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#Asylum:

How Syrian Refugees Engage with Online Information*

Alexandra A. Siegel† Jessica Wolff‡ Jeremy Weinstein§

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Abstract

Despite an emergent body of literature examining refugees' use of online tools to access information, little is known about what types of information refugees encounter or engage with. Analyzing 143,201 posts and 802,173 comments on public Arabic-language Facebook pages targeting Syrian refugees from 2013 to 2018, we systematically describe one of Syrian refugees' most popular online information ecosystems. Additionally, we use engagement and comment data to develop organic measures of refugees' interactions with different information sources. We find that posts linking to official sources of information garnered more engagement than those containing unofficial information or news media content, regardless of the topic or tone of the message. Disaggregating our data over time reveals that official sources did not receive higher levels of engagement until early 2016, when new official sources created by governments and NGOs became active online and began to more consistently provide information about salient topics from asylum to sea travel. These new official sources also produced more encouraging messages relative to older official sources, perhaps heightening their appeal. By analyzing the online prevalence, content, and popularity of diverse information sources, this work contributes to our understanding of how vulnerable populations access information in the digital age, while offering policy insights to governments and NGOs seeking to disseminate information to refugees.

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Introduction

The Syrian conflict has created one of the worst humanitarian crises in modern history, with more than 12 million people killed or forced to flee.[1] As refugees embark on their journeys and adjust to life in their new host societies they face high levels of uncertainty and anxiety (Carlson, Jakli and Linos 2017). Access to reliable information about modes of travel, asylum application processes, and eligibility for education, employment or other services can make or break refugees' chances at survival. Upon their arrival, information access also becomes a key determinant of social integration and inclusion (Lloyd et al. 2013; Caidi and Allard 2005).

How do refugees assess information in the digital age? While refugees were once almost exclusively dependent on word of mouth, social ties, mainstream media, and official communications from governments and humanitarian organizations, rising internet and mobile phone penetration has transformed information access. Research from diverse contexts suggests that smartphones have played a key role in helping refugees find safe travel routes and avoid imminent threats in their host countries (Harney 2013; Dekker and Engbersen 2014). Moreover, survey research indicates that many Syrian refugees rank smartphones as more important than food, shelter, or access to other critical services (Gillespie, Osseiran and Cheesman 2018). Social media platforms have been a particularly vital source of information, with Facebook emerging as the most widely used source for Syrian refugees (Dekker et al. 2018).

UN agencies and humanitarian organizations have devoted substantial resources to providing official sources of online information for refugees, primarily to combat online misinformation and rumors (Camacho, Herrera and Barrios 2019). Joining many longstanding sources of online information for refugees, including the UNHCR, Amnesty International, and government migration agencies, new sources proliferated in 2015 and 2016 as organizations worked to meet refugees' demand for timely and accurate information. For example, in 2015, Mercy Corps—in partnership with the International Rescue Committee, and supported by Cisco, Google, Microsoft and Trip Advisor—developed Refugee.Info, a multilingual informational website for refugees in Europe. The Refugee.Info program, now a global initiative called Signpost, has been expanded to offer information through four channels, including the website, a mobile app, a blog and social media.

[1] https://reliefweb.int/report/syrian-arab-republic/

As Mercy Corps describes, "because a lack of access to trustworthy, accurate information can make people more vulnerable to violence or exploitation, programs like Signpost provide timely, credible information about rights, laws and the availability of services to help crisis-affected people regain the power to make safe, informed choices for themselves and their families."[2] Similarly, in 2016 the EU financed InfoMigrants, a website available in five languages designed to "reach migrants to counter misinformation at every point of their journey: in their country of origin, along the route, or in the places where they hope to start a new life."[3] Individual governments have also developed similar initiatives, such as a website created by the German foreign office in 2017, "Rumors about Germany: Facts for migrants," which was designed to "debunk myths on the internet about life in Germany [that] give the wrong impression to potential refugees and migrants."[4]

Despite these costly efforts devoted to providing Syrian refugees with credible information online, little is known about what types of information refugees have access to or engage with. While an emergent body of literature has examined refugees' use of online tools to access information,[5] these studies typically rely on survey questions about the *platforms* used by refugees, rather than the particular online sources they engage with. Moving beyond the self-reported use of online platforms, here we analyze the content of 143,201 posts and 802,173 comments on public Arabic-language Facebook pages targeting Syrian refugees from 2013 to 2018. This enables us to systematically describe one of Syrian refugees' most popular online information ecosystems. Additionally, we use publicly available engagement and comment data to develop organic measures of refugees' information seeking behavior.[6]

We find that posts linking to official sources of information garnered more engagement than those containing unofficial information regardless of the topic or tone of the message. This finding persists across diverse issue areas—such as information regarding refugees' journeys, legal status, and access to services—as well as when examining differences between posts that pro-

[2]https://www.mercycorps.org/blog/technology-refugee-crisis

[3]https://www.infomigrants.net/en/about

[4]https://rumoursaboutgermany.info/

[5]See, for example, (Wall, Campbell and Janbek 2019; Lloyd et al. 2013; Carlson, Jakli and Linos 2017, 2018; Caidi and Allard 2005; Wall, Otis Campbell and Janbek 2017; Gillespie, Osseiran and Cheesman 2018).

[6]As we note in our discussion of limitations in the conclusion, because of ethical constraints and limited data availability, we can only evaluate information production and engagement on public Facebook pages.

vide encouraging or discouraging information regarding opportunities to travel to or settle in a particular host country. However, when we analyze variation in this engagement over time, we see that official sources of information did not become popular until 2016, at which point they surpassed the engagement levels of unofficial sources. This coincided with the introduction of new official information sources, which provided more information than longstanding official sources on key topics—from sea travel and asylum to employment opportunities and healthcare—such as popular official websites like RefugeeInfo, launched by Mercy Corps.[7] In addition to providing new information about key topics, these new sources also provided more encouraging messages—messages that encourage or demonstrate the possibility for refugees to travel, apply for asylum, access services, or remain in a particular country—relative to those produced by older official sources or unofficial sources.

By systematically tracking the prevalence and popularity of official and unofficial information on public Facebook pages targeting Syrian refugees, this work contributes to our understanding of how vulnerable populations access information in the digital age. Our analysis also offers policy insights as governments and NGOs seek to disseminate accurate and timely information to refugees.

Theoretical Motivation

Refugees often face "information precarity"—insecure, unstable and undependable access to information, which threatens their wellbeing (Wall, Otis Campbell and Janbek 2017; Wall, Campbell and Janbek 2019). Such precarity is heightened during crisis periods, when governments and NGOs are overwhelmed and rapid policy changes fuel rumors and disinformation (Carlson, Jakli and Linos 2018). While the proliferation of smartphones has increased refugees' access to diverse sources of information (Gillespie, Osseiran and Cheesman 2018), little is known about the types of information refugees have access to or choose to engage with.

A growing body of social science literature has explored refugees' use of smartphones and social media to access information during their journeys and upon arrival in their host countries.[8]

[7] https://www.refugee.info/selectors

[8] See, for example, (Wall, Campbell and Janbek 2019; Lloyd et al. 2013; Carlson, Jakli and Linos 2017, 2018; Caidi and Allard 2005; Wall, Otis Campbell and Janbek 2017; Gillespie, Osseiran and Cheesman 2018)

Research from the Syrian context suggests that refugees use social media platforms—particularly Facebook and Whatsapp—to form "migration networks" to access information from governments, NGOs, and previous refugees' experiences (Dekker et al. 2018). Social media expands refugees' networks beyond their offline acquaintances, diversifying and amplifying information about migration routes, asylum opportunities, access to services, and other topics (Dekker and Engbersen 2014). Because information on social media is often publicly accessible it reaches broad audiences in real time. In fact, recent research suggests that Syrian refugees have become less reliant on their family members or friends for information about migration opportunities because of ubiquitous access to online information (Holland and Peters 2020).

While interviews and survey evidence suggest that Syrian refugees rely heavily on social media to access information, disinformation and misinformation have proliferated and refugees are often aware of the uncertain nature of online information (Dekker et al. 2018). Refugees often rely on rumors to make migration decisions in the absence of other more trustworthy information (Carling et al. 2015), making the ability to validate online information particularly crucial (Hagen-Zanker and Mallett 2016).

What sources of information do refugees engage with on social media? Refugees typically prefer information "from sources that can demonstrate concretely that they are working in their best interest to help them move onward to their intended destination" (Carlson, Jakli and Linos 2017). But discerning the motives of information providers is not a straight forward task. Moreover, refugees' preferred sources do not always have access to or provide timely information that refugees need to make important decisions.

As events on the ground shift rapidly during humanitarian crises, official sources—such as governments or NGOs—may lack up-to-date or complete information. While such gaps are often unintentional, official organizations may also restrict information to discourage smuggling or limit asylum applications (Carlson, Jakli and Linos 2017). Explicitly xenophobic governments may also intentionally spread misinformation through official sources to garner political support and deter refugee flows (Ivarsflaten 2005). Moreover, refugees may perceive official organizations as unfairly prioritizing certain ethnic groups or limiting their autonomy (Young 2016). Such negative experiences with official information sources can lead refugees to be skeptical and to

feel as though such organizations are not acting in their best interest. These perceptions are heightened under conditions of high uncertainty and anxiety and can lead refugees to turn to friends, family members, and other unofficial information sources, which they may perceive as more credible (Carlson, Jakli and Linos 2017).

The incentives of unofficial providers of information are more difficult to discern. Such sources range from content produced by refugees themselves helping one another by describing their experiences and answering migration related questions to posts from smugglers encouraging refugees to travel in order to drum up business (Ruokolainen and Widén 2020). The incentives of these unofficial sources of information vary from those that are genuinely interested in providing timely accurate information to those that may distort information for personal gain and those that inadvertently spread inaccurate information. Such unofficial information might give refugees false hope or unrealistic expectations in order to encourage them to travel. As a result, refugees may be exposed to inaccurate or incomplete information from both official and unofficial sources, making it difficult to evaluate their trustworthiness.

Existing evidence on the sources that Syrian refugees find credible (on or offline) is mixed. On the one hand, interviews of Syrian refugees in Greece suggests that they are generally quite distrustful of official sources (Carlson, Jakli and Linos 2018). By contrast, survey evidence evidence from the Netherlands suggests that Syrian refugees primarily rely on official sources and trusted family members or friends, leading the authors to optimistically conclude that "the use of smartphones and social media information makes asylum migrants less dependent on smugglers and network ties in Western Europe" (Dekker et al. 2018). Because existing work relies on small-scale interviews or survey data, and we lack comparative evidence from refugees in different host countries, we know very little about the sources of information that Syrian refugees encounter online, or how content of and engagement with official and unofficial sources may differ.

Data and Measurement

To examine how Syrian refugees engage with different sources of online information, we use a large scale dataset of public posts and comments from Arabic-language Facebook pages targeting Syrian refugees to evaluate the content and popularity of posts linking to official and unofficial

sources of information. In particular, we explore how content differs across official and unofficial sources, as well as which types of content receive the most engagement.

Facebook is the most widely used social media platform by Syrians, with 97% of social media users citing Facebook as their preferred social media platform as of 2017 (Ramadan 2017*a*). While public Facebook pages are only one component of the Facebook information ecosystem, they are commonly followed by Syrian Facebook users, are widely used by governments, NGOs, international organizations, and everyday citizens to disseminate information, and are easily searchable (Ramadan 2017*b*; del Mar Gálvez-Rodríguez, Haro-de Rosario and del Carmen Caba-Pérez 2019).

Conducting searches for both private and public Facebook groups and pages, we determined that public pages constitute 52% of the groups and pages that meet our search criteria.[9] While private groups and friend to friend communications are undoubtedly an important component of Facebook's information ecosystem, it is not possible for researchers to collect this data without gaining membership into private groups or "friending" particular individuals on Facebook. Accessing private communications in this way poses serious ethical concerns—particularly when examining data from marginalized or vulnerable populations. By contrast, by collecting page data, we only access public content, which contains no identifying information from individual Facebook users. While only one cross-section of the Facebook information ecosystem, our aggregate-level analysis of data from public pages provides behavioral measures of how Syrian refugees engage with information online, while protecting individual privacy. Beyond the ethics of user privacy, it is not possible to access data from private groups without severely violating Facebook's terms of service by gaining permission to join a private group and then scraping data.

Facebook Data

To identify popular public Arabic language Facebook pages argeting Syrian refugees, we first conducted a manual search using Facebook's advanced search tool for all public Facebook pages

[9]Specifically we used the same advanced search criteria described below to search for both public and private groups and pages. We found 305 private groups and 331 public groups that met our criteria. Many private groups are searchable despite the fact that only members can view their content. We are unable to determine the number of Facebook groups that might be hidden in addition to being private. These groups would not be returned in a search by non-members. While hidden groups may be important sources of information, they are unlikely to contain viral content as they are not findable or joinable by Facebook users that are not directly invited to join them.

containing the Arabic language terms "syrian" (سوري or شامي), "refugee" (لاجئ), "migrant" (مهاجر), "migration" (هجرة), and "asylum" (لجوء), including grammatical variations.[10]

We then collected ids for all pages identified with our keyword search that appeared to target Syrian refugees. This meant excluding pages that exclusively targeted non-Syrian refugees (such as those designed for Iraqi or Palestinian refugees) as well as pages targeting non-displaced Syrians (such as pages for Syrian university students or community pages for Syrian towns), as well as charity organizations raising funds for Syrian refugees. We also excluded any pages that contained fewer than 1000 likes or followers to focus our data collection on more popular content.

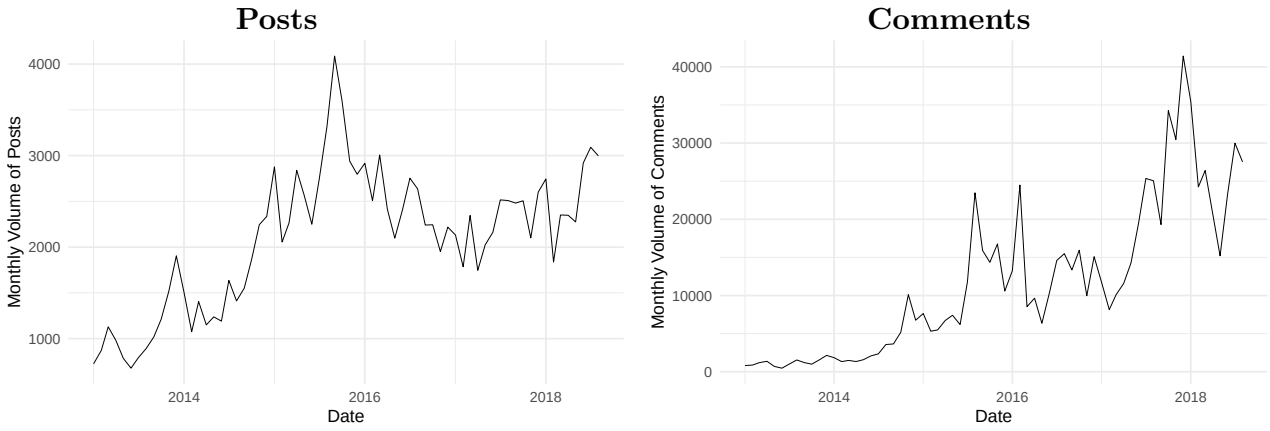
After identifying all public pages that met this criteria, we used the Netvizz application (Rieder 2013) to extract posts, comments, and metadata from each group or page dating back to January 2013. Before Facebook changed its API access in late 2018, Netvizz offered researchers the ability to extract basic data from public Facebook pages, such as the content and frequency of posts, likes, shares and comments without collecting any user metadata or identifying information.[11] Netvizz also enabled us to extract network data from public Facebook pages, allowing us to observe connections based on "likes" between pages. We used this network data to add relevant pages that were either directly or indirectly[12] connected to our initial list of pages but did not contain any of the aforementioned keywords. This helped us to ensure that our keyword-based approach to page identification was not leading us to miss similar pages targeting Syrian refugees. We then collected posts, comments, and metadata from the additional pages collected using this network-based approach. This yielded a dataset of 143,201 posts and 802,173 comments from 331 public Facebook pages targeting Syrian refugees produced between January 2013 and September 2018. The volume of posts and comments over time from these pages is displayed in Figure 1. We can see that activity grew on these pages over time, with the total volume of posts peaking in 2015. The bottom plot presents the annual number of Syrian refugees according to UNHCR data, highlighting the steady growth in the Syrian refugee population over the period under study from 2013 to 2018.

[10]We stemmed these terms so that they would capture plurals, definite articles, and masculine and feminine conjugations

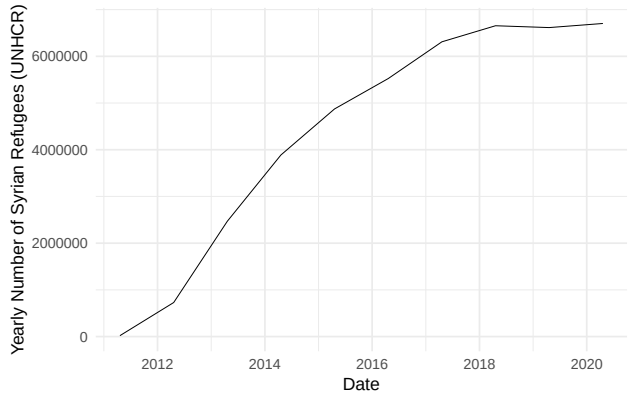
[11]In contrast to the Crowdtangle API, which has become an increasingly popular method for extracting public Facebook data, Netvizz enabled researchers to collect comments and network data in addition to post data.

[12]By "indirectly connected" we mean connected through multiple hops, for example a page liked by one of the pages that a page in our initial dataset had liked.

Figure 1: Monthly Volume of Posts and Comments



Annual Number of Syrian Refugees (UNHCR Data)



The majority of the public Facebook pages that we identified are "community pages," or pages targeting specific communities of Syrian refugees. These include pages such as "Syrian refugees in Germany" or "Syrian refugees in Istanbul." Many of these pages are "asylum pages," or pages dedicated to providing information to Syrian refugees about asylum. They include pages such as "asylum in Canada and Canadian nationality for Syrians " or "Path to asylum in Germany." A third popular category of pages updates Syrian refugees on relevant local events. This includes pages such as "Zaatari news page," offering news from Zaatari refugee camp in Jordan, or "Syrian refugee news in Greece." Smaller categories include pages providing information to Syrians on smuggling services such as "travel from Syria to Turkey smuggling" or "smuggling to Europe and Canada," as well as pages run by official organizations such as the UNHCR (the UN's refugee

agency) pages and "Refugee Info," an information platform run by the International Rescue Committee (IRC) and Mercy Corps.

As these examples indicate, many of the public Syrian refugee Facebook pages target refugees in particular host countries. The most common countries and regions referenced in the titles of our public pages are displayed below in Table 1. Most of the pages are targeted toward refugees in the MENA region or Europe. While the number of pages for each host country or region generally correlates with the number of refugees that have settled in each destination, the discrepancies displayed in the table below may indicate outsize interest in settling in Europe and Canada and less interest in settling in Lebanon relative to the number of refugees hosted.

Table 1: Top Host Countries and Regions in Public Syrian Refugee Facebook Pages

Host Country	Number of Pages	Number of Refugees (UNHCR)
Jordan	42	660,646
Germany	38	560,000
Turkey	32	3,411,029
Europe	28	1,100,000
Canada	14	44,620
Lebanon	14	805,326
Egypt	12	145,157
Sweden	11	115,000
West	10	
Greece	9	50,000
Netherlands	9	126,300

Measurement

Using data from these public Facebook pages targeting Syrian refugees, we examine differences in the content and tone of posts that link to official and unofficial sources of information, as well as differences in the levels of engagement they receive.

Sources of Information

What types of information are shared across these public pages? To assess differences in content, tone, and engagement between official and unofficial sources of information, we first classify the sources of information that are frequently linked to in posts across our 331 public Facebook pages. We first classify all URL domains that are engaged with at least 500 times in

our dataset of public pages.[13] A full list of these domains can be found in Table A1. We identify three categories of sources in our data: official sources, unofficial sources, and news outlets. We define official sources as content produced by governments, NGOs, or international organizations. For example, we would consider a Facebook post on any of our public pages that linked to the UNHCR's website or Facebook page to contain an official source of information. Unofficial sources include websites or content from Facebook pages that are devoted to migration information but have no known affiliation. These include websites such as "Voices of Sweden," a migration resource with no known ties to any official organizations, or content from its public Facebook page. We consider posts on any of our public pages that link to these unofficial sources to contain unofficial sources of information. News sources include websites or content from Facebook pages affiliated with news outlets that employ professional journalists. For example, posts linking to a story from Al-Jazeera's website or Facebook page would be categorized as containing news information. It is important to note that different sources of information are posted across all types Facebook pages in our data. For example, official information from the UNHCR's website or Facebook page might be posted on a community Facebook page run by Syrian refugees. Similarly, a news article may be posted on a page belonging to an official organization like Refugee.Info. Through categorizing sources of information posted across our Facebook pages, we can measure the degree to which official, unofficial, and news content is posted and engaged with across the diverse set of public Facebook pages in Syrian refugees' online ecosystem.

Topic Salience

To identify topics in our data, we use a word2vec model (Mikolov et al. 2013) trained on the entire corpus of posts in our dataset.[14] Word2vec models produce word-embeddings built on shallow neural networks, which rely on the collocation of words in texts to create vectors of terms that represent each word. They have been shown to capture complex concepts from analogies to changing cultural meanings and stereotypes associated with race, ethnicity, and gender (Rodman 2020). In particular, we begin with a set of Arabic seed words that we identify as being relevant

[13]While 500 is an arbitrary cutoff, it is designed to capture commonly shared URLs in our data. To identify domains of information shared on public Facebook pages, we used the *longurl* R package to expand the urls included in the Facebook post metadata.

[14]We chose to train our word2vec model on the entire corpus of posts in our dataset—rather than using common pretrained embeddings—because there is a great deal of language specific to Arabic language Facebook posts including hashtags, dialect-specific terms, and online slang that we wanted to be sure to capture in our dictionary-based approach.

to the concept of interest (e.g. لجوء for asylum). We then used word embeddings to identify other words that are semantically related to our seed words in the data. Semantic similarity here is based on these words appearing in similar contexts, and can be computed using cosine similarity on the word embedding space (Gurciullo and Mikhaylov 2017). These dictionaries are then limited to the 100 most similar words and we remove overly general or irrelevant terms.[15] We measure salience of topics as the proportion of posts and comments containing dictionary terms associated with particular topics. Here we focus on topics relevant to refugees' journeys (land and sea travel), their status (asylum, refugee camps) and access to services (education, employment, healthcare).

Encouraging vs. Discouraging Tone

In addition to classifying posts according to the topics they mention, we also develop a measure of tone to assess whether posts are broadly encouraging or discouraging refugees to travel to or settle in a particular host country. We define encouraging posts as those that encourage refugees to travel, including those that give travel advice, offer travel services, or emphasize that it is possible to travel somewhere. These also include posts that encourage refugees to apply for asylum in a particular country, describe the benefits of living in a particular country, how to remain in a particular country or access services there. By contrast, discouraging posts are those that discourage refugees from travel including discussing obstacles to traveling to the destination country, or describing the challenges or risks for Syrian refugees living in the destination country. They also include posts describing barriers to accessing services in a given country or dangers refugees may face there as well as posts suggesting that refugees should return to their origin countries.

To classify posts as encouraging or discouraging, we draw on a recent innovation Khodak et al. (2018), and implemented and extended by Rodriguez, Spirling and Stewart (2020), known as an "à la Carte on Text"(ALC). This method provides a computationally efficient way to identify semantic change over time or other covariates.[16] In our application, we train an embedding layer

[15]While this threshold of 100 words is somewhat arbitrary, going further down the list yielded almost entirely irrelevant words across topics.

[16]The technique can similarly be used to examine changes over other ordered document-level covariates (e.g., political leaning).

across all posts in our dataset. For this, we use the `GloVe` algorithm and the R packages `quanteda` (Benoit et al. 2018) and `text2vec` (Röder, Both and Hinneburg 2015).[17]

Unlike word frequency or topic modelling approaches, which use a bag of words as their foundation, word-embedding techniques retain the context and order of the text. One advantage of this is that embedding layers retain information on the semantic associations between words, meaning we can use matrix arithmetic to perform analogy tasks or derive axis (vector) representations of concepts of interest. Kozlowski, Taddy and Evans (2019), for example, calculate an "affluence dimension" in their books corpus by subtracting the vector for the word "poor" from the vector for the word "rich," "poverty" from "affluence," and "worthless" from "priceless" before summing these together. Rozado and al Gharbi (2021) use this technique to derive an axis of "economic development" in their news corpus, and Barrie et al. (2023) use a similar approach to measure criticality of the regime in Egyptian and Tunisian state media. We can then project a target word of interest onto these dimensions in order to determine any temporal change (or other document- or covariate-level unit) in the relationship between words (or concepts) in vector space.

To understand how migration is discussed across official and unofficial news sources and over time, we calculate an encouraging-discouraging dimension. To create a vector to capture the concepts of "discouraging" and "encouraging", as well as a vector for our target concept of "migration", we went through an iterative process to identify relevant terms and avoid bias. First, we used word embeddings to identify relevant seed words. Specifically, we used embeddings trained on a separate dataset of Arabic-langauge tweets to avoid introducing biases in the dictionary construction phase. Beginning with a topical seed word to capture a concept of interest such as migration, we used nearest neighbors label propagation to assign a topical relevance score to all words in the Twitter dataset as a function of their similarity to the Arabic seed word migration (هجرة). We repeated this step for a variety of seed words. We then manually validated words

[17] We set vector dimensionality to length 300, and use a window size of six. The maximum number of iterations for training the embedding layer was set to 100. We pruned the vocabulary over which to train the embedding layer to words that appear at least 200 times across the corpus. This resulted in a term co-occurrence matrix of dimension 614540 X 614540 (i.e., 614540 unique words). We then compute the transformation matrix required for the ALC approach using the R package `conText` developed by Rodriguez, Spirling and Stewart (2020), which is then used to reweight words appearing with high frequency in the corpus.

that had high topical relevance scores for each seed word, to ensure that the seed words included in our measure of discouraging or encouraging were likely to capture the topic of interest. This exercise left us with a list of terms that we used to construct our migration, encouraging and discouraging vectors. The terms used to capture migration were Arabic terms for "migration", " journey", "route", and "asylum." The terms in the encouraging vector were "safety", "help", "support", "obtain", "protect", and "opportunity." The terms used in the discouraging vector were "danger" ,"expel", "threat", "force", "death", and "drowning". We then subtract our vector from the words for discourage from our vector of the words for encourage. This gives us an "axis of encouragement," which we understand as a proxy for the degree to which discussions of migration are encouraging (expressing support or discussing opportunities) or discouraging (expressing pessimism or discussing obstacles or dangers).

We can also observe temporal trends by calculating the cosine similarities between our target words of interest and our encouraging-discouraging vector. To recover the over-time cosine similarities, we first split our observation period into year-month slices, and then get the context words around our target vector "migration", for example for each week. Using the ALC approach we then estimate a time-period-specific embedding for each theme of interest. We do so by taking the average of the vectors of surrounding context words from our pre-trained embedding layer for each of the words making up each theme. We then combine these context words and apply the transformation matrix to downweight commonly appearing words.[18]

To validate our "axis of encouragement" we had two native Arabic speakers manually code 100 randomly selected posts in the top quartile (most encouraging) and 100 randomly coded posts in the bottom quartile (most discouraging). 85% of the encouraging posts were manually coded as encouraging and 83% of the discouraging posts were manually coded as discouraging. Many of the incorrectly classified posts either contained both encouraging and discouraging messages or had a neutral tone. Just 5% of the 200 manually coded posts expressed the opposite sentiment of their coding. This increases our confidence that our relative measure of encouraging and discouraging tone is reasonably accurate—especially for measuring relative changes over time.

Examples of encouraging posts (translated from Arabic) include:

[18]This entire procedure is achieved with the function `get_seq_cos_sim()` in the `conText` R package (Rodriguez, Spirling and Stewart 2020).

- *"Learn about asylum in Turkey and its advantages for Syrians...I visited the Immigration Department of the Turkish Ministry of Interior and met with its Director General, Mr. Atilla Toros...The following points were a summary of his answers. - The Law on Foreigners and International Protection issued by the Turkish Parliament on 4-4-2013, the details of which were approved by the Cabinet's decision on 10-13-2014, to provide temporary protection for everyone who has been displaced from his country and sought refuge in Turkey or the Turkish border due to circumstances that threaten his life and prevent him from returning to his country. It includes his wife and children, and stipulates that the Turkish authorities grant him the right to remain in Turkey until he decides to return to his country without any coercion. - Temporary protection identification card, its holder enjoys the advantages offered by the Turkish government, such as the right to education, health care, granting aid, work permit according to the instructions of the Ministry of Labor, birth registration, marriage confirmation, divorce and death, and the right to stay in Turkey until he returns to his country voluntarily. - The issues of registration and granting cards are going largely to include the registration of about 1.6 million Syrian refugees on Turkish lands and camps and giving them a national number to benefit from the right to education, health care and aid, and there will be no difference between the number that begins with 98 and the number that begins with 99, but it is a temporary matter until all Syrians are registered, and then the two numbers are combined, and the beneficiary is given a permanent protected plastic card for him and his family bearing his picture and personal information and linked to one information center, and the national number is circulated to all state departments to benefit from the services provided. - The Director General of the Immigration Department asked every Syrian refugee to Turkey not to hesitate to register with the security authorities to obtain temporary protection to benefit from the services provided by Turkey to them, and not to pay attention to rumors, and to take information directly from the Immigration Department, which publishes it in nine languages, and it is printed It is available on the Immigration Department's website."*

- *"The Migration Agency is keen to ensure that its staff are present at the reception sites for refugees in order to assist them, give them the necessary information and guide them correctly when they arrive in Sweden. 'We are here to provide the necessary assistance to refugees, to welcome them and to give them the necessary information on how to act correctly when applying for asylum in Sweden,' said Christian Wigren, an employee at the Stockholm Migration Agency. She indicated that the Migration Agency employees are trying to clarify the procedures that asylum seekers must adhere to when submitting asylum applications in Sweden, in addition to providing them with the necessary needs, and securing means of transportation to ensure their arrival to the camps for newly arrived refugees. Fegren indicated that the level of cooperation between representatives of government authorities and organizations is very good, and there are many daily tasks that are carried out through cooperation among them, for example, exchanging information and coordinating efforts. The Migration Agency tries to use staff with multiple skills in languages to facilitate communication with those refugees who need assistance from government authorities. The authority stresses the need for all government agencies currently present at refugee reception stations to continue the efforts made and perform their main task of communicating with asylum-seeking unaccompanied children, noting that the Stockholm Social Services Department can communicate with these children and take care of them."*

- *"What is Norway's procedure? After submitting the asylum application form, the Norwegian*

Migration Agency will summon you. Do not be afraid, the questions that will be asked are the ones that you answered and mentioned in the form you submitted. The more identical and realistic your answers the better an this will go a long way towards determining whether or not your application for asylum in Norway will be accepted. What is the value of the financial aid provided to asylum seekers in Norway ? The asylum seeker is granted financial aid estimated at 270 Norwegian kroner, or an estimated 55 US dollars, with food provided three times a day...The final interview is not different from other interviews, the questions are the same, then the Norwegian Immigration Service will grant the refugee a work permit until it is time to respond to his asylum application, whether he is rejected or accepted, and this period lasts from 8 months to 20 months."

Examples of discouraging posts (translated from Arabic) include:

- *"European Union officials continue seek a UN mandate to obtain full legitimacy to pursue smugglers and human traffickers and destroy their boats. Mogherini announced that the EU would prepare for a military operation in the Mediterranean to combat illegal immigration. The EU foreign and defense ministers in Brussels announced on Monday May 18th that a decision must be made today on launching the operation. They stressed that the most important issue today is to make a political decision on the operation in the Mediterranean to combat criminal groups that engage in human smuggling, so that they can begin practical preparations in the coming weeks."*

- *"Behold, brothers, many young people residing in their countries are deceived by the beautiful pictures in Europe that they see on their friends' Facebook pages and with these beautiful pictures they consider Europe to be the paradise of the world and its pleasure and comfort. After leaving their homelands and risking migrating through the Libyan desert and the Mediterranean Sea to reach the continent of Europe, after all these dangers, those who arrive in peace are surprised by the suffering they face in Europe. Acceptance, that is, to be accepted as a refugee is difficult. And also one of the difficulties is the difficulty of learning the language of the country in which you reside. If you are in France, you learn the French language, and if you reside in Germany, you learn the German language, and if you reside in Britain, you learn English, and so on, any country in Europe has its language and after you learn the language it is necessary to learn a profession to work. And so the suffering continues one after another. People in Europe are not governed by a religion. God O turner of hearts, make our hearts firm on your religion, and may God bless our Prophet, our beloved, our intercessor, our leader and our example, our master Muhammad, may God's prayers and peace be upon him, and upon his family and companions all, and may the peace and blessings of God be upon the Day of Judgment."*

- *Besides the Mediterranean, there are at least three other major sea routes used by migrants and people fleeing conflict or persecution today...Many lose their lives or fall victim to international organized crime on these journeys. UNHCR has received information that 4,272 lives have been lost this year, 3,419 of them in the Mediterranean, making it the deadliest route ever. In Southeast Asia, an estimated 540 people lost their lives trying to cross the Bengal Sea. As for the Red Sea and Gulf of Aden, at least 242 people were reported missing as of December 8, while the number of people killed or missing was 71 as of early December. Meanwhile, smuggling and human trafficking networks are thriving and operate with impunity in areas characterized by instability or conflict, making huge profits from smuggling desperate people.*

Engagement

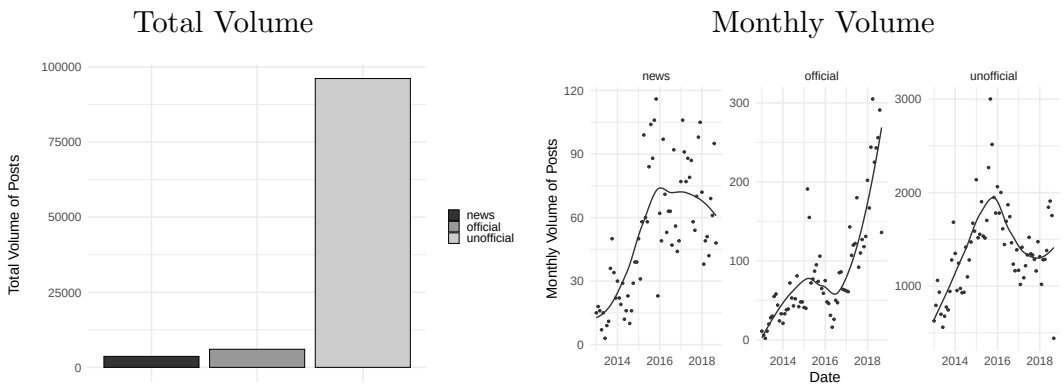
Beyond examining the prevalence of particular topics and their tone over time, we also seek to understand which topics receive the most engagement. We measure engagement as the volume of shares, likes, comments, and reactions that posts receive.

Results

We begin by measuring what sources of information are posted across public Facebook pages over time, as well as how much engagement posts linking to these sources receive. We then evaluate how different sources of information differ in the topics they emphasize and the degree to which they provide encouraging or discouraging messages to refugees.

Displaying the frequency with which different sources of information are posted across our 331 public Facebook pages, the lefthand panel of Figure 2 shows the total volume of posts linking to official, unofficial, and news media sources. We see that unofficial sources are posted on public Facebook pages at a much higher rate than official sources or news sources. Examining changes in volume over time, the righthand panel shows much higher volume of unofficial sources than official sources and news sources posted across the entire period. Official websites or pages never constitute more than 10% of links posted and links to news sources never constitute more than 5% of links. The volume of links shared from news, official, and unofficial sources all rise from the start of our data collection period in 2013 up until the height of the refugee exodus from Syria in late 2015 and then decline. However, unlike news and unofficial sources, the volume of links shared from official sources begins to increase again in mid 2016 and continues to grow until the end of our data collection period in 2018.

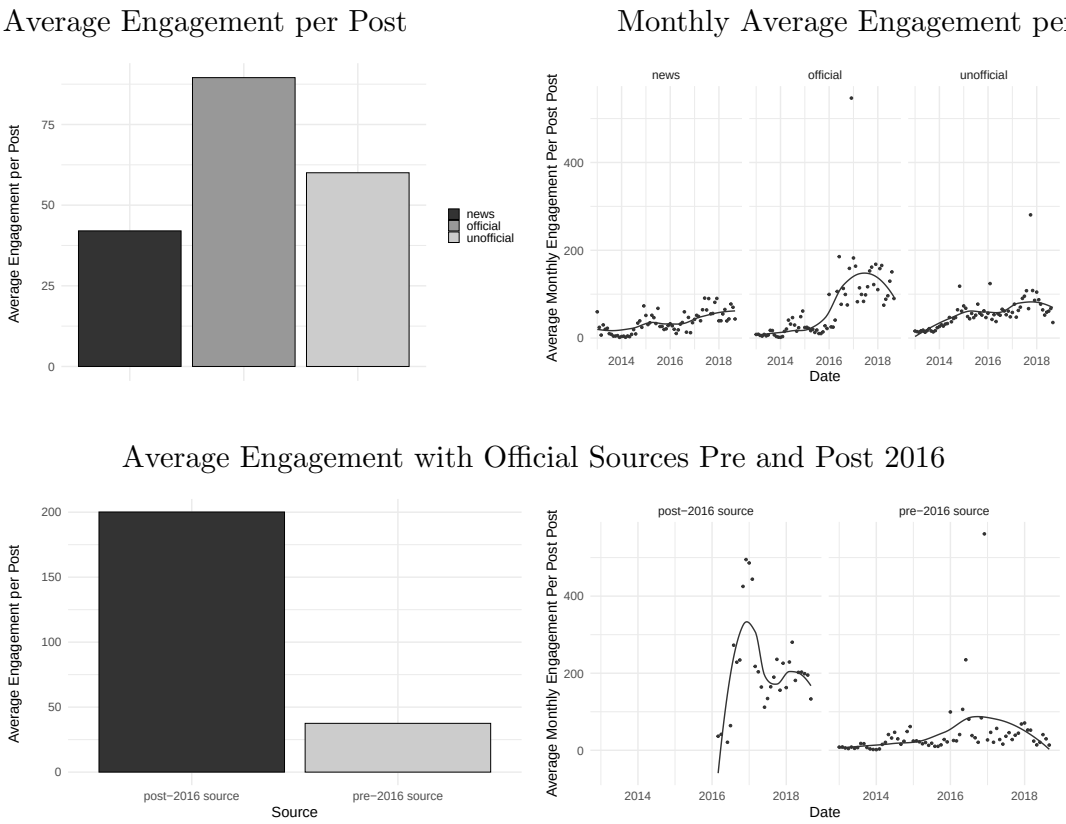
Figure 2: Volume of Posts Linking to Official, Unofficial, and News Sources



While unofficial sources dominate public Facebook pages in terms of volume of posts, Facebook user engagement with posts linking to official sources is higher than posts containing unofficial sources. The top left panel of Figure 3 shows the average engagement—including likes, comments, reactions, and shares—received by posts linking to each type of information source. Examining changes in engagement over time, the top right panel of Figure 3 suggests that high engagement with posts from official sources begins in 2016 surrounding the entrance of new official information sources such as Refugee Info and Info Migrants. Other official information sources introduced in this period that contributed to the higher levels of engagement include Mobile Info, a partner of Refugee Info, the Office of Syrian Refugee Affairs in Lebanon and its associated Facebook pages, the Australian government's new page for providing information about asylum and citizenship, the UNHCR's Arabic language page focused on Turkey, Kenana Online, an Egyptian government portal designed to help underprivileged groups including migrants access services, and Generation 2.0 an NGO focused on human rights of migrants in Europe. To determine whether this change is a consequence of higher engagement with newer official sources relative to older official sources, the bottom panels of Figure 3 breaks down engagement with official sources that entered our dataset before and after January 1, 2016. First the bottom left panel shows that official sources that were posted to Facebook after January 1, 2016 received over five times more engagement per post than earlier official sources—including a variety of UN and UNHCR sources, Amnesty International, government websites and migration agencies. Examples of official domains and Facebook pages that were active pre-2016 and received relatively low engagement in that period include unhcr-arabic.org, migrationsverket.se (Swedish migration agency), amnesty.org, unhcr.org, refugees-

lebanon.org (a UN and Lebanese government collaboration), un.org, asylo.gov.gr (the Greek government's asylum website). Although new official sources receive higher levels of engagement on average than older official sources engagement with older official sources nonetheless also grew after 2016, peaking in 2017.

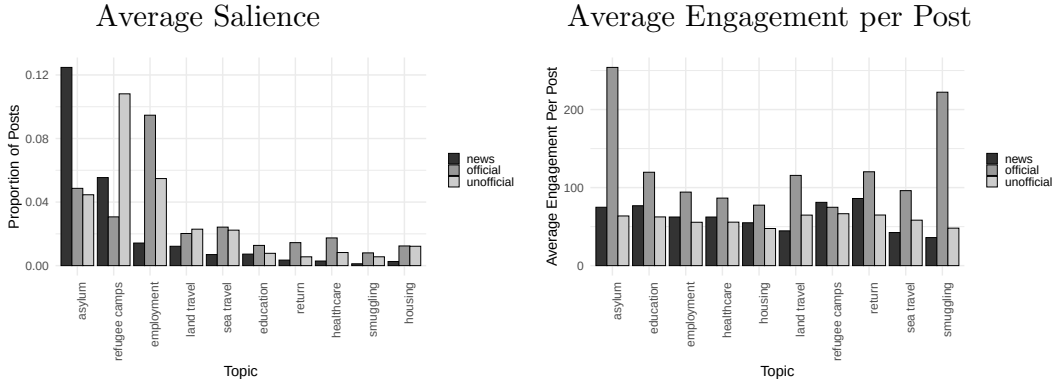
Figure 3: Average Engagement with Posts Linking to Official, Unofficial, and News Sources



To explore why posts linking to official sources—and newer official sources in particular—receive more engagement, we first explore aggregate differences in the salience of several topics related to refugees' journeys, legal status, and access to services. The lefthand panel of Figure 4 suggests that the starkest differences in topic salience between official, unofficial, and news sources pertain to asylum, refugee camps, and employment. Discussions of asylum are much more salient in news sources than official or unofficial sources. The discussion of refugee camps is more common in unofficial sources, and references to employment, healthcare, education, and refugee return are more salient in official sources. Examining how the content of official sources and the engagement it receives compares to that of unofficial and news sources suggests that

posts linking to official sources receive more engagement on average, regardless of the topic of the post. The lefthand panel of Figure 4 indicates that the different rates at which sources provide information about different topics is not driving engagement. Official sources receive higher levels of engagement across all topics, with particularly high engagement on the topics of asylum and smuggling.

Figure 4: Topic Salience and Engagement by Source Type



Examining topic salience by source over time provides some insight into why aggregate engagement with official sources increases after 2016. Comparing topic salience in official and unofficial sources over time in Figure 5, we see that official sources offered much less coverage of many important topics of interest to refugees including asylum procedures, access to education and health care, travel,and smuggling until 2015. Beginning in 2016, after the height of the Syria crisis, official sources begin to cover these topics at higher rates than unofficial sources.[19] Indeed as Figure A2 in the Appendix suggests, engagement with official sources on each of these topics does not surpass engagement with unofficial sources until early 2016 when official sources begin to cover these topics at higher rates. Notably employment is the only topic that official sources cover at higher rates than unofficial sources across the entire period up until mid 2018. However, even though employment was covered by official sources at higher rates from the start of our data collection period, official posts about employment did not begin to gain more traction than unofficial posts until 2016.

[19]Figure A1 displays these same patterns for news sources in the Appendix.

Figure 5: Topic Salience by Source Over Time
Official vs. Unofficial Only

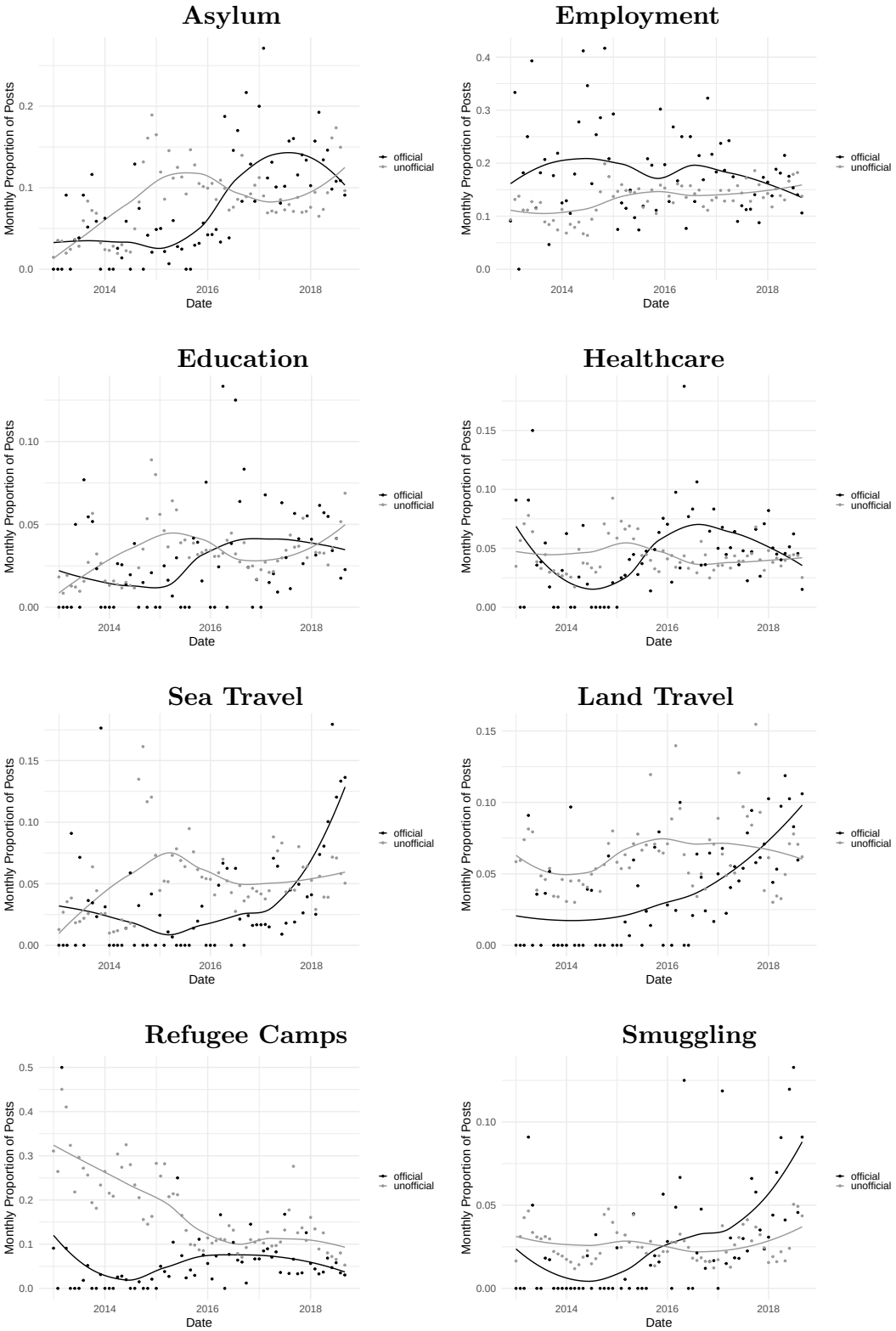
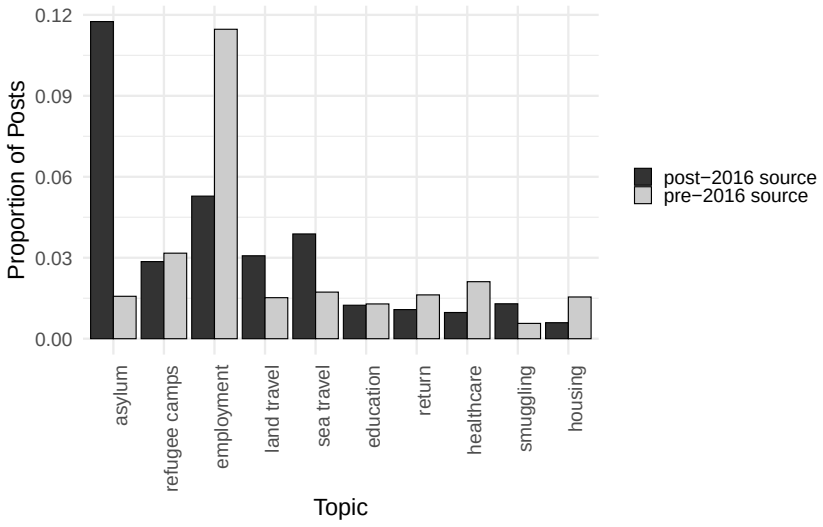


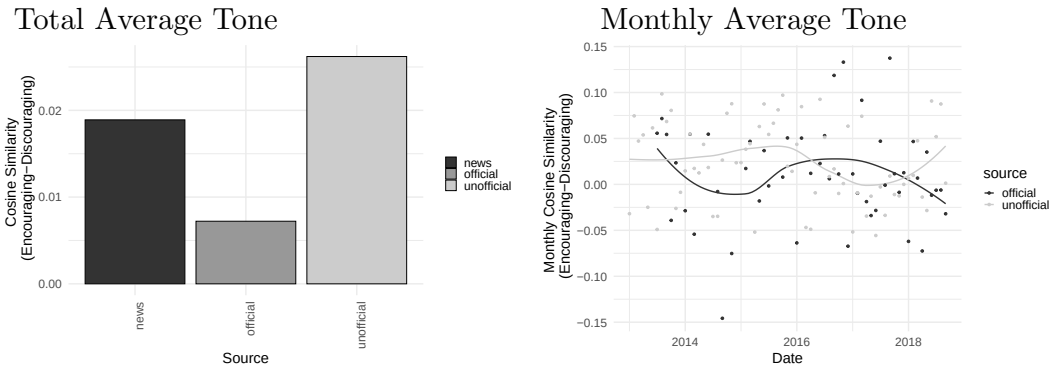
Figure 6: Topic Salience in Official Sources (Pre vs Post 2016)



We see that these over time changes are largely driven by the entry of new official sources. Newer official sources focus significantly more on asylum, land and sea travel and smuggling than older official sources. The most salient category for older official sources is employment—notably the only topic for which official sources were more prominent than unofficial sources in the pre-2016 period.

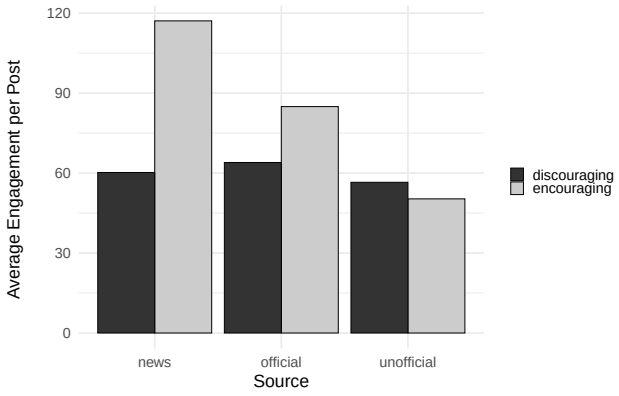
Moving beyond topic salience, we examine differences in the tone with which official, unofficial, and news sources provide information. Specifically, we draw on our measure of the degree to which posts express more encouraging or discouraging messages about immigration or travel to different host countries. Figure 7 displays the average tone of posts with negative values representing more discouraging tone and positive values representing more encouraging tone. As the lefthand panel of Figure 7 demonstrates, all source types have a more encouraging than discouraging tone in aggregate, with content linking to unofficial sources expressing the most encouraging tone, followed by news sources and official sources. Breaking this down over time and focusing on the difference between official and unofficial sources for ease of visualization, we see that the tone of official sources becomes more encouraging than the tone of unofficial sources beginning in 2016.

Figure 7: Encouraging vs. Discouraging Posts by Source Type



Does increased encouraging tone in official sources relative to unofficial sources explain the shift in engagement? If encouraging messages generally receive more engagement—regardless of source—this could help explain the increased and sustained engagement with official sources that we see beginning in 2016. We compare engagement with the top quartile of posts in our data (most encouraging posts) to the bottom quartile of posts in our data (most discouraging posts). We find that encouraging posts linking to news and official sources receive more engagement than discouraging posts. For posts linking to unofficial sources of information, however, we see little difference in engagement with more encouraging and more discouraging posts.

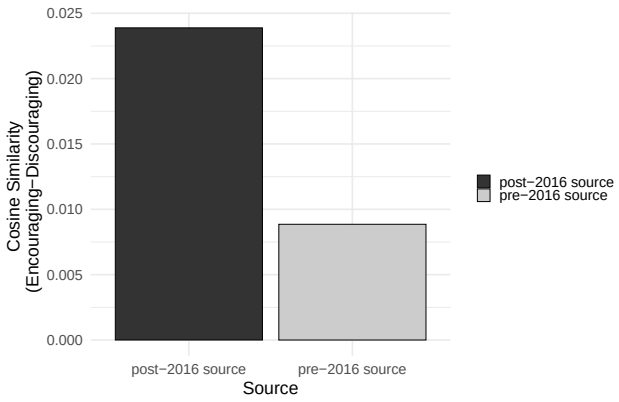
Figure 8: Engagement by Source Type and Sentiment



We also explore whether posts linking to newer official sources have a more encouraging tone than posts linking to older official sources. Examining the sentiment of posts linking to newer official sources introduced after 2016 relative to those linking to older official sources, we see that newer sources are more than twice as encouraging on average. Because encouraging posts

generally receive more engagement for posts containing news sources or official sources, this could help explain the rise in engagement we see with official sources after 2016.

Figure 9: Comparing Sentiment of Pre vs. Post 2016 Official Sources



Discussion and Conclusion

Our findings suggest that although posts linking to official information sources on Facebook pages targeting Syrian refugees garnered more engagement in aggregate than posts containing content from unofficial sources, this pattern was almost entirely driven by increased engagement after the peak of the refugee exodus from Syria in late 2015. This result is consistent across a range of topics from asylum and employment to sea travel and smuggling, as well as across posts communicating encouraging and discouraging messages. Analyzing the salience of key topics across these pages, we see that up until early 2016, posts linking to unofficial sources referenced these important topics at a higher rate than posts linking to official sources.

What accounts for the increased provision of information by official sources beginning in early 2016? Our data suggests that this pattern is primarily driven by the entry of new official sources, which emerged through efforts by governments and NGOs to combat disinformation and provide accurate information online in a timely manner ramped up in this period. For example, the launch of the IRC and Mercy Corp's RefugeeInfo in 2015 and the EU's InfoMigrant site and in 2016 may have contributed to an increase in timely official information covering important topics along refugees' journeys and upon arrival in their host countries. Indeed, InfoMigrant and RefugeeInfo are two of the top 10 most shared domains in our dataset across the entire time

period. While these sites were particularly widely shared, we also see increased engagement with official sources that were available earlier—including Amnesty International, the UNHCR, a UN and Lebanese government collaboration, and the Swedish migration agency—as well as increasing engagement with other new official sources such as sites developed by the Australian, Lebanese, and Egyptian governments as well as those developed by European NGOs such as Generation 2.0 and Mobile Info. Our results also suggest that once more official information became available on key topics of interest—particularly asylum, land travel, and sea travel—refugees engaged with this information at higher rates. In addition to providing information on important topics, these newer official sources offered refugees more encouraging messages than older official sources or than unofficial sources of information. Given that our data suggests that posts linking to more encouraging information from official sources typically garner more engagement, this may also explain the dominance of official sources in our data in this period.

While our finding that official organizations provide more encouraging might seem surprising given the documentation of governments actively discouraging refugees from entering their countries (Carlson, Jakli and Linos 2017; Ivarsflaten 2005), it is important to note that encouraging content does not necessarily advocate for refugees to travel to a particular host country as much as it provides advice and information showing refugees how to safely and successfully apply for asylum or access services. By contrast discouraging information typically actively discourages refugees or highlights harms they may face. Given that the documentation of these harms often requires expressing direct criticism of host country governments, it is perhaps unsurprising that governments and the NGOs that operate within them are less likely to produce this content than less-constrained unofficial actors. Future research should continue to systematically document what types of actors produce encouraging and discouraging information during refugee crises as well as why organizations make these strategic choices.

Despite its advantages, our measurement approach has several limitations. First, because of ethical constraints and limited data availability, our we can only evaluate information production and engagement on public Facebook pages. We therefore cannot necessarily generalize our findings to Facebook as a whole, let alone other social media platforms, although Facebook was the most popular platform used by Syrian refugees in this period. Additionally it is worth noting that

content from public pages is more likely to appear in searches of Facebook's platform as it is typically receives higher levels of engagement as it is available to a wider audience. Second, any content that may have been deleted between the time of posting and the time of data collection in September 2018 is missing from our dataset. Finally, we can only observe behavior of individuals who publicly engage with content on our Facebook pages. It is possible—and even likely—that many Syrian refugees simply lurk on public pages without ever physically engaging with content. We therefore are only able to measure public engagement, not impressions or non-public interactions with our posts. While we cannot measure this undetectable behavior, engagement metrics are nonetheless useful because they tell us what content is most amplified—and therefore more visible—on the platform. We hope that as Facebook and other platforms develop new approaches for making data on private user activity and impressions safely and ethically available to researchers that we will gain more insights into these important types of behavior that we are currently unable to capture in our analyses.

Importantly, assessing quality of information from official or unofficial sources is beyond the scope of this paper and we cannot make a normative judgment about the relative quality of these different sources. While official sources might appear more credible, unofficial sources have often provided refugees with vital information in a more timely fashion than official sources and typically contain endorsements or narratives from other refugees, which may make them more compelling. Nonetheless, little is known about the quality of information from unofficial sources, which often do not make public transparent information about sources of their funding, how they obtain information, or their motives more generally. It is difficult to assess the quality of information from either official or unofficial sources in an information environment that shifts rapidly and covers such a broad array of domains.

Our approach offers several contributions to the migration and political communication literature. First, we systematically describe a popular online information environment targeting Syrian refugees, providing detailed insight into the content and tone of information posted over a five year period. Second, we build on recent work using survey data and qualitative interviews to understand how social media facilitates refugees' access to information on their journeys and upon arrival in their host countries by developing naturalistic behavioral measures of refugees'

engagement with online information. Third, while most existing work focuses on refugees residing in a single host country,[20] our dataset allows us to analyze information targeting Syrian refugees who reside in a wide range of host countries from MENA to Europe and North America. Finally, we assess how refugees engage with posts linking to official and unofficial sources of information in a changing information environment, a key contribution to our understanding of how vulnerable populations access information in the digital age.

Our findings provide preliminary evidence that efforts by governments and NGOs to provide accurate information online in a timely manner, including the launch of Mercy Corp's RefugeeInfo in 2015 and the EU's InfoMigrant site in 2016 among others may have contributed to increased engagement with official information sources beginning in early 2016. In particular, our results suggest that official information on topics such as asylum, smuggling, and land and sea travel, as well as more encouraging narratives are more likely to receive high levels of engagement. Future research should seek to explore the causal impact of these types of policy interventions to better understand optimal strategies for providing refugees with timely and accurate information to help give them the agency to make informed decisions with dignity along their journeys and as they integrate into their host societies.

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[20] Though see (Holland and Peters 2020) for an exception.

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Appendix

Table A1: Most Popular Domains Shared Across Public Facebook Pages

domain	name	shares	type
facebook.com	Facebook	760945.00	user_generated_content
		22180.00	user_generated_content
hiijra.blogspot.com	Migration Blogspot	8094.00	unofficial_migrant_info_site
infomigrants.net	Info Migrants	2205.00	official_migrant_info_site
youtube.com	Youtube	2133.00	user_generated_content
hijra2.ml	Migration2	2046.00	unofficial_migrant_info_site
blog.refugee.info	Refugee.info	1975.00	official_migrant_info_site
drive.google.com	Google Drive	1560.00	user_generated_content
sverigesrost.se	Voices of Sweden	1484.00	unofficial_migrant_info_site
hocine933.blogspot.com	Migration and Asylum	1230.00	unofficial_migrant_info_site
sbs.com.au	SBS Australia	1215.00	australian_news
hocine93.ml	Migration and Asylum	825.00	unofficial_migrant_info_site
aksalser.com	Aks al-Ser	749.00	syrian_oppposition_news
refugee.info	Refugee.info	675.00	official_migrant_info_site
1arabimmg.blogspot.com	Arab Immigration Blog	636.00	unofficial_migrant_info_site
arabimmg.blogspot.com	Arab Immigration Blog	625.00	unofficial_migrant_info_site
youtu.be	Youtube	612.00	user_generated_content
all4syria.info	All 4 Syria Info	514.00	syrian_oppposition_news
infomi.gr	Info Migrants	507.00	official_migrant_info_site
arabinworld.com	Arabs in Europe news	507.00	unofficial_migrant_info_site
tinyurl.com		397.00	
guc.edu.eg	German University in Cairo	394.00	university_site
independent.co.uk	The Independent	383.00	uk_news
hiijra.blogspot.fr	Migration Blogspot France	366.00	unofficial_migrant_info_site
arabiancanada.com	Arabian in Canada / Voices of Canada	365.00	unofficial_migrant_info_site
dw.com	DW	329.00	german_news
theguardian.com	The Guardian	325.00	uk_news
tomooh.org	Volunteer.org	324.00	unofficial_migrant_info_site
arabhijra.com	Arab Migration	263.00	unofficial_migrant_info_site
alliraqnews.com	Iraq News	253.00	iraq_news
the-migrant.com	The Migrant	233.00	unofficial_migrant_info_site
ahla-3alam.com	Ahla Alaam	233.00	lebanese_news
addiyar.com	Ad-Diyar	228.00	lebanese_news
docs.google.com	Google Docs	227.00	user_generated_content
arabic.rt.com	RT Arabic	222.00	russian_state_news
arabeurobe.com	Arabs in Europe	220.00	unofficial_migrant_info_site
mansiyoun.net	Forgotten Refugees	218.00	unofficial_migrant_info_site
change.org	Change.org	212.00	petition_site
bbc.com	BBC	202.00	uk_news
europressarabia.com	Europress Arabia	190.00	european_news_arabic
aljazeera.net	Al Jazeera	186.00	aljazeera_news
alkompis.se	Al-Kompis (Sweden)	177.00	swedish_arabic_news
assabeel.net	Assabeel	176.00	jordanian_news
wp.me	Wordpress	166.00	user_generated_content
ara.tv		163.00	
alghad.com	Al-Gahad News	162.00	egyptian_news
m.youtube.com	Youtube	162.00	user_generated_content
almoghtribon.net	Al-Moghtribon	162.00	unofficial_migrant_info_site
arabineuropa.com	Arab in Europe	147.00	unofficial_migrant_info_site
swedenlatestnews.com	Sweden Latest News	144.00	swedish_news

Figure A1: Topic Salience by Source Over Time

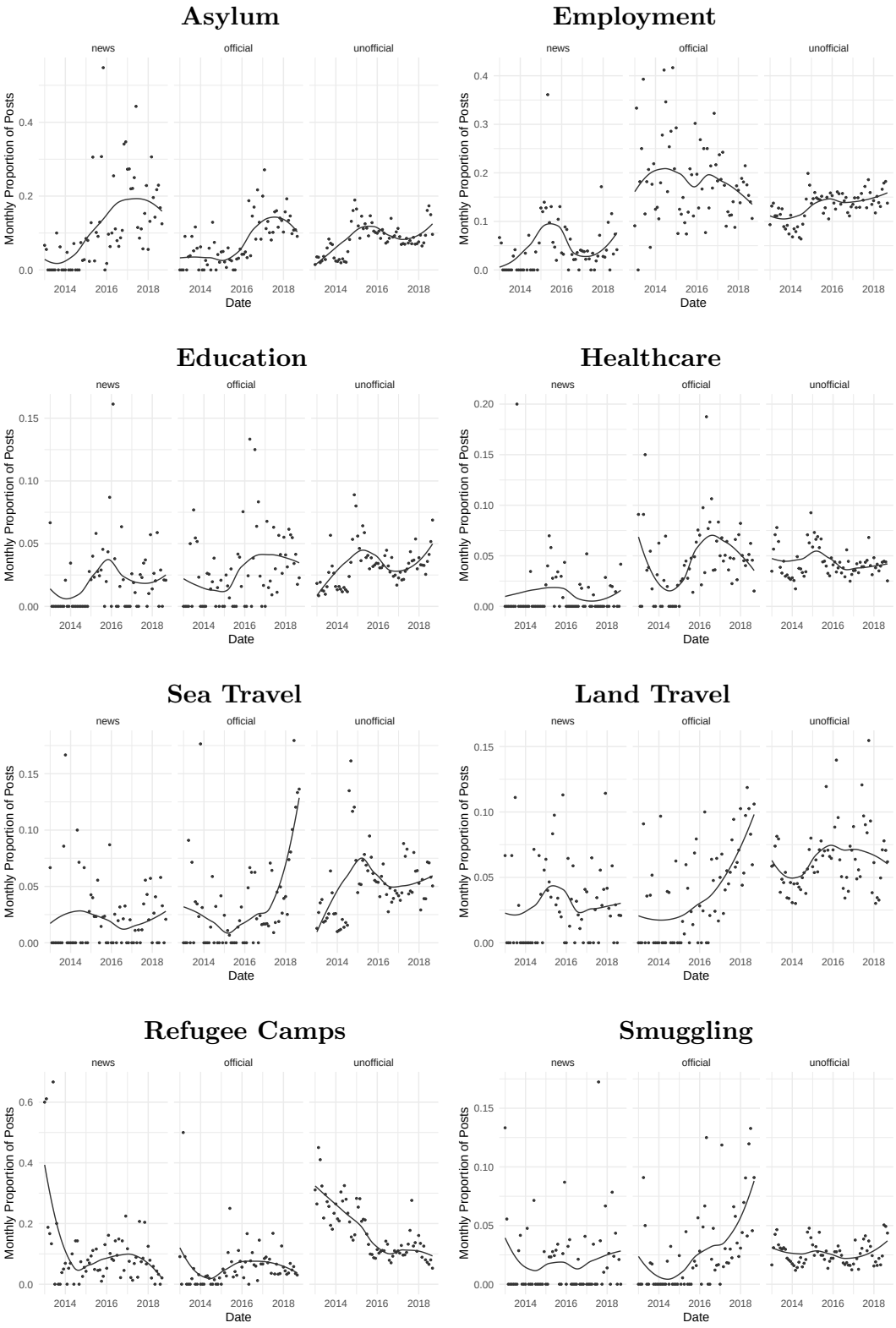

Figure A2: Engagement with Official and Unofficial Sources by Topic Over Time

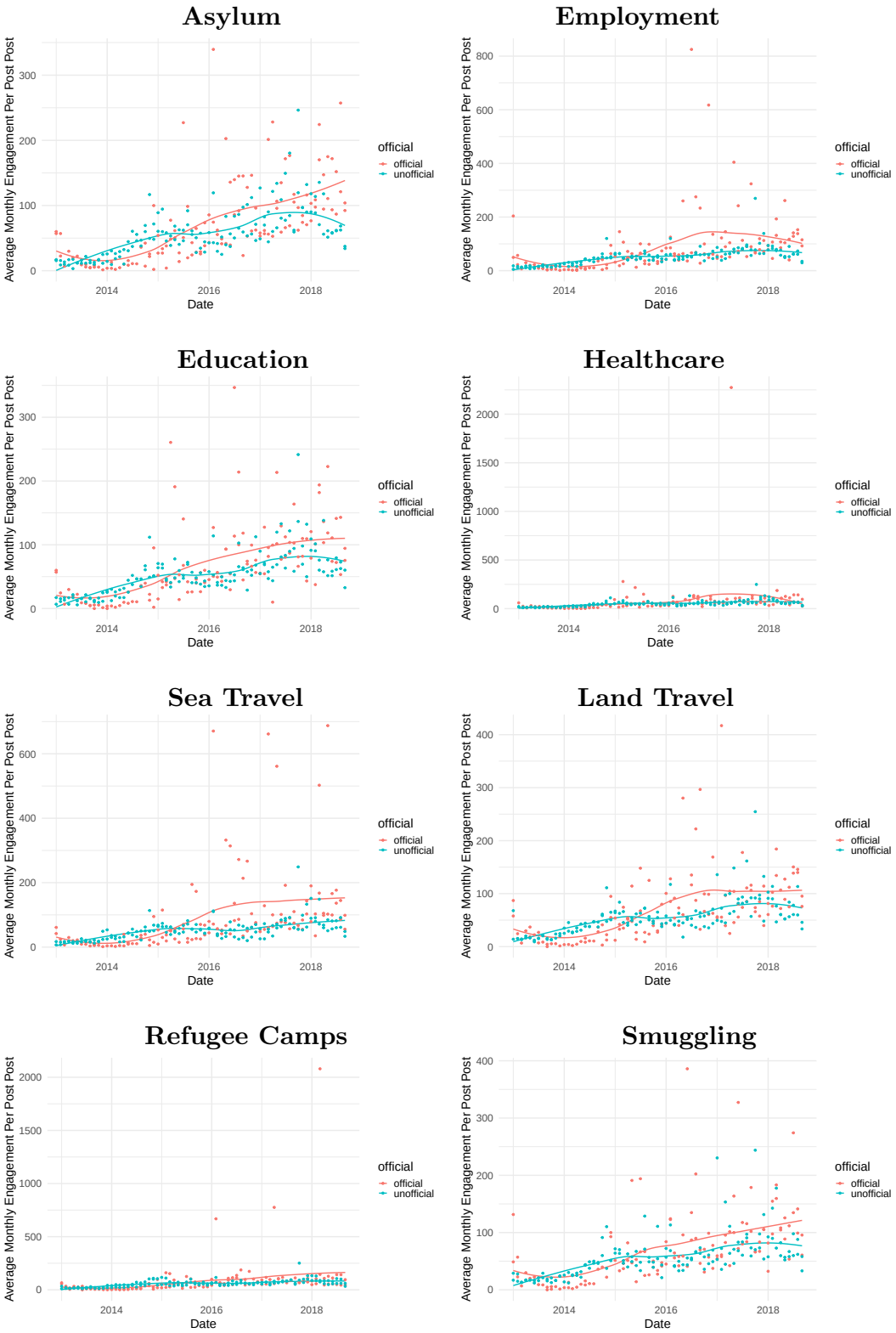

Table A2: Facebook Page Ids

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11	101088183562292
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