#Stoprussia: Weaponizing Social Media for Foreign Support[*]

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September 2, 2023

Since the emergence of states, they have fought wars, and when doing so, they have tried to solicit foreign support for their war efforts. Historically, those efforts have been challenging to observe because they have taken place among high-level diplomats behind closed doors. That has changed over the last decade as social media has become ubiquitous, and governments have actively deployed it for messaging purposes. The publicness of social media provides the potential for learning what kinds of messaging 'work' with different kinds of foreign audiences.

We provide original insight into this issue by examining how Ukrainian officials have used social media to solicit foreign support for its ongoing war with Russia. The Ukrainian government has been at the forefront of digitizing government–from public procurement to paying taxes to warnings of incoming missile attacks. Members of the government have also been highly active on social media as part of an attempt to shape the international narrative around Russia's invasion on February 24, 2022. In this report, we exploit the timelines of the Twitter accounts of Ukrainian government officials to understand what kind of international messaging 'works'.

The public-ness of Twitter allows us to gather data on every tweet government officials have ever made, the international networks that consume those tweets, and a clean measure of the extent to which each of those tweets disseminates across distinct international networks. The results provide uniquely granular evidence on how the content and sentiment of tweets impact their success in reaching distinct international audiences. Our granular evidence provides the first systematic test of the efficacy of efforts to solicit foreign support during war.

Our analysis of a corpus of millions of tweets and retweets gathered under the auspices of the #Data4Ukraine project provides several key findings:

- Consistent with our expectation that Twitter is a strategic tool for communicating with international audiences, the volume of government tweets increases dramatically and shifts toward English-language posting as soon as the invasion begins.

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- The preponderance of those tweets focus on several different international themes and circulate in 9 distinct international networks, which range from governments to human rights organizations to mass media.

- The content and sentiment of government messaging impact the extent to which they disseminate across different foreign constituencies. For instance, US and Canadian government twitter networks are much more responsive to tweets about human rights violations than they are to those about security considerations. On the other hand, the mass media community is highly responsive to tweets about specific Russian attacks and unresponsive to Ukrainian government tweets about Russia or Putin.

All told, the results provide uniquely granular evidence on how the content and sentiment of tweets impact their success in reaching distinct international audiences. In doing so, we provide the first large-scale, systematic test of the efficacy of social media outreach efforts to solicit foreign support during war.

1 Prior Research: Social Media, Foreign Support and War

There is widespread recognition that political actors often use social media to rally audiences in times of conflict (Zeitzoff, 2017; Larson, 2021). Most relevant work, however, has focused on how governments deploy digital media for or against their own citizens and vice versa. For instance, a growing body or work describes how autocratic regimes capture media outlets and manipulate domestic information environments (Szeidl and Szucs, 2021; Knight and Tribin, 2019b,a; Di Tella and Franceschelli, 2011; Rozenas and Stukal, 2019). Those approaches to controlling formal digital media are echoed in efforts to manage social media. For instance, Russian social media is filled with pro-government and anti-government bots (Stukal et al., 2019), and the Chinese government employs sophisticated methods to prevent users from accessing information with collective action potential (King, Pan and Roberts, 2013). Nevertheless, most such work is on how governments target citizens with messages. Research on digital diplomacy – i.e. using social media platforms for diplomatic objectives and to target foreign audiences – is in its infancy.

Social media offers governments with tremendous capacity to micro-target different audiences. Russian intelligence operations, for instance, have targeted minority voters in the US to dissuade voting, promoted conspiracy theories among conservatives, and disseminated false information about the #BlackLivesMatter movement (Bradshaw, DiResta and Miller, 2022). Given that the government of Ukraine and its officials were amongst the most social media savvy even before the Russian invasion, we expect that after the invasion they used social media as a tool for framing and disseminating their message to foreign audiences and that they did it in ways that discriminated amongst important international constituencies.

2 Our Approach

Our approach builds on the enormous corpus of Twitter data that DevLab@Penn gathered for the #Data4Ukraine Project. Of course a great deal of communication about the war in

Ukraine is not on Twitter, but the popularity of Twitter among journalists, activists, and policymakers meant the platform was often the first place that many people turned to learn about the world (epecially before Musk purchased Twitter!). Indeed, Twitter quickly became a key tool for the tech-savvy Ukrainian government to communicate with the international community.

Relying on Twitter's academic API and a small list of very general query terms, we collected a dataset of approximately 500 million tweets related to the war, which we used to map, classify and deliver data on the war on a near real-time, hourly basis from March 2022-February 2023. To that data we add two additional data collections. First, we collect the full timelines (i.e. entire Twitter histories) of each member of the Ukrainian Parliament, minister and other executive branch official on Twitter. Out of 475 relevant government officials (450 Rada/Parliament members and 25 state ministers), 107 have active Twitter accounts out of. The full history of those 107 accounts produces a collection of approximately 150,000 tweets (70% of which have been retweeted across international networks) both before and after the Russian invasion. Those 107 Twitter accounts include an average of 241,828 followers and 356 friends. We use the tweets of these government officials for topic and sentiment analysis below.

Second, to examine the effects of specific messages on the frequency of retweets across international audiences – how the original tweets are amplified and disseminated across international networks – we use the #Data4Ukraine metadata to identify all twitter handles publicly engaging with (retweeting) Ukrainian officials since the invasion began. This results in a dataset of approximately 12,500 tweets by Ukrainian government officials and the corresponding 4,189,260 retweets for which we could identify unique retweeting handles. [1] The most retweeted in this collection belongs to the Ukrainian Foreign Minister, Dmitry Kuleba, and reads: *"Bucha massacre was deliberate. Russians aim to eliminate as many Ukrainians as they can. We must stop them and kick them out. I demand new devastating G7 sanctions NOW.".* It was retweeted 21,396 times.

In Figure 1, we plot the daily timelines of counts of tweets disseminated by Ukrainian officials and their retweets by the international community. The graph demonstrates that both the original tweets and their retweets are concentrated around key events of the war timeline.

By combining the Ukrainian government timelines with the collection of retweets and the broader corpus of tweets on the war, we are able to map out the distinct international networks that consume and disseminate each tweet by a Ukrainian official. To do so we apply a standard community detection algorithm to the entire Ukraine metadata corpus (in addition to the dataset of Ukrainian officials); this identifies clusters within the Ukraine Twitter network as well as particularly influential Twitter handles within those networks (Traag, Waltman and Van Eck, 2019). Although our community detection analysis yields over 20 individual communities, we rely on the top 10 communities with over 20 members each in our final analysis. Table 1 lists the top 10 communities along with the number of individual accounts identified in each of them.

To identify the topics about which Ukrainian government officials tweet, we use an unsupervised topic modeling approach by training a transformer-based topic model with Bert-

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[1] Approximately 15% (2,158) of the tweets in this collection have zero retweets.

Figure 1: Timeline of 147,489 Twitter Posts of Ukrainian Officials and their 34,307,407 Retweets with Key Events Around the Volume Spikes
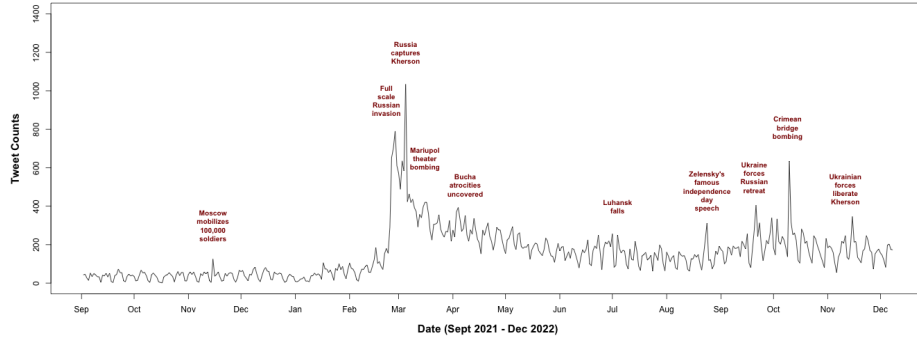
(a) Daily volume of original tweets
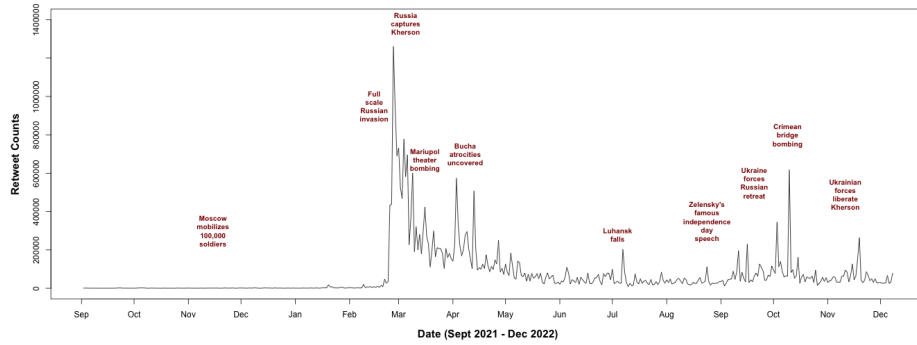
(b) Daily volume of retweets

Table 1: List of Communities

N	Community	Members	N	Community	Members
1	Mass Media	710	6	European States and NATO	115
2	Ukrainian and European News	656	7	US Government	84
3	EU and UN	305	8	Policy Think Tanks	58
4	Ukrainian Government	267	9	UK Intelligentsia	42
5	Canadian Government	126	10	Human Rights	17

Topic (Grootendorst, 2022). Following a number of cross-validations with different cutoff values, BertTopic modeling yields $K = 50$ topics that represent the wide range of issues the Ukrainian government officials discuss on Twitter. We then classify these topics into ten aggregate groups by merging them based on their relevance. Table 2 in the Appendix summarizes how we group topics into broader themes, and Table 3 provides examples of specific tweets in each topic grouping or theme.

To assess the impact of tweets' sentiment on their amplification online, we train a separate transformer-based model (Twitter-RoBERTa) that classifies tweets into positive, negative, and neutral tweets by predicting sentiment scores and probabilities associated with each score.[2]

3 Results

Below we present the key results in several subsections. First we analyze how the invasion impacted the volume of tweets by Ukrainian government officials as well as the language in which they tweet. We then analyze how the invasion impacted the topics that they tweeted about. Finally, we turn to an analysis of how different kinds of international audiences respond to Ukrainian government tweets about different topics.

3.1   The Volume and Language of Tweets

The left-hand side of Figure 2 shows that the overall volume of tweeting increases dramatically with the invasion. From fewer than 50 tweets per day before the invasion, the Twitter output increases to 6-800 in the days immediately after the invasion. Even 6 months after the invasion, the average daily volume is more than double what it was before the invasion. The immediate jump after the invasion is broadly consistent with the widespread sense that the invasion was unexpected. The right-hand side of Figure 2 shows that the post-invasion increase in volume is overwhelmingly driven by an increase in English-language tweets. We take these twin facts – the increased volume of posts and the shift to English – after the invasion as evidence that Ukrainian officials were indeed using Twitter as a means of communicating with international audiences.

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[2]Twitter-RoBERTa is a variant of the RoBERTa model based on 58 million tweets and fine-tuned for sentiment analysis tasks with the TweetEval benchmark (Barbieri et al., 2020).

Figure 2: The Volume and Language of Tweets Pre- and Post-Invasion
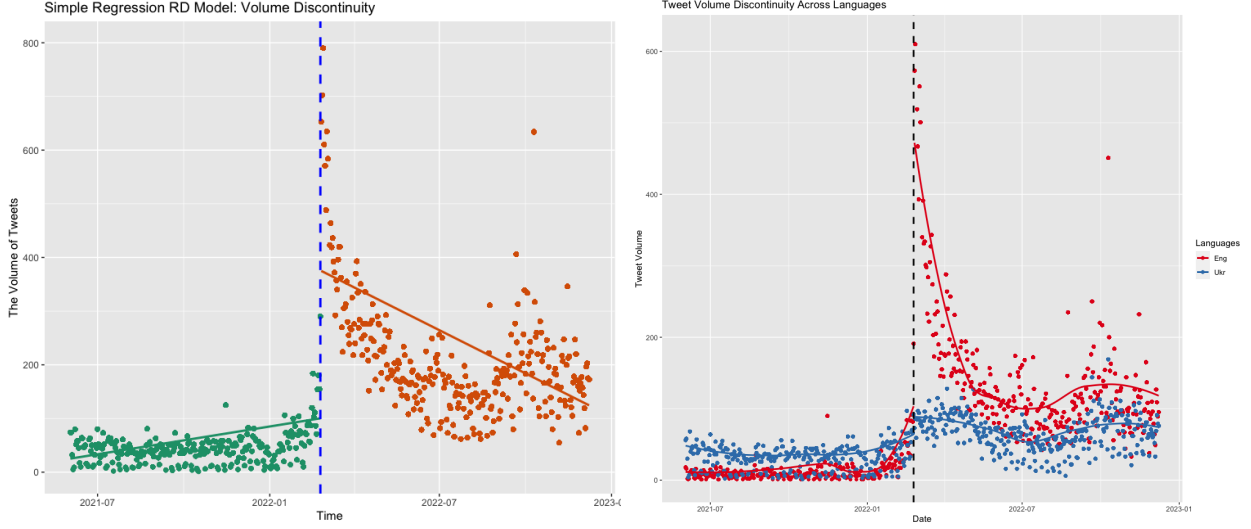
3.2 The Topics in Ukrainian Government Tweets Before and After the Invasion

The changes described above are echoed in *what* government officials tweet about. Table 2 distinguishes the volume of posting on major topics pre- and post-invasion across all three languages. The red and blue arrows indicate whether the volume of a topic goes up or down post-invasion. The results indicate that the invasion led to a shift from domestic to war-related topics: there is an increase in Ukrainian officials' postings on humanitarian issues and attack-related messages; discussions of domestic executive and legislative matters, social, cultural, and economic issues decline, in some cases quite dramatically. This provides further evidence that the invasion incentivized governmental officials to deploy digital communication strategies to capture the attention of foreign audiences.

Table 2: Share of Tweet Content across Languages Before and After Invasion

Main Topics	Pre-invasion			Post-invasion		
	English	Ukrainian	Russian	English	Ukrainian	Russian
Attacks	0.957	0.264	0.421	4.972 ↑	1.282 ↑	0.792 ↑
Humanitarian	7.023	5.019	5.245	7.855 ↑	7.862 ↑	8.911 ↑
Russia	1.440	0.359	0.590	2.820 ↑	1.000 ↑	0.891 ↑
International Security	6.484	2.358	1.980	5.900 ↓	2.984 ↑	0.495 ↓
National Defense	0.270	1.419	0.506	0.239 ↓	1.141 ↓	0.198 ↓
Infrastructure	1.050	2.408	1.011	0.458 ↓	1.351 ↓	0.198 ↓
Executive & Legislative Issues	2.601	7.630	4.150	1.206 ↓	3.811 ↓	1.584 ↓
Economic & Business Issues	4.170	6.140	4.487	0.894 ↓	2.209 ↓	1.683 ↓
Social Issues	4.551	6.388	2.760	0.875 ↓	3.392 ↓	0.891 ↓
Cultural Issues	1.691	4.368	8.026	2.189 ↑	5.695 ↑	24.951 ↑

3.3 How Topics and Sentiment Impact the Dissemination of Ukrainian Government Tweets Across International Audiences

Did these Twitter-based efforts to solicit foreign attention work? And if so, how did they work across different international audiences? Figure 3 provides initial evidence that Ukrainian government posts on topics related to human rights violations, Russian attacks, and national defense are retweeted at much higher rates immediately after the invasion. The figure shows discontinuities in the volume of retweeting across different topic groups before and after the invasion. For readers interested in finer-grained details, Figure 5 in the Appendix provides more detailed information about the frequency with which each international community retweets different topics.

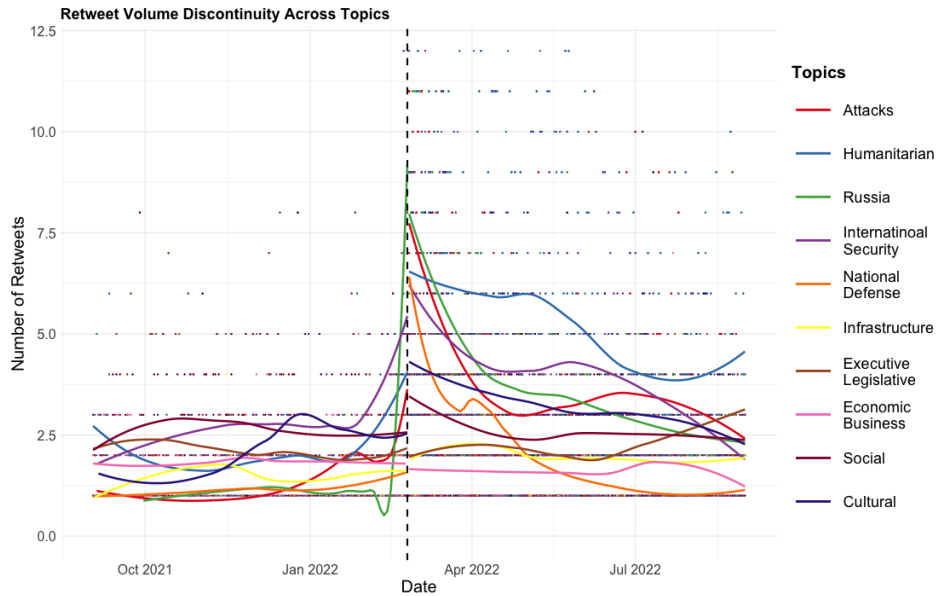Figure 3: Retweet Volume Discontinuities Across Topics

Figure 4 turns to how both the topics and sentiment (i.e. positive or negative messages) of Ukrainian government tweets impact the extent to which they amplify across different international communities. We emphasize five communities that center around: mass media/international news, Ukrainian and East European news, EU and UN-related accounts, European states and NATO, and official Canadian and US government accounts. For comparison's sake we also include the Twitter community that encompasses Ukrainian government accounts themselves to see if different characteristics impact the success of messaging across domestic Ukrainian and foreign audiences.

Figure 4: The Impact of Topic and Sentiment in Message Amplification Across International Communities
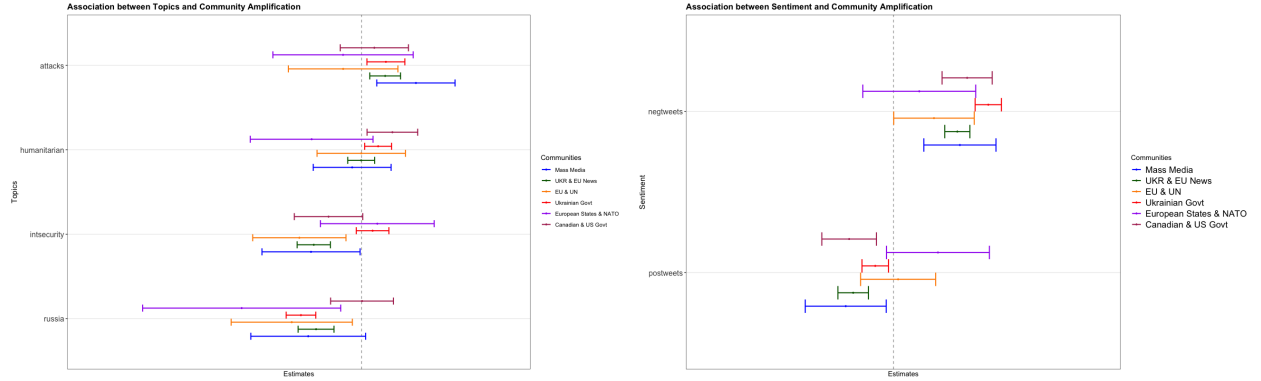
The figure plots the estimated impact of the topic (left-hand side) and sentiment (right-hand side) of tweets on the extent they are retweeted across each distinct audience. Anytime confidence intervals cross the dotted line at zero, we infer that the topic or sentiment has no statistically significant impact on the extent a message spreads across that network. Results on the left-hand panel suggest that government tweets about Russian attacks are particularly viral across both mass media and the news community that specializes on Ukraine and Eastern Europe. The Ukrainian community is similarly responsive to such posts, but *not* foreign governments. On the other hand, the US and Canadian government-centered communities are particularly responsive to posts about humanitarian crises and human rights abuses; such messaging has no impact on other international communities. Turning to posts about Russia and international security, both generally repress the extent to which different international communities amplify Ukrainian government messages.

Turning to the right-hand panel, the results generally show that negative messaging works with international audiences. With the exception of the social media community centered around European governments and NATO, key foreign audiences are more likely to amplify negative Ukrainian government posts and less likely to retweet tweets with positive sentiment.

4   Conclusion

Our research provides three unique contributions. First, we analyze hundreds of thousands of individual-level tweets and re-tweets as granular indicators of government efforts to curry support for its war effort. Second, we use millions of tweets about the war to extract information about which foreign communities, i.e. media, governmental and humanitarian social media networks, are steady consumers of Ukrainian government tweets. Third and finally, we bring the latest natural language processing (NLP) tools to the classification of the topics and sentiment of each tweet. By combining that information with the incidence of retweeting across different foreign social media communities, we learn how the substance of messaging impacts its success with different kinds of international audiences.

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Appendix

Table 3: Consolidated Topics

Topic Grouping 1 - Attacks		**Topic Grouping 2 - Humanitarian & Human Rights**	
18	Missiles/Kharkiv/Russian	0	Enemy/War/Crime/Day
30	Kyiv/Region/Killed	10	Crimean/Tatars
37	Drones/Iranian/Kamikaze	15	Grain/Food/Tons/Million
40	Kyiv/Missile/Explosions/Hit	22	Humanitarian/Aid/Corridors
		25	Children/Killed/Ukrainian
		28	Women/Gender/Violence
		38	Crimes/War

Topic Grouping 3 - Russia and Putin		**Topic Grouping 4 - International Security**	
13	Russia/Putin/Putin's	3	European/EU/Integration/Candidate
16	Russian/Invasion/Ukraine	11	Sanctions/Russian/Oil
		21	NATO/Ukraine/Membership
		26	No Fly Zone Over Ukraine/Americans/Support
		43	Genocide/Sky/Stop/Members/Plead/Protect
		45	Poland/Warsaw/Andrzejduda

Topic Grouping 5 - National Defense		**Topic Grouping 6 - Infrastructure**	
23	Information/Security/Operational	6	Infrastructure/Ukraine/Ministry
35	Security/Organization/Security Work	12	Infrastructure/Minister/Andrey

Topic Grouping 7 - Executive, Legislative & Judicial Issues		**Topic Grouping 8 - Economic & Business Issues**	
4	Nazk/Anticorruption/Declaration	7	Privatization/Auction/Start/Price
5	Supreme/Council/Parliament	17	Budget/Billion/State/Minfin
8	Zelensky/President/Ukrainian	24	Exports/Goods/Cubies
19	Draft/Act/Law	27	Energy/Efficiency/Zubkogennadiy
34	MIP/Minister/Information Policy	31	Free Trade/Agrarian/Agricultural
41	Green/President/Volodymir	33	Fighting/Combating/Corruption
48	Reform/Reforms We Need/Government	39	Finance/Minister/Budget
49	Courts/Judicial/Anticorruption	46	Digital/Transformation/Ministry

Topic Grouping 9 - Social Issues		**Topic Grouping 10 - Cultural Issues**	
1	Education/Medical/Health/School	2	See/Welcome
14	COVID/Vaccinated/People/Cases	9	Christmas/Day/Christ
20	Children/Disabilities/Rehabilitation	32	Museum/Exhibition
29	Education/Science/Ukraine/Students	36	Memory/Maxshcherbyna/Respect
42	Pension/Reform/Pensioners	44	Video/Youtube/Like
		47	Good/Day/Morning

Table 4: Examples of Tweets within Different Topic Groups

Account holder	Position	Original Tweets
Attacks		
Inna Sovsun	MP	#Kyiv was bombed with Iranian drones this morning. At least 4 major explosions. I hope #Iran will be sanctioned for that!
Roman Hryshchuk	MP	Powerful shelling of Kharkiv: 10 people injured, three of them children. Russians hit private houses, a children's art house, a school, and a sports infrastructure facility were damaged. A kindergarten in the central part of the city is on fire.
Oleksiy Goncharenko	MP	#Russia has just fired missiles at a hotel in the central park of #Zaporizhzhia! People under the rubble! The Russians also fired at the TV tower and the electrical substation! Part of the district is without light. A total of 9 rockets were launched! #RussiaisATerroistState
Humanitarian and Human Rights		
Oleksandr Merezhko	MP	In the future International Tribunal on crimes committed against Ukraine Putin and his accomplices will face the charges for such crimes as: 1) crimes against peace (planning and starting war); 2) crime of aggression; 3) war crimes; 4) crimes against humanity.
Mykhailo Fedorov	Minister of Digital Transformation	During 15 days of war, Russian occupants killed 71 children in Ukraine! @Globecast isn't it enough to stop the broadcast of bloody Russian TV propaganda?
Eduard Proshchuk	MP	Russian troops ruthlessly kill Ukrainian children #stopputin #stopwar #stoprussia #BuchaMassacre #NATOCloseTheSky #PutinLies @POTU @jensstoltenberg @OlafScholz @EmmanuelMacron @BorisJohnson
Russia and Putin		
Mykola Kniazhytskyi	MP	Putin's statements today are a bid for leadership in an anti-Western world. But #Putin was wrong. He clearly does not understand that even third world countries do not want to deal with a country that threatens everyone with a #nuclear bat. #RussiaIsLosing #Ukraine
Lesia Vasylenko	MP	The sooner #Putin is stopped, the sooner the world can move on to better things. Putin's greed will only grow. As his resolve to solve the Ukrainian question. This only means that @NATO countries will have to keep increasing their defence budgets too
Dmytro Natalukha	MP	And if we sincerely want russia to change - it has to change not just from the top, but from the bottom as well. People, nurtured with propaganda, lies and hatred will not change their attitudes voluntarily, especially - if they feel untouchable, as sanctions don't affect them
International Security		
Ivanna Klympush	MP	Those talking about lift of #sanctions, have to remember #RU continues to send its weaponry to independent #European state.
Denys Shmyhal	Prime Minister	EU adopted 8th sanction package against rf. Another step to affect the aggressor's economy. Grateful to EU for solidarity with UK. We expect continued pressure, including a full energy embargo & disconnection of all banks from SWIFT. This is the only way to stop the war.
Alona Shkrum	MP	President Macron has supported #unrussiaUN and demanded that #UN Security Council should limit the right of veto "in case of mass war crimes". Merci pour votre soutien et position forte!
National Defense		
Pavlo Sushko	MP	Had a next meeting in the Verkhovna Rada. We voted also on: increased spending on national security and defense; to receive Ukrainian citizenship one has to know basics of the Constitution of Ukraine and the history of Ukraine.
Official channel	Ministry of Foreign Affairs	This time our shared victory should be followed by the establishment of a revised security system that will truly ensure that the war, occupation and aggression will really never happen again. The grounds for this new secure world have already been laid down now.
Andriy Yermak	Head of the Office of the President of Ukraine	Together with @AndersFoghR, we held the second meeting of the working group on security guarantees for UK. Discussed a draft plan of recommendations for future security guarantees for UK. The Group believes that @NATO and the Article 5 remain the gold standard of guarantees.

Account holder	Position	Original Tweets
		Infrastructure
Pavlo Sushko	MP	We are working with architects, the Ministry of Infrastructure and local authorities on the problems brought by the war. IDPs, destroyed cities, queues for apartments, housing for the military. We will do everything possible to resolve these issues as soon as possible.
Yulia Klymenko	MP	Today Rada Transport & Infrastructure Committee has supported draft law 1061 on implementation of road safety audit based on EU directive 2008/96/EC. Hope our roads will be safer.
Kira Rudik	MP	#Taiwan will help to rebuild the civil infrastructure of five Ukrainian cities. For this purpose $6 million will be sent to #Kharkiv,#Chernihiv, #Mykolaiv, #Sumy and #Zaporizhzhya. Thank you! It is necessary to begin cleaning up the traces of the war already now.
		Executive, Legislative, and Judicial Issues
Volodymyr Zelenskyy	President	IT solutions can be an effective step towards eliminating abuse and ensuring court transparency. Similar to public services in a smartphone, we seek to create a court in a smartphone. Jury trial is also among the effective tools.
Olga Stefanishyna	Deputy PM for European & Euro-Atlantic Integration	Ukraine continues anti-corruption reforms to build transparent, strong, and trustworthy state institutions. Despite the complexity of the task and growing resistance inside the system, it is the only way to ensure a truly democratic and resilient society.
Andrii Osadchuk	MP	#Verkhovna_rada adopted 14 laws to #StopRussianAgression. They include legislation on mobilization, armed forces, liability for looting, cancelling limitations on using weapons by civilians against Russian forces, seizure of assets in Ukraine owned by #Russia
		Economic and Business Issues
Serhiy Lyovochkin	MP	Draft #budget for 2019 is anti-social. The Gov continues its 2014-2018 policies of lowering social standards, under-financing education, #healthcare and utilities' subsidies, which has already put millions of #Ukrainians below the poverty line
Valentyn Nalyvaichenko	MP	Mogherini today in Kyiv repeated my statement from July; Ukraine needs only one reform: Against corruption.
Official channel	Cabinet of Ministers	Government transfers a record number of 431 state-run enterprises and 4 large objects for privatization
		Social Issues
Official channel	Ministry of Health of Ukraine	During quarantine period due to the #COVID19 outbreak, each of us can potentially become infected. So every time you leave the house, remember - you are endangering yourself and other people. The MOH advises to self-isolate and leave home only in case of urgent need.#StayAtHome
Rustem Umerov	Chair of the State Property Fund of Ukraine	The #EU allocated an additional €16 mln to support #Ukraine. The funds will be used to equip safe education spaces for learning. Part of the money will be used to help victims of violence.
Official Channel	Ministry of Education and Science of Ukraine	Foreign students to be admitted to Ukraine's higher educational institutions remotely this year. This means admission of foreign students to Ukraine's higher educational institutions would not be cancelled this year even despite the full-scale war.
		Cultural Issues
Volodymyr Ariev	MP	It's always a perfect sign to find a rainbow. Happy Eastern and pray God for peace and prosperity.
Tkachenko Oleksandr	Minister of Culture and Information Policy	Today on Kyiv Day visited museums in our city with my son. Cultural life flourishes even during the war. Ukrainian children now are interested in weapons more than lego they grow fast as grow strength of our country #kyivculturelife
Solomiia Bobrovska	MP	Merry Christmas! At Christmas, heaven opens and God brings magic into our hearts and teaches us how to love. Spread sparks of love around you, and it will be the best gift for the Son of God. For all welcoming the Star in the sky - Christ is born! #Christmas #love

Figure 5: Retweet Frequency of Topics by Various Communities
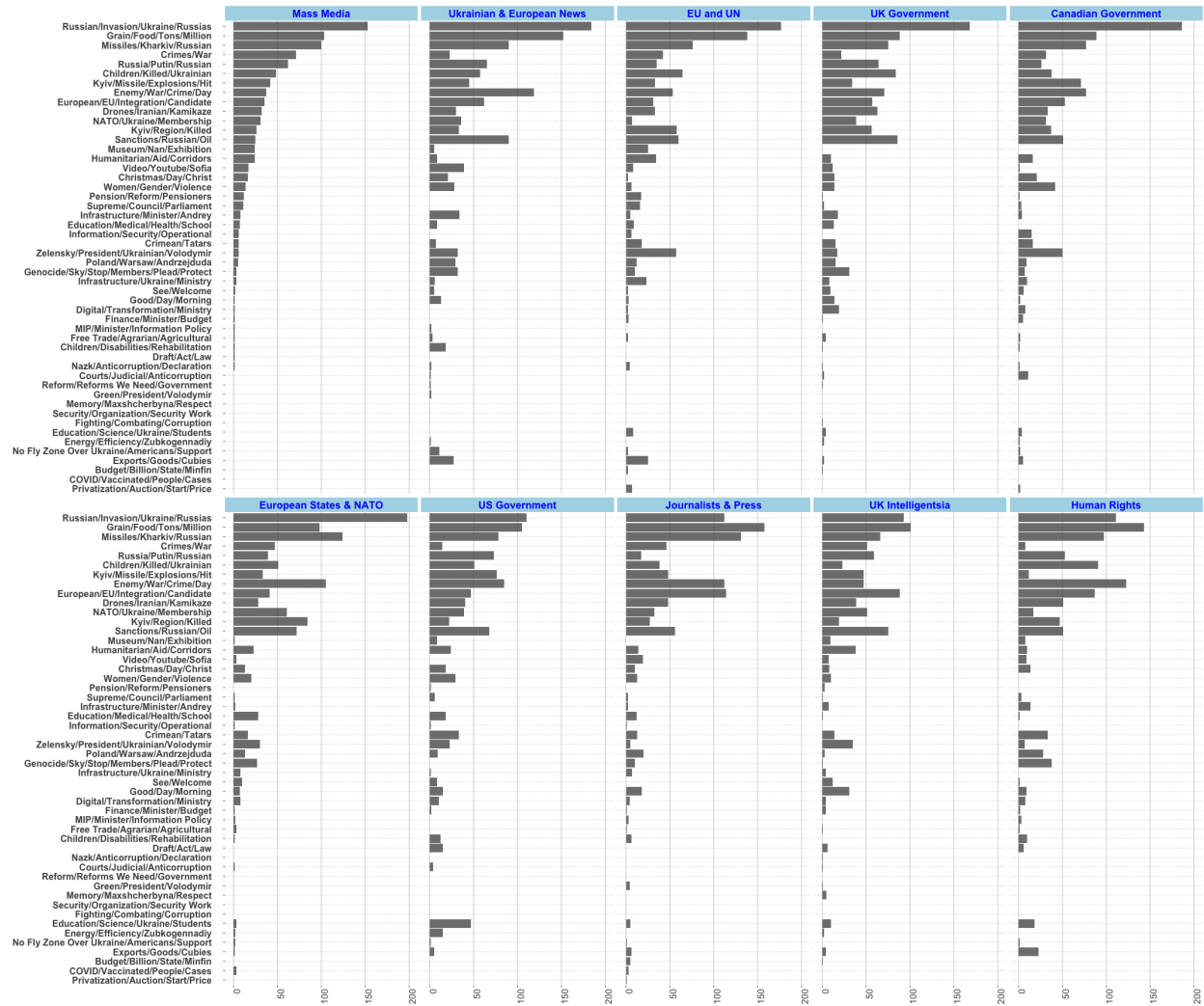
Total retweet count by communities per topic

13