

Effects of Colonialism on Sentiments towards Queen Elizabeth II

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The legacy of colonialism by the British empire left a generational memory of exploitation and oppression on its former dependencies. How does this legacy affect the attitudes and sentiment of former colonies towards the monarchy today? We conduct a study to analyze the effects of colonialism on sentiment towards the British monarchy, specifically Queen Elizabeth II. Although many mourned her passing on September 8, 2022, others saw the incident as an opportunity to express their sentiments towards what her reign symbolized to them. In this study we use a dataset of 1,067,665 tweets from 117 countries and territories collected within two weeks from the Queen's death to quantify the effect. In line with our hypothesis, Twitter users from former British colonies tend to express less sadness towards the Queen's passing. In comparison, countries that were formerly colonized by countries other than the UK exhibit a high level of sadness, suggesting that historical relation with the British monarchy plays a larger role than colonization itself in people's sentiment towards the Queen's death.

Introduction

The British empire was the largest system of colonies, protectorates, dependencies, and other territories ruled by the United Kingdom (UK) under the sovereignty of the British monarchy (1). As the Monarchy was central to the establishment, expansion and maintenance of the British empire, it also played an important role in the legacy of colonization, slavery, exploitation and suppression the empire left on former dominions (2).

In recent years, Queen Elizabeth II became the longest-serving monarch with her reign of 70 years. Although during her ruling the empire dissolved as territories gained sovereignty, there were mixed attitudes and sentiments towards her legacy that were heightened in public discourse after her death on September 8, 2022 (3). While many have mourned the death of the Queen, critics of the royal family saw her passing as an opportunity to reassess the role of the Crown and acknowledge the struggles of those affected by British imperialism. Princeton University Professor Anna Arabindan-Kesson expresses how “For many of us from the ‘colonies,’ the death of Elizabeth II signifies in very particular ways that she was the symbol of an empire built on genocide, slavery, violence, extraction and brutality, the legacies of which continue in our present day” (4). Similar to Professor Arabindan-Kesson, others have used social media outlets to express their sentiments towards the Queen, her passing, and their views towards the British monarchy. Given the variety and complexity of attitudes, this paper analyzes the effect of colonialism on sentiments towards Queen Elizabeth II, with a particular emphasis on her passing.

Given how recently the event occurred, not much work has been done that studies the effect of colonization on people’s sentiment regarding the Queen’s passing. Nonetheless, existing literature has studied the effect of colonization in other contexts. (5) looked at how colonial legacies affect workplace emotions and (6) looked at sentiments in post-colonial East Asia. (7)

conducted an analysis on popular attitudes towards the British monarchy during the Great War. Though these studies look at colonization through different lenses and time periods, they all conclude that colonial legacy causes an impact on people's sentiments.

Despite the lack of literature on this event, a series of surveys have documented the public's attitude towards the Monarchy. More particularly, the British Social Attitudes survey conducted by the National Centre for Social Research finds that 79% of women compared to 66% of men think the monarchy is important for Britain (8). In addition to this gender gap, age also seems to play a role in support towards the monarchy. British Social Attitudes records that only 33% of people under 25-years old support the monarchy, compared to 68% of those 50-years and older (9). These findings suggest that age, gender and other confounders such as ethnicity might also play a role in people's attitudes and sentiments towards the British monarchy and Queen Elizabeth II, specifically.

In this study, we collected tweets about the Queen's death from around the world. Using a randomized baseline model while controlling for gender and ethnicity, we found that retweets about the Queen's passing from former British colonies tend to be less sad. We also looked into the effect of ethnicity on sentiments in the US, the UK and the Commonwealth Realm and found that Asians and Hispanics tend to express more sadness whereas Indians tend to express more joy and less sadness, which provides evidence for our hypothesis as India was a former British colony. Using multinomial logistic regression, we also found that males tend to express less sadness compared to females in many countries.

Results

We used a dataset of 1,067,665 English tweets and retweets spanning across 117 countries and territories posted by 680,687 authors. In our analysis, we treat tweets (including quote tweets, N=309,205) and retweets (N=758,460) separately, as we consider tweets and quote tweets as

expressing original ideas whereas retweets represent endorsement. Hence, we expect to see differences in the sentiments exhibited by tweets versus retweets. Given the larger number of retweets than tweets, we make the assumption that sentiments of retweets more faithfully represent the attitude of the general public. Each tweet/retweet is labeled with an emotion based on its text, a country (identified using either the tweet itself or the location of its author), as well as gender and ethnic group (inferred from the author's name or username). The ethnic groups considered include English, European, Indian, Asian, Hispanic, and Arab. To study the effect of colonialism on tweets sentiment, we grouped the 117 countries and territories involved into six types: (1) Former British colonies and/or protectorates (non-commonwealth) (FBC), (2) The Commonwealth Realms (TCR), (3) UK, (4) Other Colonies (not colonized by the UK) (OC), (5) US, and (6) Others. See Methods for details on how countries and ethnicity were inferred and grouped. Supplementary Fig. 1 and 2 show the summary of the distributions of tweets and retweets across country types and the distribution of ethnic groups in each country type. As a robustness check, we computed the correlation between country type and ethnic group to ensure that the two variables are not highly associated (Cramér's $V=0.11$ for tweets and 0.18 for retweets).

Figure 1 shows the choropleth maps that visualize the prevalence of each emotion in tweets and retweets by country. In each figure, the colors represent the percentage of tweets/retweets labeled with a certain emotion in a given country. A few interesting dynamics can be observed from this. First, several countries from Central and South America have noticeably high percentages of tweets labeled sadness, with values around 80 percent. Second, we observe that Australia, US, UK, South America, and Iran have higher percentages of tweets labeled anger. Lastly, Ethiopia and other African countries have noticeably higher percentages of tweets labeled joy. These observations fall in line with our hypothesis that countries from the group FBC have more joyous sentiment towards the Queen's passing. Supplementary Fig 3 gives

more detailed information on the countries with the highest percentage of each sentiment.

Note that, as seen in the legends, the value ranges and thus color intensity for each emotion may vary. Specifically, sadness, anger, and joy feature higher percentages on average, while fear, love, and surprise are less represented in the tweets. From the figure for joy, we observed that Ethiopia far exceeds all other countries, while Australia, New Zealand, and several African countries are also higher in percentage of joy. From the figures for fear and love, we observed that Iran and Pakistan have relatively higher percentages for fear and love, respectively, but the difference is not significant considering the scales. For surprise, the differences are marginal since the highest percentage represented is less than 2 percent.

To visualize the difference across the six country groups, we plot the sentiment distributions in each country group in Fig 2. When looking at the emotion distribution for both tweets and retweets, we find that country groups which are historically more closely related to the British monarchy seem to have similar percentages of joy (21-22% for FBC, TCR, UK, and US), whereas OC and Others seem to have higher sadness percentages. To better understand this dynamic, we looked specifically at distributions in tweets versus retweets. From the Tweets subplot in Fig 2 we observed similar sentiment patterns across all groups, but the Retweets subplot shows a distinctively high level of sadness for OC and Others. Supplementary Fig.4 gives the sentiment distribution of the top 5 countries with the highest tweet count in each country group.

To study the effect of country group membership on sentiment, we performed a randomized baseline model which permutes the location of tweets/retweets while controlling for gender and ethnic group. Specifically, for each tweet/retweet in our dataset, we randomly chose another tweet/retweet, possibly coming from a different country group, posted by an author of the same gender and ethnic group as the original tweet/retweet. We then compute for each country group the difference in the percentage of tweets/retweets that exhibit a certain emotion between the

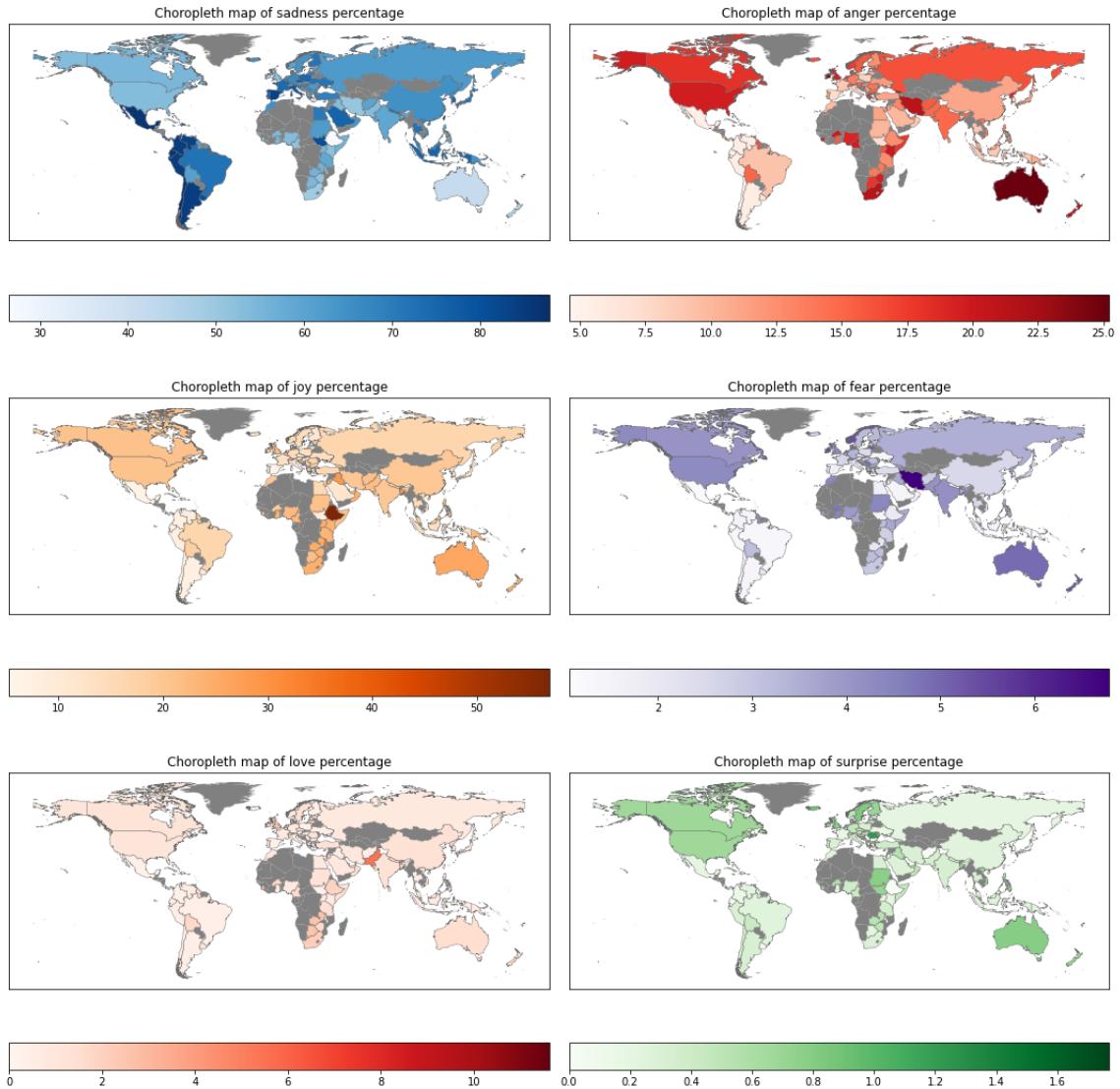


Figure 1: Prevalence of Six Different Emotions in Each Country Each country is colored based on the percentage of tweets showing a certain emotion among all tweets from that country. Countries shown in gray were identified with less than 50 tweets and retweets and hence were excluded from analysis.

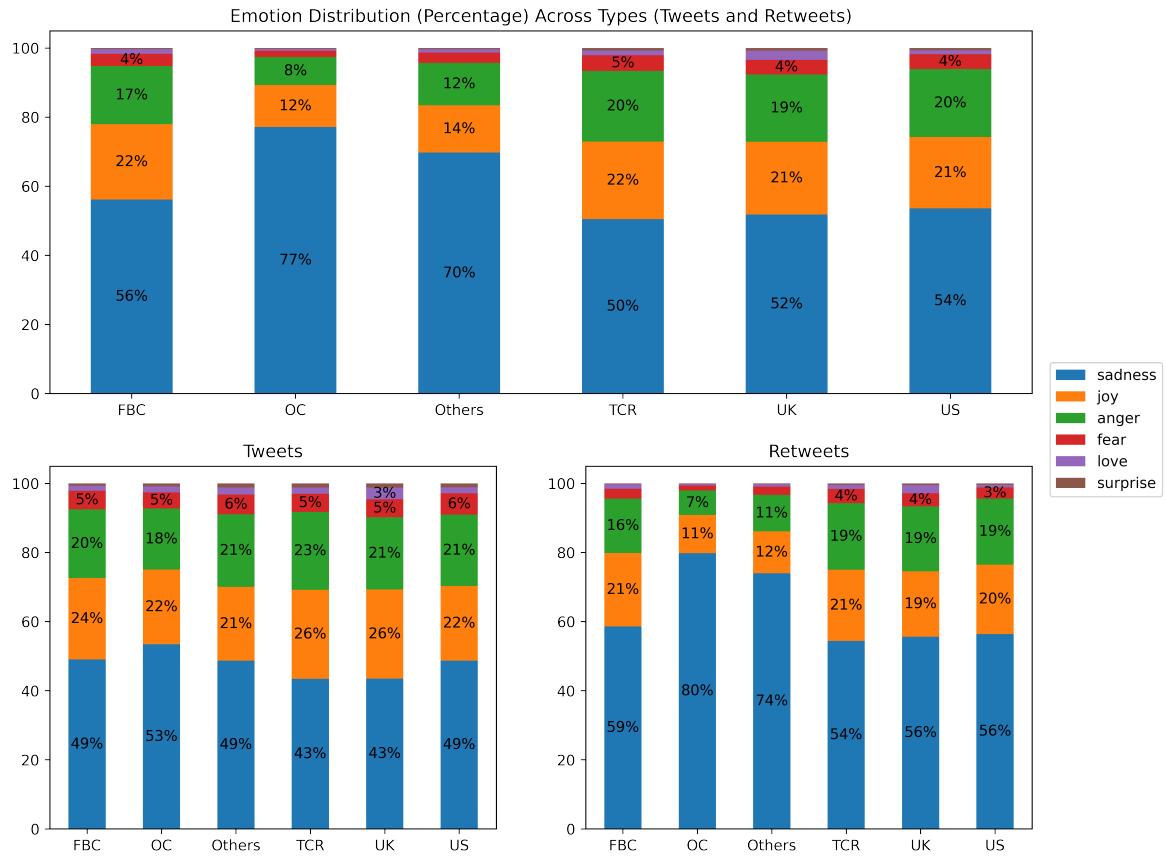


Figure 2: Distribution of six different emotions in six country types. The subplot at the top shows the distribution for the entire dataset, while the bottom left and bottom right subplots show the distribution for tweets and retweets respectively. For better readability, we hide the percentage annotation for each emotion if it is less than 3%.

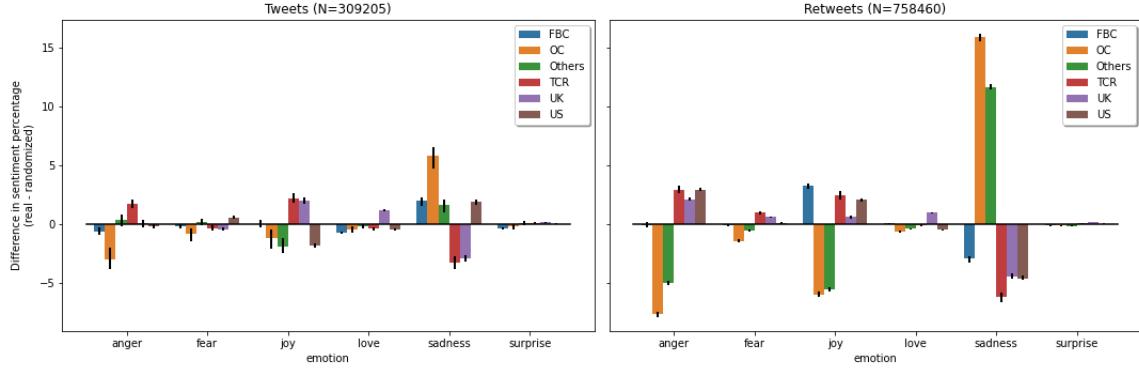


Figure 3: Randomized Baseline Model For Country Types. Difference in percentages of tweets and retweets which exhibit certain emotions for each country group. The error bars represent the 95% confidence intervals when bootstrapped for 100 times.

real and the randomized data. The results of this analysis are shown in Fig 3. The bars represent the difference when subtracting the emotion percentage in the real world from those in the counterfactual world. For a bar representing emotion E and country type T , the height of the bar gives the tendency of tweets/retweets to express E because of the membership in T after controlling for gender and ethnic group.

We observed that the differences of tweets and those of retweets do not necessarily follow the same pattern, and the effect for retweets tends to be more pronounced than that of tweets. Interestingly, for sadness in FBC, the difference for tweets is positive (1.94%, CI=[1.54%, 2.28%]) while that for retweets is negative (-2.94%, CI=[-3.22%, -2.66%]). Considering that there are 81.5 thousand more retweets than tweets in FBC, we see that although people from FBC tend to post more sad tweets about the Queen’s death, the endorsement for such tweets is lower in FBC. OC stands out as the group expressing the most sadness in tweets (5.80%, CI=[4.76%, 6.60%]) among all country types. This suggests that colonization itself does not necessarily lead to negative sentiments towards the British monarchy. For retweets from OC and Others, the two groups that have the least to do with the British monarchy historically, the levels of anger and joy are low (-7.67% and -5.98% for OC, -5.01% and -5.52% for Others)

while the levels of sadness are high (15.82% for OC, 11.64% for Others). For US, UK and TCR, the three country types most related to the British monarchy historically besides FBC, retweets tend to carry more anger and less sadness. Lastly, we note that the UK stands out as the only group with positive values for love in both tweets (1.15%, CI=[1.08%, 1.23%]) and retweets (0.98%, CI=[0.94%, 1.01%]).

We further looked into the role of ethnic groups by performing another randomized baseline model. Specifically, in the three country types US, UK and TCR, for each tweet/retweet we randomly choose another one with the same gender and possibly different ethnic group as the corresponding data point in the counterfactual world, and then we compute the difference in sentiment percentage as before. Fig. 4 shows the results of this analysis. Observe that across all cases except for retweets in the US, Asians stood out as expressing the most sadness and the least joy among all the ethnic groups. Hispanics in the US show a high level of sadness and a low level of anger for both tweets and retweets. Finally, we note that in the UK and TCR, Indian people tend to post more tweets with joy (2.55% in UK, 2.65% in TCR) and less tweets with sadness (-1.59%, -1.65%), but the same phenomenon is not preserved for retweets.

To quantify the effect of ethnic group and gender, we performed multinomial logistic regression. Supplementary Table 1 shows the results of the model performed on all tweets. Here we observed that Asians ($\beta = 0.2493, p < 0.001$) and Hispanics ($\beta = 0.5044, p < 0.001$) express remarkably higher sadness, and men ($\beta = -0.1142, p < 0.001$) express significantly less sadness. These trends align with findings from the randomized baseline model. Given that the US is racially diverse, we did another multinomial logistic regression on data from the US, presented in Supplementary Table 2. We found that Hispanics ($\beta = 0.135, p < 0.001$) and Asians ($\beta = 0.3585, p < 0.001$) expressed more sadness, which matches the overall tendency.

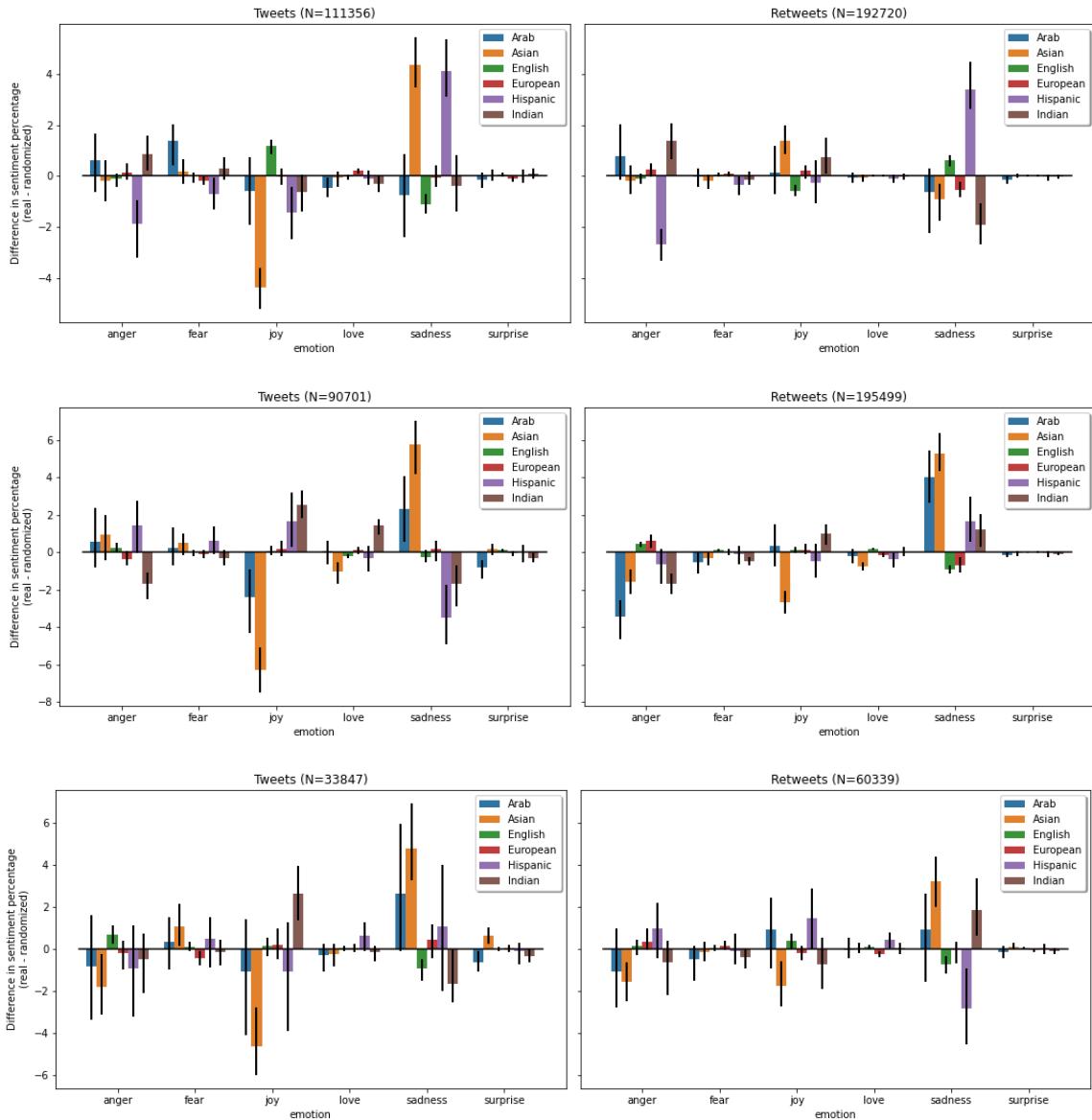


Figure 4: Randomized Baseline Model For Ethnicity. Difference in percentages of tweets and retweets which exhibit certain emotions for each ethnic group in the US (top), the UK (middle), and TCR (bottom). The error bars represent the 95% confidence intervals when bootstrapped for 100 times.

Discussion

In this study, we attempt to quantify the effect of colonialism on attitudes towards the British monarchy using the specific case-study of Queen Elizabeth II's passing. Overall, we observe that countries demonstrate different sentiment patterns towards the queen's death depending on their historical relation with the British monarchy. Specifically, when compared to other groups, OC and Others express more sadness and less joy in both tweets and retweets, and OC exhibits the strongest tendency to post sad tweets. As for the effect of ethnicity, within the UK, US, and TCR, Asians exhibit the strongest tendency to post sad tweets and retweets, followed by Hispanics, and in the UK and TCR, Indians show the tendency to tweet with more joy and less sadness. In addition, the UK is the only group that shows a tendency for love in both tweets and retweets. Lastly, men in general express less sadness than females. These findings reveal the interplay between country of origin, ethnicity and gender on sentiments towards Queen Elizabeth II.

Although our study sheds light on peculiar dynamics between the British monarchy and the world, there is more to the story than the data we were able to collect as our methodology comes with limitations. First, given the limited time-frame for our project and API availability, we restricted our study to only English tweets, and we expect that many tweets against the British monarchy should be written in the native languages of former British colonies. Second, identification of countries from user locations can be prone to error, as many users do not input correct locations when creating their Twitter accounts and there are different places in the world sharing the same name. Third, the ethnicity identification contains too few classes. In particular, there are no categories for non-Arab Africans which make up a significant part of the FBC group as well as indigenous people in TCR who are more likely to speak up against the British monarchy. Fourth, even though age is an established confounder, it is difficult to control

for given the lack of relevant information. Lastly, the same emotion extracted from tweets could possibly correspond to different emotions in the real world depending on the context of the tweets. Nonetheless, our findings contribute to a larger picture of questioning the public's current opinions on the British monarchy, post-death of their longest-standing ruler, Queen Elizabeth II.

Methods

Data Preprocessing

Using the Twitter API, we collected 4,432,914 tweets posted by 2,460,377 authors which contain the words “queen” and “die”, “dead” or “death” dated between September 6 and September 22, 2022. To identify the country for each tweet, we used the country attribute from tweets if it is present. For the many tweets that were not geo-tagged, we extracted the location attribute from authors and resorted to string matching. The author location field is a string set by the user that does not necessarily represent a real place and is not necessarily in English. To identify as many author locations as possible, we queried OpenStreetMap data using the Overpass API and built a database consisting of names of administrative regions (province, region, district, county, municipality, and city) in both English and their respective native languages. We also take into consideration the country flag emojis, which are unicode characters showing the two-letter code of each country. Several rounds of string matching were performed to identify countries from author locations using the database, from largest to smallest geographically and longest to shortest in string length. We identified 239 countries for 38,617 out of 578,739 unique author locations, and for the robustness of analysis we dropped countries with less than 50 tweets. After excluding non-English tweets and tweets for which the country cannot be identified, a total of 309,205 tweets and 758,460 retweets ($N=1,067,665$) spanning across 117 countries and territories from 680,687 authors were kept for analysis.

Country Grouping

Countries were grouped according to their current political relationship with the UK. Historically, as nations obtained sovereignty from the British Empire, it developed into the Commonwealth – an association of member states which are primarily former British colonies. Today, in addition to Commonwealth Nations there are also 14 Commonwealth Realms – countries which see the British monarch as their head of state.

Given the complexity of the relationship between former British colonies, those part of the commonwealth and those still part of the UK, we decided to make three distinct groupings (1) FBC (former British colony), (2) TCR (the Commonwealth Realm) and (3) UK. Since our research focus extends beyond British colonialism, we created another group for (4) OC (other colonies which were not colonized by the UK). This fourth group allowed us to better understand the dynamics of post-colonial nations' attitudes towards the monarchy. Given the large number of tweets from the US and its unique relationship with the UK, we decided to make it into its own group (5). All remaining countries in the dataset were grouped into the category (6) Others.

Emotion Analysis

We used Distilbert-base-uncased-emotion (*10*) (a distilled version of the BERT language model) which was trained on a Twitter emotion dataset. This emotion analysis model receives a string input and outputs a prediction for its emotion (sadness, joy, anger, love, fear and surprise). The reported accuracy was 93.8% with an F-1 score of 93.79%.

Gender and Ethnicity Identification

Different classifiers for predicting age, gender and ethnicity of Twitter users have been proposed to date (*11*). Given the lack of profile image data in our dataset we were unable to accurately

predict age; therefore it remains a confounding variable to address in future work.

To infer gender, we used the python library GenderPerformr, which has shown state-of-the-art results on Twitter usernames (12). This classifier uses a dataset of 102M post-reply pairs with gender-labeled users to build a database and train an LSTM model that predicts gender of a user. To infer ethnicity, we use the python library EthnicSeer which predicts the ethnicity of a name based on its characters and phonetic pronunciation (13). The model outputs predictions among 12 ethnicities which we group into the following types: Arab (Middle-Eastern), Asian (Chinese, Vietnam, Japanese, Korean), English (English), Indian (Indian), Hispanic (Spanish) and European (French, Italian, German, Russian).

Randomized Baseline Model

In this paper we used two randomized baseline models to see how different factors affect emotions in tweets and retweets. The first model studies the effect of membership in a certain country group. For each country type T , we calculate the percentage of tweets/retweets showing each emotion E . This means that for each type T , the sum of percentages across all emotions E is 100%. Next, we produce a counterfactual world by permuting the location of tweets/retweets while fixing gender and ethnic group, and then calculate the emotion percentages as we did for the real data. We then compute the difference in emotion percentage by subtracting those of the real data from those of the counterfactual data. The second model studies the effect of membership in a certain ethnic group within a given country or group of countries. The difference in sentiment is calculated in a way analogous to the first model, except that a counterfactual tweet/retweet is now given by another tweet/retweet coming from the same country (or group of countries) with the same gender and possibly different ethnic group membership.

Multinomial Logistic Regression

In addition to the randomized baseline model, we used multinomial logistic regression to investigate the effect of ethnicity and gender on emotion. Here, the independent variables are ethnicity (Arab, Asian, English, European, Hispanic or Indian) and gender, (male or female) while the dependent variable is emotion (anger, fear, joy, love, sadness, or surprise). The results as given in Supplementary Table 1 and 2. Note that due to the encoding of nominal variable, the class "female" in gender and the class "Arab" in ethnicity were dropped.

Contributions

Ariana Alvarez worked on the literature review, gender inference, and multinomial logistic regression. Suei-Wen Chen conducted the data preprocessing, country identification, RBM, and data visualization. Ryan Elliot Hsu conducted the ethnicity inference, multinomial logistic regression, and data visualization. Alex Ko conducted the BERT emotion analysis and data visualizations for emotion distributions. All members participated in developing the experimental design, writing and proofreading the paper.

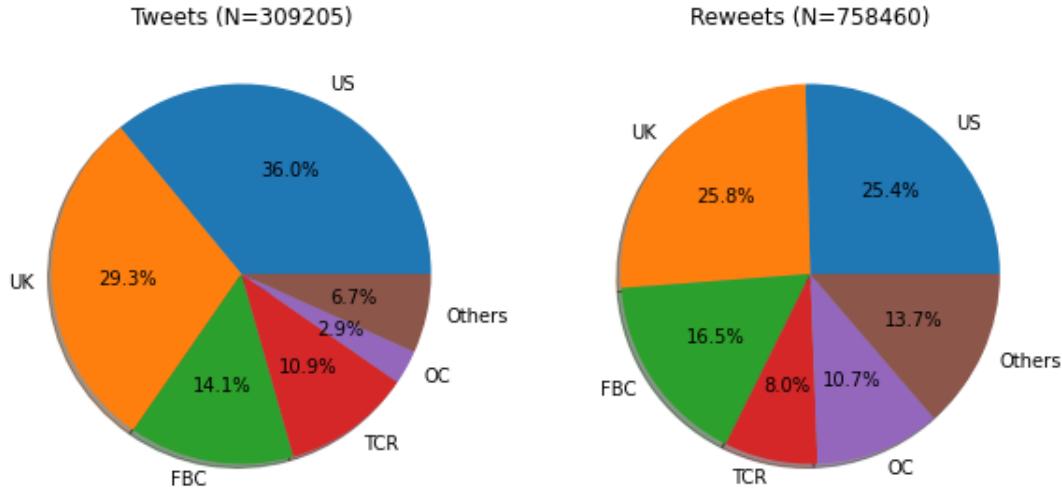
Acknowledgements

The authors would like to thank Bedoor AlShebli, Shahan Ali Memon, and Sara Saboor for their helpful feedback and support.

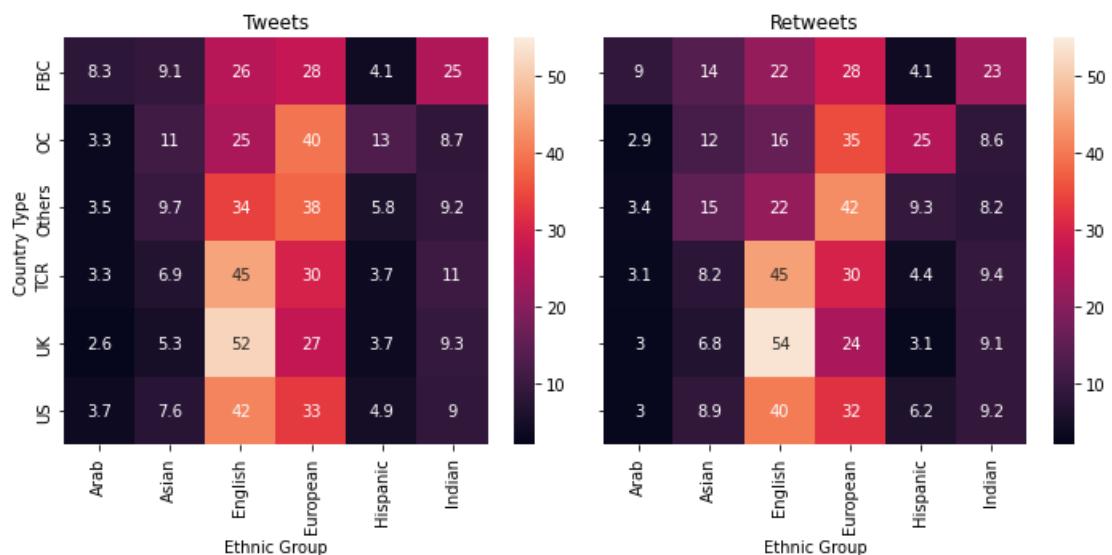
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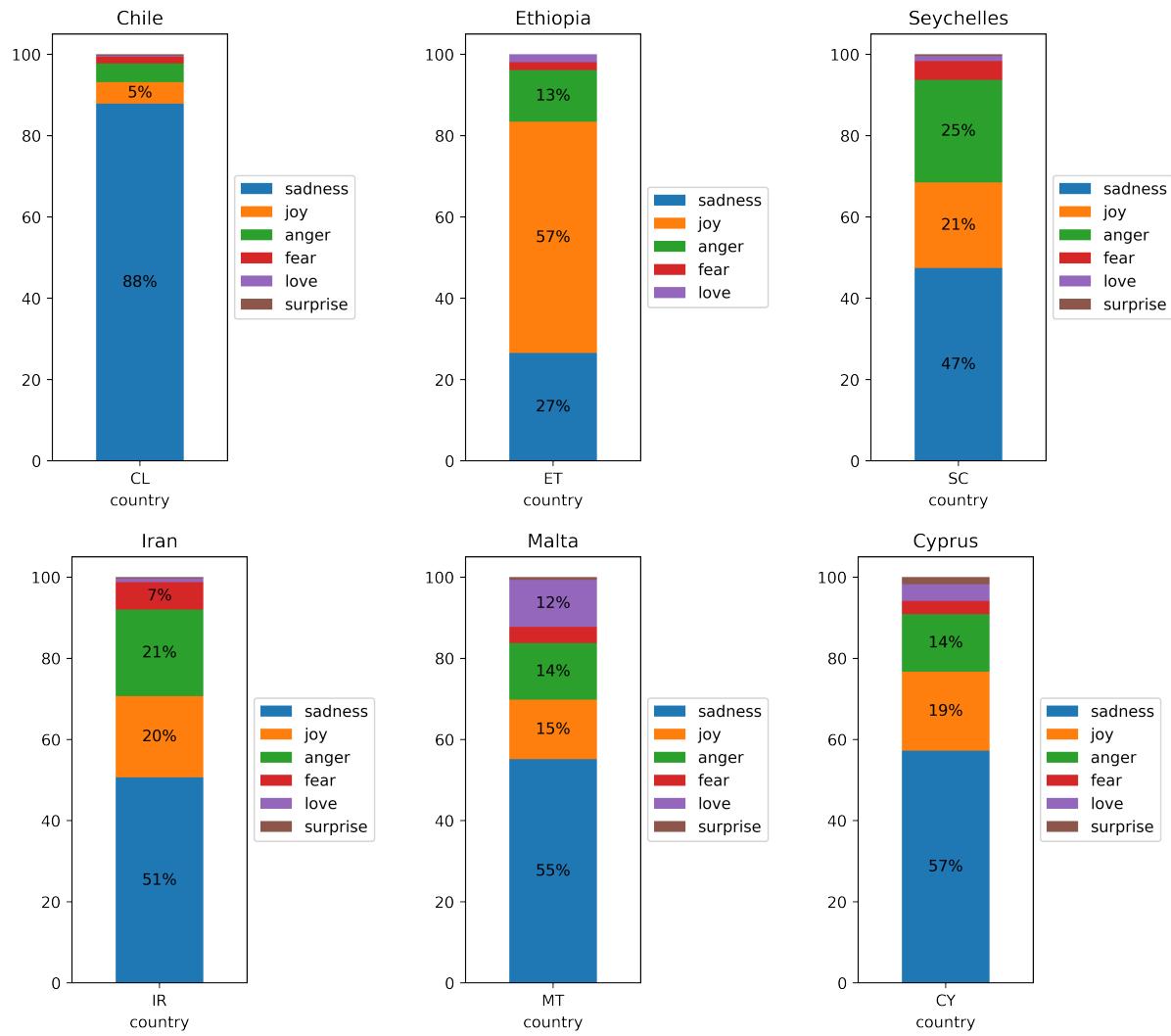
Supplementary Materials



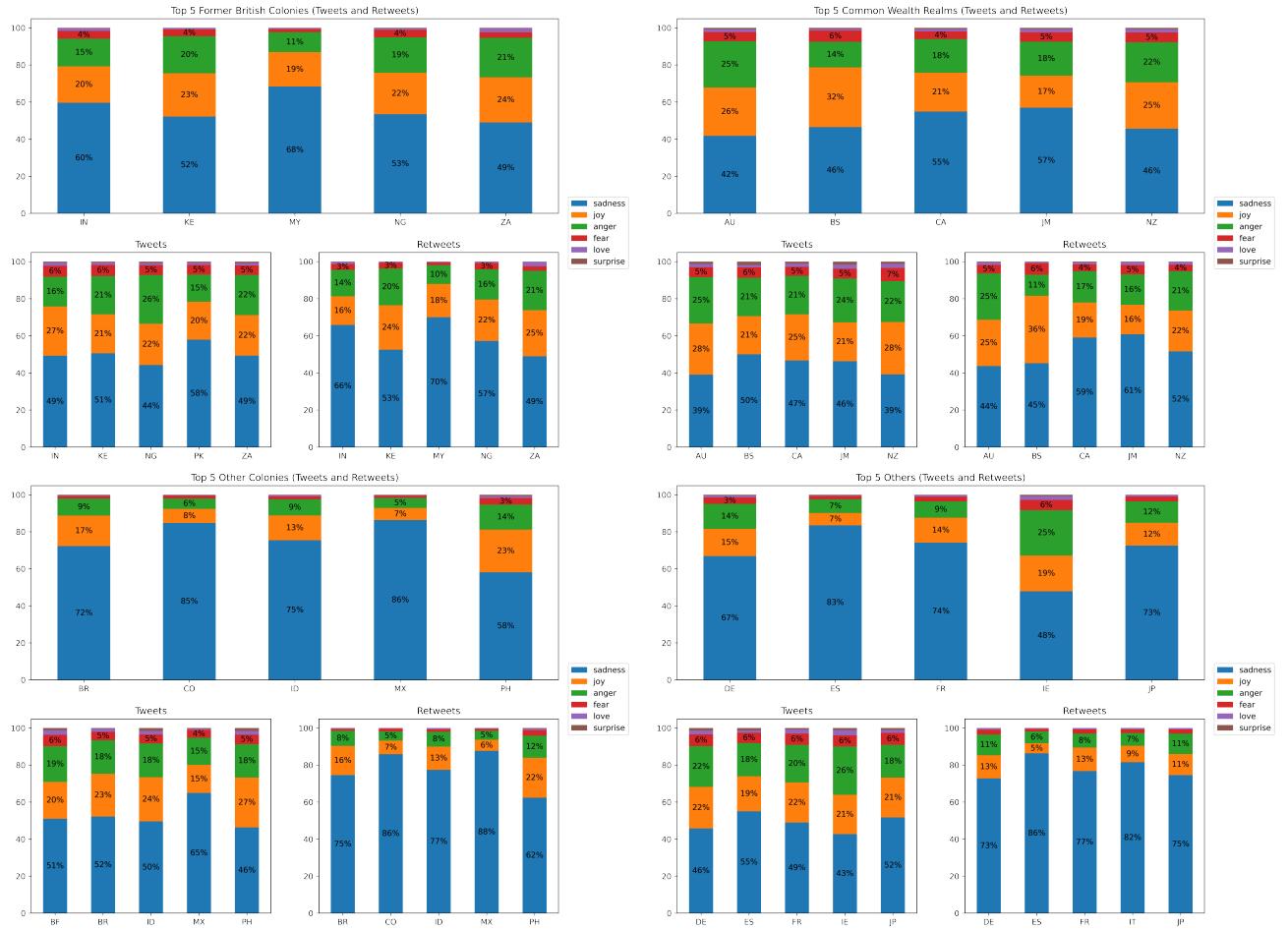
Supplementary Figure 1: Proportion of tweets and retweets in each country group.



Supplementary Figure 2: Percentages of ethnic groups in each country type (each row sums to 100%).



Supplementary Figure 3: Emotion distribution of countries with the highest percentage of each sentiment. Chile (sadness), Ethiopia (joy), Seychelles (anger), Iran (fear), Malta (love), and Cyprus (surprise).



Supplementary Figure 4: Top 5 countries with the most tweets and retweets in each country type. a) Former British Colonies. b) The Commonwealth Realms. c) Other Colonies. d) Others.

MNLogit Regression Results						
Dep. Variable:	emotion	No. Observations:	1067665			
Model:	MNLogit	Df Residuals:	1067630			
Method:	MLE	Df Model:	30			
Date:	Mon, 05 Dec 2022	Pseudo R-squ.:	0.001668			
Time:	20:01:22	Log-Likelihood:	-1.2384e+06			
converged:	False	LL-Null:	-1.2405e+06			
Covariance Type:	nonrobust	LLR p-value:	0.000			
emotion=fear	coef	std err	z	P> z	[0.025	0.975]
const	-1.2702	0.026	-47.987	0.000	-1.322	-1.218
gender_M	-0.0501	0.011	-4.414	0.000	-0.072	-0.028
ethnicity_group_Asian	-0.1910	0.032	-5.953	0.000	-0.254	-0.128
ethnicity_group_English	-0.2235	0.027	-8.296	0.000	-0.276	-0.171
ethnicity_group_European	-0.2504	0.027	-9.131	0.000	-0.304	-0.197
ethnicity_group_Hispanic	-0.1823	0.036	-5.072	0.000	-0.253	-0.112
ethnicity_group_Indian	-0.1942	0.031	-6.343	0.000	-0.254	-0.134
emotion=joy	coef	std err	z	P> z	[0.025	0.975]
const	0.1769	0.017	10.639	0.000	0.144	0.209
gender_M	-0.0431	0.007	-6.512	0.000	-0.056	-0.030
ethnicity_group_Asian	0.0343	0.020	1.746	0.081	-0.004	0.073
ethnicity_group_English	-0.0616	0.017	-3.649	0.000	-0.095	-0.029
ethnicity_group_European	-0.0470	0.017	-2.746	0.006	-0.081	-0.013
ethnicity_group_Hispanic	0.1489	0.022	6.898	0.000	0.107	0.191
ethnicity_group_Indian	0.0862	0.019	4.584	0.000	0.049	0.123
emotion=love	coef	std err	z	P> z	[0.025	0.975]
const	-1.8014	0.034	-52.340	0.000	-1.869	-1.734
gender_M	-0.2232	0.016	-14.350	0.000	-0.254	-0.193
ethnicity_group_Asian	-0.3486	0.043	-8.116	0.000	-0.433	-0.264
ethnicity_group_English	-0.3252	0.035	-9.214	0.000	-0.394	-0.256
ethnicity_group_European	-0.4845	0.036	-13.345	0.000	-0.556	-0.413
ethnicity_group_Hispanic	-0.2403	0.048	-5.052	0.000	-0.334	-0.147
ethnicity_group_Indian	-0.2166	0.040	-5.404	0.000	-0.295	-0.138
emotion=sadness	coef	std err	z	P> z	[0.025	0.975]
const	1.2833	0.014	92.450	0.000	1.256	1.311
gender_M	-0.1142	0.006	-20.714	0.000	-0.125	-0.103
ethnicity_group_Asian	0.2493	0.016	15.272	0.000	0.217	0.281
ethnicity_group_English	-0.1820	0.014	-12.901	0.000	-0.210	-0.154
ethnicity_group_European	-0.0227	0.014	-1.589	0.112	-0.051	0.005
ethnicity_group_Hispanic	0.5044	0.018	28.170	0.000	0.469	0.540
ethnicity_group_Indian	0.0873	0.016	5.547	0.000	0.056	0.118
emotion=surprise	coef	std err	z	P> z	[0.025	0.975]
const	-2.4794	0.053	-46.559	0.000	-2.584	-2.375
gender_M	-0.8314	0.027	-30.650	0.000	-0.885	-0.778
ethnicity_group_Asian	-0.3222	0.067	-4.833	0.000	-0.453	-0.192
ethnicity_group_English	-0.6559	0.057	-11.603	0.000	-0.767	-0.545
ethnicity_group_European	-0.6743	0.058	-11.658	0.000	-0.788	-0.561
ethnicity_group_Hispanic	-0.2301	0.075	-3.088	0.002	-0.376	-0.084
ethnicity_group_Indian	-0.3864	0.065	-5.984	0.000	-0.513	-0.260

Supplementary Table 1: Multinomial Logistic Regression for All Tweets and Retweets.

MNLogit Regression Results

Dep. Variable:	emotion	No. Observations:	304076				
Model:	MNLogit	Df Residuals:	304041				
Method:	MLE	Df Model:	30				
Date:	Mon, 05 Dec 2022	Pseudo R-squ.:	-0.0005631				
Time:	20:06:55	Log-Likelihood:	-3.6494e+05				
converged:	False	LL-Null:	-3.6473e+05				
Covariance Type:	nonrobust	LLR p-value:	1.000				
<hr/>							
	emotion=fear	coef	std err	z	P> z	[0.025	0.975]
const	-1.3698	0.051	-27.005	0.000	-1.469	-1.270	
gender_M	0.1179	0.020	5.875	0.000	0.079	0.157	
ethnicity_group_Asian	-0.2469	0.060	-4.085	0.000	-0.365	-0.128	
ethnicity_group_English	-0.2078	0.052	-4.026	0.000	-0.309	-0.107	
ethnicity_group_European	-0.2803	0.052	-5.366	0.000	-0.383	-0.178	
ethnicity_group_Hispanic	-0.2356	0.067	-3.507	0.000	-0.367	-0.104	
ethnicity_group_Indian	-0.2565	0.059	-4.347	0.000	-0.372	-0.141	
<hr/>							
	emotion=joy	coef	std err	z	P> z	[0.025	0.975]
const	0.0412	0.032	1.270	0.204	-0.022	0.105	
gender_M	0.0440	0.012	3.755	0.000	0.021	0.067	
ethnicity_group_Asian	0.0327	0.038	0.870	0.385	-0.041	0.106	
ethnicity_group_English	-0.0197	0.033	-0.596	0.551	-0.084	0.045	
ethnicity_group_European	-0.0514	0.033	-1.543	0.123	-0.117	0.014	
ethnicity_group_Hispanic	0.1981	0.041	4.865	0.000	0.118	0.278	
ethnicity_group_Indian	-0.0308	0.037	-0.832	0.405	-0.103	0.042	
<hr/>							
	emotion=love	coef	std err	z	P> z	[0.025	0.975]
const	-2.1105	0.076	-27.953	0.000	-2.258	-1.963	
gender_M	-0.2563	0.033	-7.881	0.000	-0.320	-0.193	
ethnicity_group_Asian	-0.3369	0.092	-3.666	0.000	-0.517	-0.157	
ethnicity_group_English	-0.4914	0.078	-6.279	0.000	-0.645	-0.338	
ethnicity_group_European	-0.4633	0.079	-5.864	0.000	-0.618	-0.308	
ethnicity_group_Hispanic	-0.2337	0.101	-2.311	0.021	-0.432	-0.035	
ethnicity_group_Indian	-0.3731	0.090	-4.141	0.000	-0.550	-0.197	
<hr/>							
	emotion=sadness	coef	std err	z	P> z	[0.025	0.975]
const	0.9847	0.027	36.010	0.000	0.931	1.038	
gender_M	-0.0258	0.010	-2.635	0.008	-0.045	-0.007	
ethnicity_group_Asian	0.1357	0.032	4.287	0.000	0.074	0.198	
ethnicity_group_English	0.0214	0.028	0.769	0.442	-0.033	0.076	
ethnicity_group_European	-0.0139	0.028	-0.495	0.621	-0.069	0.041	
ethnicity_group_Hispanic	0.3585	0.034	10.421	0.000	0.291	0.426	
ethnicity_group_Indian	0.0166	0.031	0.533	0.594	-0.044	0.078	
<hr/>							
	emotion=surprise	coef	std err	z	P> z	[0.025	0.975]
const	-2.5101	0.099	-25.457	0.000	-2.703	-2.317	
gender_M	-0.6846	0.047	-14.581	0.000	-0.777	-0.593	
ethnicity_group_Asian	-0.3277	0.121	-2.717	0.007	-0.564	-0.091	
ethnicity_group_English	-0.6708	0.104	-6.440	0.000	-0.875	-0.467	
ethnicity_group_European	-0.7342	0.106	-6.926	0.000	-0.942	-0.526	
ethnicity_group_Hispanic	-0.2341	0.133	-1.754	0.079	-0.496	0.027	
ethnicity_group_Indian	-0.3498	0.118	-2.959	0.003	-0.581	-0.118	

Supplementary Table 2: Multinomial Logistic Regression for All Tweets and Retweets in the US.