Emotion and Reason in Political Language

Gloria Gennaro & Elliott Ash

ETH Zurich

The Economic Journal
January 2022
“An emotional speaker always makes his audience feel with him, even when there is nothing in his arguments; which is why many speakers try to overwhelm their audience by mere noise.”

– Aristotle

“In politics, when reason and emotion collide, emotion invariably wins.”

– Drew Westen
The dichotomy between emotions/affect and rationality/cognition is central to behavioral/social science (LeDoux 1998, Elster 1999).

Growing attention to emotions in politics (e.g. Ansolabehere and Iyengar 1997; Gault and Sabini 2000; Brader 2005; Valentino et al 2011; Ortoleva and Snowberg 2015; DellaVigna et al 2016; Mc-Clendon 2018; Loewen et al 2017).

Positive and negative valence widely studied (e.g. Kosmidis et al 2019, Rheault et al 2016; Rice and Zorn 2019); more limited attention to emotional intensity (Dietrich et al 2019, Osnabrügge et al 2021); some recent work analyzing specific emotions, e.g. joy, anger, fear (Widmann and Wich 2021).
The Method
Measuring Emotion and Reason

Corpus

- Universe of floor speeches in U.S. Congress from *Congressional Record, 1858-2014*
  - Exclude non-speech content such as roll calls, bill sponsorships, and legislation
  - \( N = 9,799,375 \)

- Pre-Processing
  - Keep only nouns, adjectives, and verbs
  - Drop punctuation, capitalization, numbers, stopwords (including names of states, cities, politicians), and word endings (snowball stemmer)
  - Drop tokens occurring in less than 10 speeches (vocab size = 63,334 words)

- Word embeddings trained on corpus of all speeches
  - Word2Vec (Mikolov et al 2013) implementation from python *gensim*.
  - 300-dimensional vectors, 8-word context window
Word Embedding is a technology from computational linguistics that represents words and phrases as vectors in a geometric space, where locations and directions encode meaning (Mikolov et al. 2013, Rodriguez and Spirling 2021).
Measuring Emotion and Reason

LIWC dictionaries

- Seed dictionaries of emotional/logical words from the LIWC dictionaries (Tausczik and Pennebaker, 2010)
  - “Cognitive Processing” (799 tokens and wildcard expressions): causation, comparison, uncertainty, inclusion, exclusion
  - “Affective Processing” (1,445 tokens and wildcard expressions): positive and negative emotions/moods, e.g. anxiety, anger, sadness

- Pre-processing to match our vocabulary in Congress speeches
  - stemmed nouns, adjectives, and verbs
  - inspect and drop false positives, e.g. "admir*" matching to "admiral"
  - Resulting lexicons: 359 cognition tokens, 848 emotion tokens

- Each dictionary is represented by its centroid in the word embedding space
Measuring Emotion and Reason

Emotion and Reason centroids

Size denotes closeness to the centroid

Gennaro & Ash 6 / 15
A document vector $\vec{d}_i$ is the weighted average of the document’s word vectors:

$$\vec{d}_i = \frac{1}{|i|} \sum_{w \in i} \frac{\alpha}{\alpha + p(w)} \vec{w}$$

- $|i|$ number of tokens $w$ in speech $i$
- $p(w)$ relative frequency of word $w$ in corpus → inverse frequency weighting
- $\alpha = 0.001$ smoothing parameter (Arora, Liang, and Ma 2016)

Relative emotionality of $d$ is

$$Y_i = \frac{\text{sim}(\vec{d}_i, \vec{A}) + 1}{\text{sim}(\vec{d}_i, \vec{C}) + 1}$$
Examples

Sample from the Most Affective Sentences

This country as outstanding Senators who fought for years, the Senator from Tennessee in the House before he came to the Senate, and both he and the Senator from Louisiana ever since they have been in the Senate, in their efforts to protect the American people.

The key to whether or not we are going to be successful in ending what is a national disgrace is those of you who are watching this program today and others.

Let’s do our part, my fellow Americans, and make this a better country today before we go to bed tonight, as a tribute to our brave men and women who are fighting for us around the clock.

Sample from the Most Cognitive Sentences

I again emphasize that the pending proposed legislation merely represents guidelines for the executive branch to follow prior to the submission of project proposals for consideration by the Congress.

Speaker, I rise to seek a clarification from the manager of the bill regarding the agreement reached by conferees on the procedure for future appropriation requests for Indian irrigation projects.

This amendment contains technical fixes which include a clarification in the weighing provision of the bill and correction of the placement of language addressing observer coverage.
Human Validation

- Sample: Sentence pairs by decade among top emotional and cognitive snippets
- Coders evaluate which sentence in each pair is more emotional and more logical, for 10 pairs each
  - U.S.-born native English speakers on M-Turk
  - Two coders for each sentence pair
- Score performance over time
  - Sample size: 1714 sentence pairs, ≈ 100 per decade
- We do not force a single emotion-cognition dimension
### Main Results

#### Full Sample English Comprehension Consistent Coding

|             | Accuracy | Blank | Size | Accuracy | Blank | Size | Accuracy | Blank | Size |
|-------------|----------|-------|------|----------|-------|------|----------|-------|------|
| Overall     | 0.874    | 0.035 | 1714 | 0.923    | 0.029 | 1158 | 0.927    | 0.013 | 1388 |
| Decade 1    | 0.842    | 0.056 | 72   | 0.893    | 0.037 | 54   | 0.929    | 0   | 56   |
| Decade 2    | 0.853    | 0.062 | 96   | 0.94     | 0.024 | 82   | 0.905    | 0.028 | 72   |
| Decade 3    | 0.912    | 0.026 | 78   | 0.944    | 0.038 | 52   | 0.926    | 0   | 68   |
| Decade 4    | 0.812    | 0.067 | 90   | 0.894    | 0.031 | 64   | 0.909    | 0.031 | 64   |
| Decade 5    | 0.836    | 0.081 | 62   | 0.843    | 0.062 | 48   | 0.927    | 0.025 | 40   |
| Decade 6    | 0.859    | 0.083 | 72   | 0.871    | 0.107 | 56   | 0.94     | 0.042 | 48   |
| Decade 7    | 0.856    | 0.069 | 130  | 0.863    | 0.08  | 88   | 0.902    | 0.037 | 108  |
| Decade 8    | 0.915    | 0.008 | 128  | 0.944    | 0     | 72   | 0.97     | 0.01 | 100  |
| Decade 9    | 0.876    | 0.025 | 118  | 0.925    | 0.015 | 66   | 0.881    | 0.009 | 108  |
| Decade 10   | 0.957    | 0.009 | 114  | 1        | 0     | 72   | 0.971    | 0.01 | 104  |
| Decade 11   | 0.873    | 0     | 126  | 0.976    | 0     | 82   | 0.907    | 0   | 108  |
| Decade 12   | 0.889    | 0.029 | 140  | 0.969    | 0.021 | 94   | 0.949    | 0.017 | 116  |
| Decade 13   | 0.827    | 0.024 | 124  | 0.831    | 0.035 | 86   | 0.89     | 0   | 100  |
| Decade 14   | 0.869    | 0.022 | 134  | 0.936    | 0     | 78   | 0.915    | 0.017 | 116  |
| Decade 15   | 0.843    | 0.061 | 114  | 0.902    | 0.051 | 78   | 0.963    | 0   | 80   |
| Decade 16   | 0.931    | 0     | 116  | 1        | 0     | 86   | 0.96     | 0   | 100  |
EmotionMeter Package

github.com/elliottash/emotionmeter

```python
# import the package
from emotionmeter import EmotionMeter

# and create the instance of it
meter = EmotionMeter(data_path="data/smallExtractedTweets.csv",
text_column="Tweet",
corpus="en_core_web_sm")

# get df with calculated reasoning and emotional scores
meter_with_score = meter.calculate_score_and_other_stats()

# print sample most emotional tweets
print(meter.show_sample_emotional_tweets(from_most_emotional=True))
```
Descriptive Evidence from U.S. Congress, 1858-2014
Emotionality by Chamber over Time

Normalized Score
Tf-Idf Measure
Vector Distance
w/o Procedures

Gennaro & Ash
Emotion and Reason
Emotionality by Topic
Overall, and Republicans vs Democrats, after 1970

Panel A
- National Narrative
- Foreign Policy
- Party Politics
- Social Issues
- Immigration
- Economic Policy
- Fiscal Policy
- Monetary Policy
- Tribute
- Governance
- Procedure

Panel B
- Average Topic Emotionality for Republicans over Democrats
Emotionality by Minority/Majority Status

Table

Gennaro & Ash
• Emotionality by topic: National Narrative vs. Procedure
• Demographic minorities in Congress use more emotionality
• Speakers at the ideological extremes use more emotion
• Emotionality is uncorrelated with sentiment
• Emotionality is uncorrelated with readability
• Emotionality in Congress is uncorrelated with emotionality in larger society
• Trends are determined by changes in both emotion and reason
New measure of emotive vs. cognitive speech combining dictionary methods with word embeddings

Emotionality increases in times of conflict (war and polarization) and when politicians seek empowerment (among opposition politicians and minorities)

Many open substantive questions
  - What is the impact of elections or television on emotionality in Congress?
  - Is there a link between secular trends in emotionality and polarization?
  - What is the effect of emotionality on voters and other Congressmen?

Many alternative applications
  - Different corpora
  - Experimental settings
Thank you!

elliottash.com
gloriagennaro.rbind.io
github.com/elliottash/emotionmeter
Seed dictionaries of positive and negative sentiment from Demszky et al. (2019)

For each word, add the 10 most similar ones in our model

Two “poles” in Word2Vec space, for positive and negative, i.e. the vector centroids for the affective and cognitive dictionaries

Assign each word in the original dictionaries to one of the two categories by their relative (cosine) distance between the poles

This creates four final dictionaries: cognitive-positive, cognitive-negative, affect-positive, affect-negative
Emotionality over Time
Normalized by trend in Google unigrams
Emotionality and Sentiment

![Graph showing the relationship between cognition and emotion with a concentration of points in the lower right quadrant, indicating a positive correlation.](image)
Emotionality and Readability

Sentence Length
Emotionality and Readability

Word Length
Emotionality in Society

Google Unigrams

![Graph showing the trend of emotionality in Google Books from 1900 to 2015.](image-url)
Tf-Idf of Emotional and Cognitive terms

\[ Y_i = \frac{1 + \sum_{w \in (i \cap A)} f(w)}{1 + \sum_{w \in (i \cap C)} f(w)} \]
Create a vector representing the Affect-Cognition dimension in the semantic space \((\vec{A} - \vec{C})\)

Take the cosine similarity between the document vector and the Affect-Cognition dimension

\[
Y_i = \frac{\vec{d}_i (\vec{A} - \vec{C})}{||\vec{d}_i|| ||\vec{A} - \vec{C}||}
\]
Vector Distance Measure of Emotionality

$$Y_i = \frac{\overrightarrow{d_i}(\overrightarrow{A} - \overrightarrow{C})}{||\overrightarrow{d_i}|| \cdot ||\overrightarrow{A} - \overrightarrow{C}||}$$
Emotionality by Chamber over Time
Without Procedural Language
Introduction

“Emotion” refers to how emotional is the speaker or how emotional is the language used. Can you sense from the text that the speaker is feeling strong emotions, such as anger, sadness, or joy? Is the speaker describing emotional feelings or an emotional experience?

“Logic” refers to the use of logical reasoning by the speaker. Is the speaker making an argument from logic, reason, or statistics?

English comprehension test: pick the 5 most emotional and 5 most logical words among Love, Consequence, Therefore, Afraid, Glad, Disgust, Joy, Discern, Obvious, Contradiction
Human Validation
Protocol: Warm Up

Which sentence is more emotional?

"The report required by the act does not include the information requested in the resolution of the Senator from Nebraska."

"Speaker, I rise today to pay tribute to a dear friend of mine, and a fellow Missourian, who dies this week after a lifetime of service to his country and to his community."

Which sentence is more logical?

"The report required by the act does not include the information requested in the resolution of the Senator from Nebraska."

"Speaker, I rise today to pay tribute to a dear friend of mine, and a fellow Missourian, who dies this week after a lifetime of service to his country and to his community."
Human Validation
Protocol: Real exercise and attention checks

- Start of the exercise, attention check after 5 (out of 10) pairs

  Which sentence is more emotional?

  "Here you are throwing into the waste heap $15,000,000 revenue by this very wool item, and on sugar two or three times that amount."

  "I saw a statement in the Post this morning that $135."

  I don't understand one or both of the sentences.

- Final survey: ease in completing the task, and in understanding the sentences, perceived partisanship, self-declared partisanship, US born, gender, age, ethnicity, speak English at home, parents born in the US
Human Validation
Results from Random Pairing

- We obtain 1316 annotations in total, that correspond to 680 unique sentences.
- Coders chose option iii (could not understand the snippets or judge the relative emotionality) in 16.95% of the sample.
- Human coders agree 56.99% of the time on which sentence is more emotional, and 56.23% of the time on which sentence is more cognitive.
- Similar performance with simple Vector Distance measure.
- Dictionary based measure performs significantly worse.
- Robust to difference sentence selection and paring procedures.
• LDA applied to our full processed corpus, with speeches treated as documents
• We drop from the vocabulary all words in our emotive-cognitive lexicon
• We assume 128 topics and learn distributions over topics for each document and distributions over words for each topic
• 119 of the 128 topics are recognizable as a coherent topic
• For ease of interpretation, we inspected the individual topics and aggregated them into 7 larger categories
• We assign to each speech the topic with the highest probability based on the speech content
Emotionality by Topic
Overall, and Republicans vs Democrats, after 1970

Panel A
- National Narrative
- Foreign Policy
- Party Politics
- Social Issues
- Immigration
- Economic Policy
- Fiscal Policy
- Monetary Policy
- Tribute
- Governance
- Procedure

Average Topic Emotionality

Panel B
- Average Topic Emotionality for Republicans over Democrats
Trends in Emotionality
By Economic Topic

[Graph showing trends in emotionality by economic topic over time]
## Emotionality and Individual Characteristics

|               | (1)      | (2)      | (3)      | (4)      | (5)      | (6)      | (7)      |
|---------------|----------|----------|----------|----------|----------|----------|----------|
| \((DWnom1)^2\) | 0.016*** |          | 0.014*** | 0.017*** |          |          |          |
|               | [0.003]  |          | [0.003]  | [0.002]  |          |          |          |
| Democrat      |          | 0.027*** |          | 0.012**  | 0.018*** |          |          |
|               |          | [0.006]  |          | [0.006]  | [0.004]  |          |          |
| Female        |          |          | 0.268*** |          | 0.253*** | 0.158*** |          |
|               |          |          | [0.016]  |          | [0.016]  | [0.010]  |          |
| Black         |          |          |          | 0.168*** | 0.136*** | 0.067*** |          |
|               |          |          |          | [0.026]  | [0.027]  | [0.017]  |          |
| Hispanic      |          | 0.109*** |          | 0.081**  | 0.40*    |          |          |
|               |          | [0.034]  |          | [0.035]  | [0.022]  |          |          |
| Asian         |          | -0.039   | -0.074*  | -0.095***|          |          |          |
|               |          | [0.038]  | [0.042]  | [0.025]  |          |          |          |
| Catholic      |          |          |          | 0.043*** | 0.038*** | 0.016*** |          |
|               |          |          |          | [0.010]  | [0.010]  | [0.006]  |          |
| Jewish        |          |          |          | 0.053*** | 0.056*** | 0.001    |          |
|               |          |          |          | [0.017]  | [0.016]  | [0.010]  |          |
| Chamber-Year FE | Y       | Y        | Y        | Y        | Y        | Y        | Y        |
| Topic FE      |          |          |          |          |          |          |          |
| Observations  | 5 593 863| 5 593 863| 5 593 863| 5 593 863| 5 593 863| 5 593 863| 5 593 863|
| R-squared     | 0.05     | 0.05     | 0.05     | 0.05     | 0.05     | 0.05     | 0.37     |

*Notes.* The sample is composed of all speeches pronounced by Democrat and Republican Members of Congress between 1858 and 2014. Standard errors are clustered at the politician level. *,**, *** denote significance at the 10%, 5%, and 1% levels, respectively.
## Emotionality by Minority/Majority Status

|                  | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|------------------|---------|---------|---------|---------|---------|---------|
| Opposition       | 0.112***| 0.067***| 0.020***| 0.020***| 0.020***| 0.020***|
|                  | [0.005] | [0.003] | [0.007] | [0.007] | [0.007] | [0.007] |
| Divided Government| 0.001  | 0.001  | 0.001   |         |         |         |
|                  | [0.007] | [0.007] | [0.007] |         |         |         |
| Length of Speech |         | -0.007***| -0.008***|         |         |         |
|                  |         | [0.001] | [0.001] |         |         |         |
| Sentiment        |         |         |         |         | 0.172***|         |
|                  |         |         |         |         | [0.007] |         |

|                   | Y       | Y       | Y       | Y       | Y       | Y       |
| Chamber-Year FE   |         |         |         |         |         |         |
| Topics FE         | Y       | Y       | Y       | Y       | Y       |         |
| Speaker FE        | Y       | Y       | Y       | Y       |         |         |

| Observations      | 5,593,863 | 5,593,863 | 5,593,306 | 5,593,306 | 5,593,306 | 5,593,306 |
| R-squared         | 0.05     | 0.37     | 0.41     | 0.41     | 0.41     | 0.41     |

**Notes.** Speeches pronounced by Democrat and Republican Members of Congress, between 1858 and 2014. *Opposition* is a dummy equal to one if the speech is given by a member of the party representing the minority in a given chamber and year. Standard errors are clustered at the politician level. *, ***, *** denote significance at the 10%, 5%, and 1% levels, respectively.
## Emotionality by Ideological Position

### Table

|                      | (1)       | (2)       | (3)       | (4)       | (5)       |
|----------------------|-----------|-----------|-----------|-----------|-----------|
| $(DWnom1)^2$         | 0.122***  | 0.133***  | 0.141***  | 0.142***  | 0.131***  |
|                      | [0.020]   | [0.013]   | [0.013]   | [0.013]   | [0.014]   |
| Democrat             | 0.026***  | 0.022***  | 0.018***  |           |           |
|                      | [0.004]   | [0.004]   | [0.004]   |           |           |
| Female               |           |           | 0.163***  | 0.158***  |           |
|                      |           |           | [0.010]   | [0.010]   |           |
| Black                |           |           |           | 0.067***  |           |
|                      |           |           |           | [0.017]   |           |
| Hispanic             |           |           |           | 0.043*    |           |
|                      |           |           |           | [0.024]   |           |
| Asian                |           |           |           | -0.094*** |           |
|                      |           |           |           | [0.025]   |           |
| Catholic             |           |           |           | 0.017***  |           |
|                      |           |           |           | [0.006]   |           |
| Jewish               |           |           |           | 0.001     |           |
|                      |           |           |           | [0.010]   |           |
| Chamber-Year FE      | Y         | Y         | Y         | Y         | Y         |
| Topic FE             | Y         | Y         | Y         | Y         | Y         |
| Observations         | 5533119   | 5533119   | 5533119   | 5533119   | 5533119   |
| R-squared            | 0.05      | 0.37      | 0.37      | 0.37      | 0.37      |

**Notes.** The sample is composed of all speeches pronounced by Democrat and Republican Members of Congress between 1858 and 2014. Standard errors are clustered at the politician level. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.
Emotionality by Ideological Position

[Graph showing emotionality score by DW-NOMINATE]

Gennaro & Ash
Emotion and Reason
15 / 15