*** (0.103)	0.133 (0.192)	0.023 (0.169)	-0.268 (0.180)
Nonwhite	0.113*** (0.030)	0.198*** (0.027)	-0.188*** (0.028)	0.628*** (0.132)	1.166*** (0.129)	-0.840*** (0.130)	-0.106 (0.177)	0.085 (0.151)	-0.179 (0.165)
Tweet*General	0.081 (0.080)	-0.413*** (0.076)	0.353*** (0.078)						
Any Emotion*General	0.442 (137.292)	0.059 (137.701)	-0.632 (135.956)						
Constant	-18.665 (55.686)	-18.537 (55.625)	-18.502 (55.285)	-18.324 (70.751)	-18.196 (70.974)	-19.094 (70.588)	-19.799 (117.918)	-19.279 (118.167)	-19.613 (115.386)
Observations	58,537	58,537	58,537	33,640	33,640	33,640	24,897	24,897	24,897
Log Likelihood	-24,404.550	-28,128.720	-26,826.760	-14,536.120	-16,928.790	-15,960.420	-9,384.303	-10,669.970	-10,388.340
Akaike Inf. Crit.	48,895.100	56,343.440	53,739.510	29,178.240	33,963.580	32,026.840	18,826.610	21,397.930	20,834.670

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted with 43,739 debate sentences and 14,798 tweets posted on the day of debate or the day after. See Table 2 for comparison.

Table A7: Replication of Models 1 to 3 with Joint-Coding Trained Classifiers

<i>Dependent variable:</i>	Model 1: Baseline			Model 2: Covariates			Model 3: Candidate FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm
Tweet	-0.325*** (0.019)	-0.044** (0.017)	1.183*** (0.017)	-0.314*** (0.019)	-0.059*** (0.017)	1.168*** (0.017)	-0.273*** (0.020)	-0.045* (0.018)	1.141*** (0.018)
Any Emotion	1.318*** (0.028)	1.760*** (0.027)	1.653*** (0.020)	1.334*** (0.028)	1.744*** (0.027)	1.634*** (0.020)	1.355*** (0.028)	1.730*** (0.027)	1.626*** (0.021)
General Election				0.391*** (0.028)	-0.090** (0.028)	-0.486*** (0.027)	0.689*** (0.096)	-0.033 (0.090)	-0.452*** (0.090)
2020 Cycle				0.195*** (0.018)	0.284*** (0.017)	0.086*** (0.017)	-0.097 (0.106)	-0.045 (0.094)	-0.027 (0.095)
Woman				0.021 (0.022)	0.128*** (0.020)	0.296*** (0.021)	-0.643*** (0.088)	-0.896*** (0.082)	0.516*** (0.084)
Nonwhite				-0.079*** (0.024)	-0.054* (0.021)	0.065** (0.021)	0.555*** (0.119)	1.000*** (0.111)	-0.214 (0.116)
Constant	-2.228*** (0.026)	-2.253*** (0.025)	-1.577*** (0.019)	-2.370*** (0.028)	-2.368*** (0.028)	-1.615*** (0.022)	-2.068*** (0.114)	-1.597*** (0.104)	-1.901*** (0.107)
Observations	73,711	73,711	73,711	73,711	73,711	73,711	73,711	73,711	73,711
Log Likelihood	-37,060.390	-42,298.650	-43,370.640	-36,889.970	-42,106.530	-43,067.390	-36,261.980	-41,444.110	-42,552.510
Akaike Inf. Crit.	74,126.790	84,603.290	86,747.290	73,793.950	84,227.060	86,148.780	72,675.950	83,040.230	85,257.020

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted with values from RoBERTa classifiers trained on 2,000 messages coded by all three research assistants. See Table 1 for comparison.

Table A8: Replication of Models 4 to 6 with Joint-Code Trained Classifiers

<i>Dependent variable:</i>	Model 4: By Phase			Model 5: Democrats			Model 6: Republicans		
	(1) Anger	(2) Anxiety	(3) Enthusiasm	(4) Anger	(5) Anxiety	(6) Enthusiasm	(7) Anger	(8) Anxiety	(9) Enthusiasm
Tweet	-0.308*** (0.021)	-0.017 (0.018)	1.107*** (0.018)	0.070** (0.025)	0.383*** (0.023)	0.884*** (0.024)	-0.832*** (0.033)	-0.760*** (0.030)	1.472*** (0.028)
Any Emotion	1.362*** (0.031)	1.710*** (0.029)	1.651*** (0.022)	1.327*** (0.039)	1.733*** (0.037)	1.733*** (0.029)	1.406*** (0.041)	1.745*** (0.041)	1.531*** (0.031)
General Election	0.546*** (0.104)	-0.310** (0.107)	-0.312** (0.099)	0.455*** (0.116)	-0.187 (0.110)	-0.269* (0.109)	-0.174 (0.101)	-0.062 (0.099)	0.200* (0.091)
2020 Cycle	0.166 (0.093)	0.125 (0.081)	-0.274*** (0.080)	-0.113 (0.109)	-0.009 (0.097)	0.015 (0.097)	0.401*** (0.108)	0.324** (0.110)	-0.426*** (0.105)
Woman	-0.012 (0.024)	0.036 (0.022)	0.221*** (0.022)	-0.597*** (0.088)	-0.850*** (0.083)	0.482*** (0.083)	0.508** (0.163)	0.128 (0.140)	-0.189 (0.134)
Nonwhite	-0.086*** (0.025)	0.025 (0.023)	0.083*** (0.022)	0.552*** (0.119)	1.007*** (0.112)	-0.212 (0.115)	0.135 (0.149)	0.170 (0.122)	-0.123 (0.119)
Tweet*General	0.068 (0.061)	-0.352*** (0.061)	0.358*** (0.059)						
Any Emotion*General	-0.133 (0.071)	0.188* (0.081)	-0.246*** (0.066)						
Constant	-2.504*** (0.070)	-2.095*** (0.060)	-1.495*** (0.057)	-2.093*** (0.118)	-1.714*** (0.109)	-1.983*** (0.110)	-2.513*** (0.154)	-1.982*** (0.130)	-1.512*** (0.123)
Observations	73,711	73,711	73,711	42,372	42,372	42,372	31,339	31,339	31,339
Log Likelihood	-36,755.040	-41,801.520	-42,877.800	-21,709.420	-25,081.570	-24,761.830	-14,303.790	-15,876.590	-17,638.490
Akaike Inf. Crit.	73,596.070	83,689.030	85,841.600	43,524.830	50,269.150	49,629.660	28,665.580	31,811.180	35,334.980

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted with values from RoBERTa classifiers trained on 2,000 messages coded by all three research assistants. See Table 2 for comparison.

Table A9: Replication of Models 1 to 3 with Linear Probability Model Estimation

<i>Dependent variable:</i>	Model 1: Baseline			Model 2: Covariates			Model 3: Candidate FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm	Anger	Anxiety	Enthusiasm
Tweet	-0.078*** (0.003)	-0.039*** (0.003)	0.148*** (0.003)	-0.077*** (0.003)	-0.041*** (0.003)	0.146*** (0.003)	-0.070*** (0.003)	-0.040*** (0.003)	0.140*** (0.003)
Any Emotion	0.276*** (0.003)	0.388*** (0.004)	0.630*** (0.004)	0.277*** (0.003)	0.385*** (0.004)	0.626*** (0.004)	0.278*** (0.003)	0.379*** (0.004)	0.624*** (0.004)
General Election				0.049*** (0.004)	-0.008 (0.005)	-0.072*** (0.005)	0.101*** (0.015)	-0.034* (0.016)	-0.063*** (0.016)
2020 Cycle				0.024*** (0.003)	0.046*** (0.003)	0.001 (0.003)	-0.009 (0.016)	0.024 (0.018)	-0.011 (0.017)
Woman				-0.001 (0.003)	0.011** (0.004)	0.021*** (0.004)	-0.094*** (0.014)	-0.176*** (0.016)	0.118*** (0.015)
Nonwhite				-0.004 (0.003)	-0.006 (0.004)	-0.011** (0.004)	0.104*** (0.019)	0.192*** (0.022)	-0.146*** (0.021)
Constant	0.018*** (0.003)	0.009** (0.003)	-0.033*** (0.003)	0.002 (0.003)	-0.008* (0.004)	-0.024*** (0.004)	0.052** (0.018)	0.132*** (0.020)	-0.111*** (0.019)
Observations	73,711	73,711	73,711	73,711	73,711	73,711	73,711	73,711	73,711
R ²	0.089	0.134	0.353	0.091	0.137	0.356	0.107	0.153	0.365
Adjusted R ²	0.089	0.134	0.353	0.091	0.137	0.356	0.106	0.152	0.364

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted via linear probability models instead of logistic regression. See Table 1 for comparison.

Table A10: Replication of Models 4 to 6 with Linear Probability Model Estimation

<i>Dependent variable:</i>	Model 4: By Phase			Model 5: Democrats			Model 6: Republicans		
	(1) Anger	(2) Anxiety	(3) Enthusiasm	(4) Anger	(5) Anxiety	(6) Enthusiasm	(7) Anger	(8) Anxiety	(9) Enthusiasm
Tweet	-0.075*** (0.003)	-0.035*** (0.003)	0.136*** (0.003)	-0.036*** (0.004)	0.047*** (0.005)	0.082*** (0.004)	-0.115*** (0.004)	-0.157*** (0.005)	0.216*** (0.005)
Any Emotion	0.264*** (0.004)	0.379*** (0.004)	0.646*** (0.004)	0.272*** (0.005)	0.396*** (0.005)	0.645*** (0.005)	0.284*** (0.005)	0.358*** (0.005)	0.601*** (0.005)
General Election	0.003 (0.015)	-0.075*** (0.017)	0.051** (0.016)	0.081*** (0.019)	-0.049* (0.021)	-0.053** (0.020)	-0.030* (0.014)	0.009 (0.015)	0.027 (0.015)
2020 Cycle	0.010 (0.014)	0.042** (0.015)	-0.041** (0.015)	-0.012 (0.017)	0.037 (0.019)	-0.011 (0.018)	0.078*** (0.016)	0.034* (0.017)	-0.053** (0.017)
Woman	-0.003 (0.004)	-0.006 (0.004)	0.019*** (0.004)	-0.090*** (0.015)	-0.162*** (0.016)	0.112*** (0.015)	0.012 (0.021)	-0.002 (0.022)	-0.039 (0.022)
Nonwhite	-0.006 (0.004)	0.010* (0.004)	-0.012** (0.004)	0.103*** (0.020)	0.189*** (0.023)	-0.145*** (0.021)	-0.023 (0.018)	0.015 (0.019)	-0.020 (0.019)
Tweet*General	0.002 (0.010)	-0.045*** (0.011)	0.071*** (0.011)						
Any Emotion*General	0.101*** (0.010)	0.020 (0.011)	-0.161*** (0.010)						
Constant	-0.002 (0.010)	0.039*** (0.011)	-0.026* (0.010)	0.052** (0.019)	0.090*** (0.021)	-0.116*** (0.020)	-0.0003 (0.019)	0.067*** (0.020)	-0.014 (0.020)
Observations	73,711	73,711	73,711	42,372	42,372	42,372	31,339	31,339	31,339
R ²	0.096	0.144	0.360	0.090	0.146	0.328	0.134	0.175	0.419
Adjusted R ²	0.095	0.144	0.360	0.089	0.145	0.327	0.134	0.174	0.418

*p<0.05; **p<0.01; ***p<0.001

Note: Replication conducted via linear probability models instead of logistic regression. See Table 2 for comparison.