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A pipeline of tweets: environmental movements' use of Twitter in response to the Keystone XL pipeline

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ABSTRACT
Social movements often amalgamate otherwise diffuse public political interests. In recent years, social media use has allowed both groups and individuals to engage with political issues both online and offline. How do organizations use Twitter to mobilize networked publics? To what extent do groups promote both 'connective action' online and traditional activism offline? How do their strategies differ according to whether they seek to promote or combat the *status quo*? And how do they balance encouraging and reinforcing individualized expression through group messaging? The ways pro-Keystone XL pipeline and anti-Keystone XL groups differed in their Keystone-related action on Twitter from January 2010 until October 2014 are analyzed. Boolean searching and Natural Language processing are used to analyze more than three million tweets. The results demonstrate that the frames within Twitter conversations have significant implications for how communities understand, develop, and mobilize around environmental issues.

Introduction

Debates, framing contests, competing interest groups, and the interaction among those groups, the media, and relevant issue publics shape modern political issues. A clear example of this is the controversy that surrounded the proposed Keystone XL pipeline. The controversy incorporates issues of environmental risk, climate change, anti-regulation, anti-corporatism, and federalism. Comments on social media about the controversy illustrate the diversity of issues implicated in this debate, as several distinct groups fought to promote approval or block construction of the pipeline.

This research is concerned with how groups utilize social media in their communication strategies. Many theorists (e.g., Bennett and Segerberg 2012) argue that social media allows for more personalized, expressive involvement and reduces barriers to collective action, allowing for larger,

sustained movements around social issues. Moreover, Twitter's public, networked structure creates significant potential for groups and individuals to interact to a far greater extent than what was possible prior to social networking and other modern communication technologies (see Tufekci and Wilson 2012, Chadwick 2013). Some evidence of this has emerged, particularly around isolated issues and protest events (see Karpf 2012). Nonetheless, there is still much to learn regarding how groups achieve goals through social media. This may include attempts to educate the public through information provision, promote fundraising, encourage direct political action (such as signing a petition or mobilizing a protest), endorse individualized expression, and/or increase membership. In addition, we know very little as to how and why group strategies differ. Finally, groups face a potential risk when promoting individualized expression from the fragmentation of ideas, goals, and methods. Thus, it is important to know how, if at all, groups balance efforts to unify the movement and facilitate coalition building while allowing for the benefits of 'connective action.'

Here, we examine the particulars and implications of group strategies (or repertoires of action) on Twitter. We explore the extent to which groups engage in 'connective action' forms and more traditional forms of engagement through social media, how their strategies differ depending on whether they seek to promote or combat the *status quo*, and how they balance encouraging and reinforcing individualized expression with group reinforcing messages. To examine these questions, we analyze Twitter streams pertaining to the proposed Keystone XL pipeline project from January 2010 through October 2014.

Results indicate that in general, levels of activity (in which there is an amplification of tweets) and inactivity (in which there are few tweets) on Twitter pertaining to Keystone XL was similar across users (pro-Keystone XL individuals and groups and anti-Keystone XL individuals and groups) over time. Nonetheless, we find that groups within the anti-Keystone XL and pro-Keystone XL movements differed significantly in their strategies, with those opposed to the development project more likely to interact with individual users, share tweets that were self-expressive and individualized, and seek donations. The findings here suggest that groups can and do take advantage of this new medium, but particular activities differ. The anti-Keystone XL movement more openly accommodated personalized expression and participation than the pro-Keystone XL movement, which predominantly supported traditional forms of engagement. Nonetheless, given their ability to generate mass political protests and stall attempts to push the pipeline through politically, it appears as though the anti-movement's warming to 'connective action' did not hinder their ability to maintain a united front through important coalitions.

Issue background

The Keystone XL controversy has drawn the attention of public and private interests on both sides of the debate, with a range of outspoken politicians and other actors, and various levels of government (local, state, national) involved in the decision-making process.

In 2011, TransCanada requested approval of the Keystone XL expansion project from the US State Department. The proposed expansion consists of a pipeline running from Alberta through the Plains states to refineries in Texas. Industry and third-party reports estimate that increased investment in tar sands could generate $775 billion in GDP and support 600,000 American jobs by 2035. The direct and immediate benefit is estimated at $20 billion to the American economy and $5 billion to the states along the route (Parfomak *et al.* 2013). Opponents have drawn largely on environmental arguments, although property rights are prominent, and many dispute the economic benefit. 'DilBit,' the primary component of tar sands oil, presents greater environmental concern than other crude-oil products (Stansbury 2011).[1] Subsequently, individuals and elected officials along the proposed route have expressed concern over contamination of the Ogallala Aquifer, which is the grain belt's main water source.

Moreover, the approval process has been very politicized. While 39 members of Congress wrote letters in support of the project and then-Secretary Clinton expressed her support, NASA's top climate scientist stated that development of the tar sands would be 'essentially [a] game over' for climate stability (Hansen 2012). Additionally, the Governor of Nebraska initially opposed the route, and two prominent unions also spoke out in opposition to the project (Schulte 2011). Yet, the position of the person with final decision-making power, President Obama, remained unclear.

Additionally, conflict between the EPA and the State Department led to uncertainty regarding the benefits and costs of the project.[2] This tension was mirrored in Congress; Republican Senators introduced legislation, ultimately passed by Congress on December 23, 2011, to force the Obama administration to make a decision on Keystone XL within 60 days, which the President ultimately rejected (Resnikoff 2014).[3]

In response to all of the above, for the first time in 120 years, the executive director of the Sierra Club lifted its policy against engaging in civil disobedience, resulting in 50,000 protesters and the arrest of 50 environmental activists at the White House (Moyers 2013). National and local protests have continued, with 120,000 protesters marching from Georgetown University to the White House on March 2, 2014 (Elliott 2014), and thousands more rallying in DC for the Cowboy Indian Alliance on April 22, 2014 (NBC News 2014).

Political mobilization under social media

We view groups as essential components of policy change in this context because they disseminate information to politicians and the public, serve as watchdogs, and have the capacity ultimately to shift or maintain the *status quo*. However, modern technology has changed groups and minimized the costs of information acquisition and mobilization. Despite evidence that groups and social movements use social media, researchers are only beginning to understand the extent to which this use has altered organizational behavior and its consequences.

While it is clear that environmental organizations are important to political outcomes,[4] the strategies they use to affect change, or their repertoires of political action, vary greatly (Carmin and Balser 2002). The substantial growth of the US environmental movement since the late 1960s has forced groups to professionalize to keep up with a growing membership, the development of new problems, and changing political institutions (Mitchell *et al.* 1991). In response to this professionalization, 'alternatives' have cropped up, often focused on local grass-roots issues, environmental justice concerns, and radical action (Mertig 2002). Environmental action theorists propose that these form 'networks of contention,' in which groups share some resources and mobilization but may compete over ideological distinctions and tactical goals (McCarthy and Wolfson 1996, Schlosberg 1999, Mix 2011). Moreover, there is a tension between larger and smaller groups because smaller groups run the risk of having their identity and goals assimilated into that of the larger group (Tarrow 2006, p. 55). Thus, their approaches differ to retain identity and importance.

The strategies any one group chooses (such as protest, boycott, and street theater) comes down to a range of considerations, including its experience, beliefs, ideology, and philosophy (Carmin and Balser 2002). Some view tactic diversity as an important way of identifying issues and seeking policy reform via alternative pathways (Dunlap and Mertig 1992, Carmin 1999, Mertig 2002). In many cases, repertoires of action depend on the nature of the problem. For instance, strategies differ depending on whether the issue is technical or largely invisible (such as nanoparticles) compared with one that is relatable and visible (such as the development of a nuclear power plant). The target of action is critical as well: to achieve some goals, organizations may need to lobby political actors, while other goals may be best achieved by broad grass-roots mobilization. Often, these actions are undertaken in parallel (Carmin and Balser 2002). Strategies may also differ depending on how groups view members. For example, grass-roots organizations often try to adhere to a narrow group identity, but this may prevent cross-group alliances (Lichterman 1995).

Group and movement structure also shape the tactics they use and their political goals and targets (Piven and Cloward 1977, Staggenborg 1988). For example, conservative groups may favor hierarchy and therefore oppose more diffuse bottom-up processes (Karpf 2012). In the case of the environmental movement, groups also clash with elites, who hope to maintain the *status quo* through 'astroturf' organizations (Walker 2010, Cho et al. 2011) and established political actors. Thus, differences between movements account for different strategies.

Changing communication technologies, especially the rise of social networking sites (SNS) such as Twitter, also shape repertoires of action. Following boyd and Ellison (2007), SNS are characterized by user interaction between others in their network in the form of messaging and activation of latent or weak ties. While initially viewed as merely a distraction or entertainment site, SNS, particularly Twitter, are now regularly used by political and media elites. For example, Hutchins (2014) showed how Australian Green Party members utilized Twitter to mediate media messages and communicate with their supporters. Similarly, journalists on Twitter have been shown to more freely express opinions, share user-generated content, and interact with followers (Lasorsa et al. 2012). This use is facilitated by the modes of interaction available on SNS, where users can interact directly with one or several users via the same message. Twitter, in particular, is unique because it allows users to interact with others with whom they are not formally connected through replies and mentions. This kind of interaction facilitates Bennett and Sergerberg's 'connective action.' Moreover, because disenfranchised groups typically need to resort to novel methods, a similar pattern is seen in the case of extensive and growing reliance on SNS by individuals and groups concerned with social and environmental issues (Karpf 2012).

There are three primary ways in which group activities have evolved around the changing communication environment. First, the multiple interaction avenues on Twitter provide groups with the opportunity to rely on a varied or mixed repertoire of action, interacting with users and other groups through several simultaneous approaches. Second, social media has the potential to both facilitate and block coalition building through increased interactivity and individualized expression.[5] Third, in response to the personalities of social media users, groups can promote conversations that are identity or ideologically reinforcing to mediate mass media and other messages and/or boost participation. The following discusses the theoretical and empirical underpinnings of these changes.

The Internet facilitated a breakdown in organizational boundaries (Bimber 1998), which has accelerated in recent years (Neuman et al. 2011). Consequently, power is less concentrated and engagement does not necessarily have to emerge via 'proper channels' and 'ordinary' politics

(Fatke and Freitag 2013). According to Bennett (2003, p. 144), the Internet as well as social media 'may be changing the political game in favor of resource-poor players who, in many cases, are experimenting with political strategies outside of conventional national political channels such as elections and interest processes.' This empowers non-institutional actors, including those within the environmental movement. In particular, it allows smaller organizations to expand their reach to both political elites and the population more broadly, and gives citizens the chance to participate, adding their interpretation of the movement and developing their own networks of contention (Garrett 2006, Bennett and Segerberg 2012). In this environment, parties and political organizations themselves become more and more hybridized, with competing sources of influence and action, rather than a more traditional hierarchy (Chadwick 2007). According to the theory of 'connective action,' this is due to social media's power to 'connect' interests absent formal rules and hierarchy (Bennett and Segerberg 2012).

The theoretical underpinning of this research, 'connective action,' refers to 'highly individualized publics … that use[s] broadly inclusive, easily personalized action frames as a basis for technology-assisted networking' (Bennett and Segerberg 2013, p. 2). In this new era, groups respond by being more flexible in terms of structure, membership, participation and mobilization, and definitions of issues. Prior to the advent of the Internet and social media, participation required great costs to an individual's time, effort, and other resources. Groups reduced this expense. Subsequently, the rewards were often shared, while groups controlled behavior and messaging. However, technological changes have meant new opportunities for personalized activism (Moore and Roberts 2009) and direct democracy (Boehmke and Bowen 2010). Now, anyone can publish their thoughts, coordinate with others, and exercise power (Castells 2007, 2011). Individual participants are reclaiming much of the traditional roles of groups and moving away from proper channels and ordinary politics (Fatke and Freitag 2013). In the modern context, then, organizations are fluid, groups are starting to look more like social movements, and participation is more personalized than it once was (Bennett and Segerberg 2011).

Closer examination into how the Internet and social media affect group formation and behavior has been conducted on several cases. The Internet eases recruitment efforts (Taylor et al. 2001) and helps mobilize online and offline communities (Hara 2005, Krueger 2006, Karpf 2010, Van Laer 2010, Walgrave and Bennett 2011). For example, during the anti-Iraq protests, social media was essential for mobilization, with networks based on loose ties (Bennett et al. 2008). The role of social media in spurring and maintaining the Arab Spring has received similar scrutiny. While a strong civil society and established networks provided the impetus for initial protests, Facebook allowed the size and length of the movement to increase

substantially (Eltantawy and Wiest 2011, Ghannam 2011, Khan 2012, Tufekci and Wilson 2012).

There is also evidence that groups continue to seek broad ways to spread their messages. However, now they are able to do so through the Internet and social media, which allows for a more involved participation than print and broadcast news outlets (Lester and Hutchins 2009). This is especially the case for Internet-mediated environmental advocacy organizations that exist alongside traditional environmental groups and deploy particular Internet strategies to achieve their goals (Hestres 2015). In addition, even where old media are still in control, new media allow for greater leverage of environmental interests (Lester and Hutchins 2009). Thus, one potential impact of social media is its ability to broaden and sustain environmental networks and movement over time due to the flexibility and variety of approaches and interactions between various groups and the public. This leads to our first hypothesis:

H1: Movements that are active on Twitter have adopted communication models that emphasize interaction with other groups and individuals through retweets and mentions rather than just top-down, one-directional communication.

At the same time, we expect groups to utilize those actions most appropriate for their cause and audience. In the case of Keystone XL, the issue is split between a largely pro-environmental based, anti-Keystone XL movement and a pro-development based, pro-Keystone XL movement. Thus far, the first tends to rely on protest activities and the courts to block development, while the second promotes and seeks to streamline the government's process. Public participation may be less important for the latter groups because they have more direct access to traditional pathways and institutions as well as elites (see Karpf 2012). Accordingly, we argue that the groups within the pro-Keystone XL movement, compared with anti-Keystone XL groups, are less interested in cultivating an active issue public, although they do not ignore it completely, and, unlike traditional 'astroturf' groups, are not solely corporate directed. Our second hypothesis addresses this:

H2: Groups from the anti-Keystone XL movement are more likely than those from the pro-Keystone movement to tweet about ways for their followers to get involved.

From the perspective of the public, SNS have allowed for greater individualized presence and self-expression. From the perspective of groups, related technologies have opened up a stream of possibilities to

support personalized engagement. For example, during the 2009 G20 London Summit, three movements combined concerns for the environment and growing income inequality and utilized 106 different features to produce information and rally support (Segerberg and Bennett 2011). Their actions ranged from more traditional forms of participation, such as signing a petition or making donations, to posting a photo or using a Twitter hash tag. Similar activity patterns emerged during the 2009 United Nations Climate Summit in Copenhagen (Segerberg and Bennett 2011). The free rider problem, a particular impediment to collective action, is diminished when technology allows for personalized communication because groups can customize a message so that it is most likely to spur participation, influential peers can encourage friends to participate, and users feel more directly connected to the action. Thus, social media provides the additional source of personalized expression and peer engagement not typical of traditional groups and movements. Yet, too much personalization could dilute the movement's message and divert its goals. Accordingly, social movement organizations have to delicately balance personal expression with the movement's identity, allowing that identity to intersect with users perceptions of it, countering counter-identities, and steering those identities and beliefs toward political goals. Managing these can become a large portion of a movement's work:

H3: *Groups are more likely to use and retweet tweets that are ideologically or identity reinforcing compared with other kinds of tweets.*

There are several reasons why Twitter is an especially useful place to evaluate our hypotheses. First, the potential of Twitter to facilitate collective action and decrease organizational hurdles is mixed, and therefore ripe for additional contribution. On the one hand, as discussed, protest participants and groups use Twitter for political discussion and to communicate protest information (Bennett and Segerberg 2011, Segerberg and Bennett 2011, Theocharis *et al.* 2014). On the other, the ability of Twitter to increase interactivity may be overstated and bear other costs. For example, in the case of the 2010 Gulf oil spill, looking across traditional (donation request, action request) and novel forms of group behavior (interaction, self-promotion), Merry (2014) finds little evidence of interactivity between groups and individual users. Moreover, interactivity may not always be a good thing, as groups' reduced control opened the movement to increased fragmentation.[6] Second, as a resource, Twitter features several positive features. Twitter streams serve as mechanisms 'crosscutting the protest ecology', provide some gatekeeping processes but also serve as gatekeepers, and are reflective of the changing dynamics of protest (Segerberg and Bennett 2011).

Data and methods

To test our hypotheses, we collected all tweets related to the Keystone XL pipeline from a selection of prominent pro-Keystone XL and anti-Keystone XL groups, as well as all retweets of their original tweets over the period January 2010 through October 2014. This resulted in a data set of 23,353 tweets by groups, and an additional 92,168 retweets or mentions of those groups. Groups themselves were selected in two stages. First, exploiting author expertise on the issue, we selected the major organizations that had engaged with the issue. Second, we conducted a survey of news organizations and searched Keystone-related tweets to find additional organizations. Because it is often difficult to determine what constitutes a group, we only selected named groups having significant engagement with the issue. The set of groups selected can be found in Table 1, along with a count of all related tweets.

Tweets were collected using software from Crimson Hexagon, a company specializing in social media metrics. Crimson Hexagon's tools allow users to conduct Boolean searches against the 'full firehose' of tweets, which comprises all public tweets. After several rounds of testing, the most appropriate Boolean search string for tweets about the Keystone XL pipeline was:

((keystone AND (pipeline OR oil)) OR KeystoneXL OR kxl OR nokxl)

Table 1. Tweet categorization.

Categories	Anti-Keystone XL	Pro-Keystone XL
Informational	@latimes: #KeystoneXL May No Longer Make Economic Sense http://t.co/lsZOG8Wava	Analyst: Despite #shale revolution, US will continue to need Canada's #oilsands: http://t.co/PQKxgGi4Ck #Keystone #pipeline
Action Request	TAKE ACTION: Tell President Obama to reject Keystone XL: http://t.co/F6r0qUcK04 #NoKXL	API's Erik Milito says #keystonexl makes sense on so many levels, if you agree, say it: http://t.co/hmAqNZJG #EnergyNation
Donation Request	MT @janekleeb: Donate to help TX landowner's legal fight against #KXL: http://rally.org/bishop (He's winning): http://bloom.bg/1fm7ELK #NoKXL	*
Promotional	Great #NoKXL letter to the editor of @washingtonpost from Felice Stadler of @NWF: http://t.co/HrzVDhtf5h #climate #RenewableEnergy	RT @EnergyNation: When thousands signed our #KeystoneXL anniversary card, we just had to take it to the White House: http://youtu.be/r3Kf9Q05P3M
Ideologically/Identity Reinforcing	We are pipeline fighters. #NativeYouth #GenI #nokxl (Oceti Sakowin youth at @BarackObama SD visit)	On trial for chaining herself to construction equipment http://shar.es/Mgpl4 While normal people work professional protesters flitter #KXL

*Because we were able to find only one donation request among pro-Keystone XL groups, we are unable to provide a 'typical' example tweet.

This search string appeared to return the most expansive set of results for both anti- and pro-Keystone XL groups and retweets, while excluding tweets not directly related to the issue.

Once collected, tweets were categorized based on their Twitter action (tweet or interactive) and primary motivation (action request, donation request, information provision, support and promotion, self-expression/ identity reinforcing). Categorization was conducted using supervised machine learning through Crimson Hexagon's online software, which was derived from the popular ReadMe tool. After training on a small sample by categorizing them according to our schema, this software isolates relevant phrases using a bag of words technique in the broader population of posts and categorizes them accordingly (Hopkins and King 2010). Through an iterative process of examining sample tweets, we developed a schema that incorporated the majority of tweets from groups. We then trained Crimson Hexagon's content analysis software by assigning sample tweets to each category.[7] The software identifies patterns in the language of tweets in each category according to the words or phrases used. These patterns are then applied against the tweet corpus, which the software has previously broken into sets of words (n-grams). The software accordingly estimates the appropriate category for each tweet. We then examined a subset of tweets by hand, reassigning (and therefore retraining) the software as necessary. We continued this process until the sample tweets we drew in each category were appropriately assigned.

Our categorization is largely drawn from Merry (2014), who analyzed environmental groups' activity around the Deepwater Horizon oil spill in the Gulf of Mexico. Looking directly at interactivity between environmental groups and the public, Merry categorized tweets into retweets, or directly quoting another user; replies; attributions, or giving credit to another user for something; and mentions. After this categorization, Merry largely groups all interactivity and does not explore much theoretical distinction between them. Accordingly, we collapse these categories into interactive and non-interactive tweets.

We seek to extend Merry's work by defining the nature of this interactivity. We accordingly analyze organizations' tweets around several types of engagement. 'Action Requests' and 'Donation Requests' represent traditional mobilization forms. Additionally, as many social movement organizations seek to educate the public, early theorists proposed that information propagation would be a primary function of online activism (Denning 2001), so we include a category for 'Information.' We also represent two potentially new forms of online engagement. First, Twitter gives groups the opportunity to promote their own activities outside of mobilization as well as the work of other groups. These are represented by the 'Promotional/ Supportive' category. Second, the theory of 'connective action' calls for a

certain amount of ideological flexibility from organizations, which allows independent actors to contribute their own interpretation (Bennett and Segerberg 2012). However, too much flexibility may lead to a fragmented movement, so organizations may try to reinforce that identity positively by highlighting positive action, reinforcing ideas, or noting disapprovingly of actions or ideas from opponents. The goal with these tweets is to attempt to frame the online debate around their interpretations and provide guidelines for followers to reorient notions of identity and ideology. Accordingly, these tweets may not directly relate to action or provable information, and will be closely connected to strengthening the group's ideological worldview and rallying its supporters. These are captured using the 'Identity/Ideological- Reinforcement/Hyperbole' category. Example tweets for each category are shown in Table 1.

These data were then analyzed using custom python scripts to identify domains referenced and characterize user interaction. By identifying domains, we determine whether the tweet is referencing broader media, other activist groups, or social sharing sites, such as youtube.com (for video) or imgur.com (for images). Alternately, grouping tweets and retweets according to user interaction characterizes that interaction, particularly whether groups are interacting more with other groups or members of the public. Finally, we conducted an OLS regression to determine if certain types of tweets were more likely to lead to more retweets.

Results

Table 2 shows the number of tweets by each group, with groups trying to block the pipeline labeled 'pro' and groups seeking to gain approval for the pipeline labeled 'anti'. Interestingly, local groups dominated discussion (@KXLBlockade [a group based in Texas], @BoldNebraska [Nebraska based], @EnergizeMN [Minnesota based], and @NEJobsAndEnergy [Nebraska based]), with only @EnergyTomorrow tweeting more than these local groups. Additionally, non-environmental partisan groups (@Senate_GOP, @GOP, @USChamber) played a large role in the pro-Keystone XL network in a way that was not reflected on the environmental side.

Figure 1 shows the number of tweets per day[8] for anti- and pro-Keystone XL groups. Discussion of Keystone XL by groups varied between periods of inattention and periods of heightened attention. In general, both movements followed a similar pattern, although there were periods of difference in attention, in particular early 2013. Figure 2 shows activity by each side comparatively (as a percentage of total activity). Anti groups comprised a majority of group discussion around Keystone XL on Twitter. However, in 2014, pro-Keystone XL groups expanded their presence, likely in response to

Table 2. Number of tweets by organization.

Type	Author	Count
Anti-Keystone XL	@KXLBlockade	5009
	@BoldNebraska	2276
	@350	1600
	@sierraclub	1199
	@TarSandsAction	713
	@CenterForBioDiv	546
	@NRDC	485
	@foe_us	436
	@ClimateReality	127
	@NRDCBioGems	100
	@NextGenClimate	57
	@NWF	56
	@Greenpeace	33
Pro-Keystone XL	@EnergizeMN	3191
	@EnergyTomorrow	2361
	@nejobsandenergy	2307
	@TransCanada	693
	@transcanada	563
	@EnergyNation	351
	@BuildKXLNowORG	314
	@Senate_GOPs	180
	@RedNationRising	145
	@ResourceEarth	120
	@GOP	108
	@IERenergy	100
	@USChamber	145
	@KXLFiles	61
	@NRSC	55
	@HouseGOP	19
	@VeteransFP	3
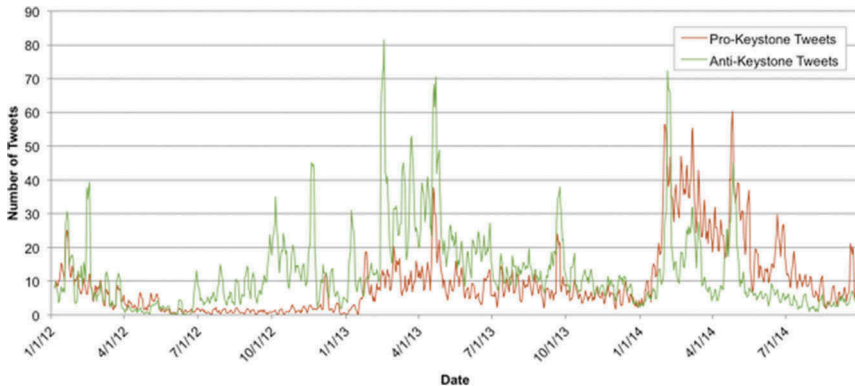
Figure 1. Attention to Keystone XL from groups.

the State Department's supplemental environmental impact statement that deemed Keystone XL would contribute little to greenhouse gas emissions.

Other summary statistics point to similar distinctions between group types. Table 3 shows the most prolific hashtags used by each side, ranked
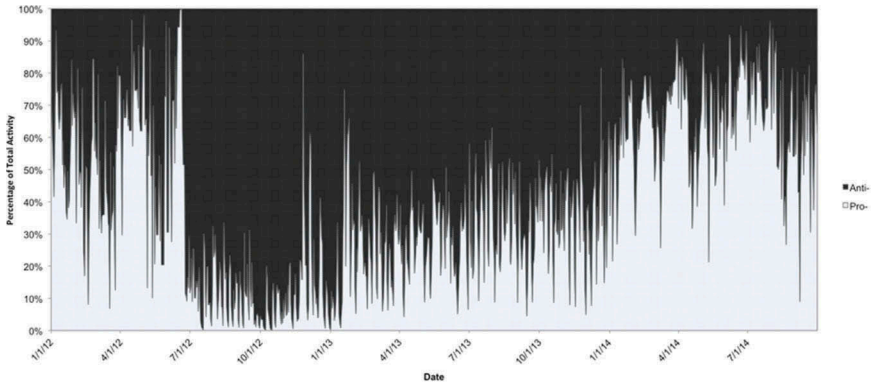
Figure 2. Attention as a percentage of total activity to Keystone XL from groups.

Table 3. Anti and pro groups' hashtags.

Anti-Keystone XL		Pro-Keystone XL	
#nokxl	10,662	#keystonexl	7015
#keystonexl	1440	#kxl	3727
#tarsands	986	#timetobuild	2287
#kxl	674	#jobs	940
#climate	324	#keystone	814
#notarsands	204	#pipeline	786
#climatesos	172	#energy	448
#keystone	168	#buildkxlnow	418
#forwardonclimate	167	#bakken	400
#nebraska	150	#builditnow	358
#idlenomore	147	#oil	305
#350ppm	129	#yeskxl	264
#exxon	104	#energysecurity	229
#rejectandprotect	104	#nebraska	174
#solidarity	80	#oilsands	174
#drawtheline	77	#rail	147
#actonclimate	73	#edshow	123
#pipeline	69	#williston	113
#fearlesssummer	57	#transcanada	96
#kxlfuneral	53	#energyindependence	87
#renewableenergy	52	#gas	80
#cowboyindianalliance	51	#4jobs	78
#eminentdomain	51	#rednationrising	75
#oil	41	#fracking	74
#climatechange	36	#obama	53
#xldissent	34	#tcot	50
#powershift	30	#vote4energy	45
#obama	24	#natgas	39
#nn12	21		
#dc	19		

from the highest number of counts to the lowest. Each network used largely different hashtags, with the exception of #keystonexl and #kxl, suggesting that there was likely very little engagement or interaction between the two sides. Anti-Keystone XL groups tended to emphasize

climate change and protest, whereas pro-Keystone XL groups emphasized jobs and energy.

Engagement can also be assessed by an examination of the type of links each group posts; those that link more to social sharing sites such as youtube.com or imgur.com are more likely to be encouraging user-generated content rather than content from mass media or self-promoted content. Additionally, the type of engagement with the audience can also shape decisions about which sites to link to. For instance, groups that seek to inform their audience or legitimate their claims may link more to respected, established, and non-partisan news organizations, whereas those who are less interested in informing and more interested in ideological reinforcement or mobilization may link more to activist sites. Table 4 shows the sites linked to by pro- and anti-Keystone XL groups. Overall, anti-Keystone XL groups were more likely to link to other sources in their tweets. Although both sides relied on youtube.com, anti groups were more than twice as likely to share video links from the Web site. In addition, pro groups tended to rely on a number of known conservative, mainstream media sources, such as the Wall Street Journal and Bloomberg News. In contrast, anti groups tended to share information from other anti groups, local news sources, and media sources such as the New York Times.

Engagement can be more directly measured by the number of mentions and retweets of other organizations and users. Table 5 shows the total

**Table 4.** Linked domains used by groups.

Anti-Keystone XL		Pro-Keystone XL	
twitter.com	1090	thehill.com	258
tarsandsblockade.org	1068	twitter.com	238
youtube.com	402	energytomorrow.org	225
facebook.com	343	washingtonpost.com	182
huffingtonpost.com	278	oilsandsfactcheck.org	161
nrdc.org	275	youtube.com	153
boldnebraska.org	274	keystone-xl.com	150
350.org	200	wsj.com	137
sierraclub.org	189	bloomberg.com	132
insideclimatenews.org	133	nationaljournal.com	124
desmogblog.com	115	buildkxlnow.org	122
grist.org	113	approvekeystonexl.com	115
nrdconline.org	98	house.gov	84
biologicaldiversity.org	92	reuters.com	78
wepay.com	89	fuelfix.com	75
salsalabs.com	87	api.org	70
foe.org	79	senate.gov	67
nytimes.com	79	omaha.com	64
thehill.com	77	startribune.com	61
washingtonpost.com	67	freeenterprise.com	60
nwf.org	65	journalstar.com	56
ecowatch.com	64	gop.com	54
ustream.tv	63	politico.com	54
gptarsandsresistance.org	58	resourcefulearth.org	53
truth-out.org	55	washingtontimes.com	52

Table 5. Mentions and retweets by groups.

	Anti-Keystone XL	Pro-Keystone XL
Total mentions and retweets	4181	2776
National groups	114	142
Others	86	58

number of mentions and retweets of other users across groups. Additionally, we coded each of the top 100 most mentioned or retweeted Twitter users according to whether they are a nationally prominent figure either within political or media circles or within the anti- or pro-Keystone XL movement. This analysis shows that environmental groups were rather more likely to mention or retweet other users. Among the 100 most frequently mentioned or retweeted users, approximately two-thirds to three-quarters were nationally prominent users.

We also used supervised machine learning techniques to classify tweet categories. Figure 3 shows the results of this analysis across anti- and pro-Keystone XL groups. The largest percentage of tweets for both networks were in the 'Ideologically and Identity Reinforcing' category, which shows the importance of this kind of activity in attracting followers and maintaining the network. About 50% of pro group tweets fell into this category compared with just over 40% of anti tweets. 'Informational' tweets were also found across groups, with about one-third of tweets for both types.
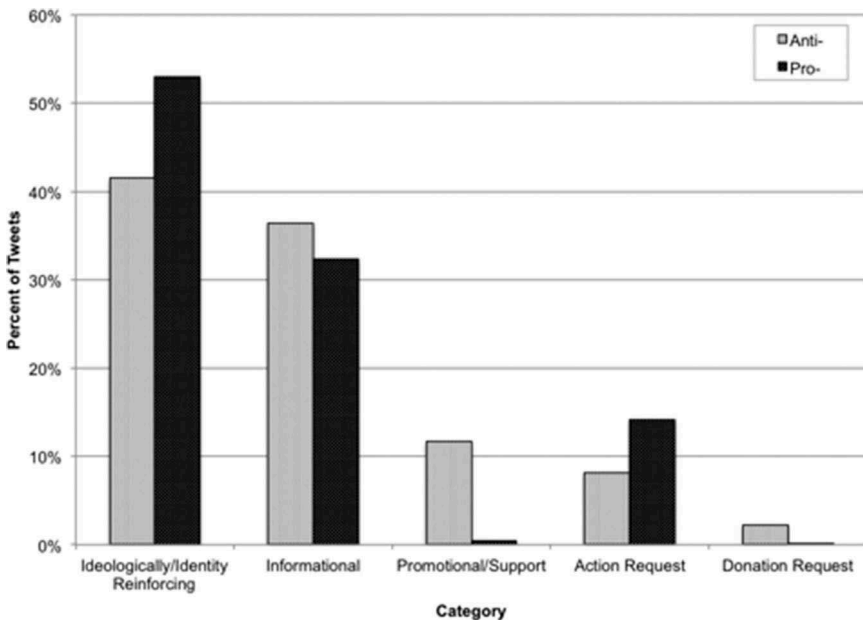
Figure 3. Percent of tweets by category.

There was more distinction between group types in the remaining categories. 'Promotional/Support' tweets were approximately 10% more common from anti groups, while 'Action Requests' were approximately 5% more common from pro groups. Inspection of the latter category showed that pro groups were more likely to urge their followers to contact their Congressperson, whereas anti groups also included an array of other participation requests, including signing petitions and participating in protests. Finally, 'Donation Requests' were very rare among pro groups, with only a single 'Donation Request' occurring.

Finally, we measured the quantity of retweets among the general population. This analysis shows that, although the number of tweets was not much different between groups, anti-Keystone XL groups were far more likely (comprising 98% of retweets) to be retweeted, suggesting a longer and more diffuse reach across the Twitter population (Figure 4).

We further broke this distribution down according to the category of original tweet. Figure 5 shows this distribution as the number of retweets as the multiplier of the number of tweets in each category. Accordingly, if there were 10 Tweets in a category and 50 retweets, this chart would show five for that category. Anti-Keystone XL groups were retweeted at a much higher rate than pro groups. In this network, 'Action Requests' were most prominent, with each tweet averaging nine retweets; 'Informative' tweets followed with eight retweets per tweet, 'Identity Reinforcing' with seven, and 'Promotional' with five.
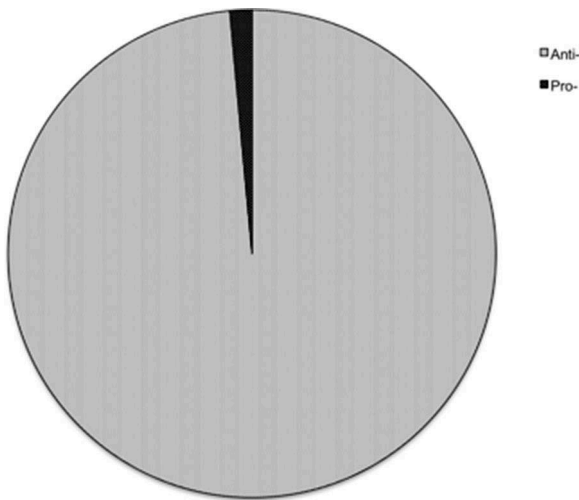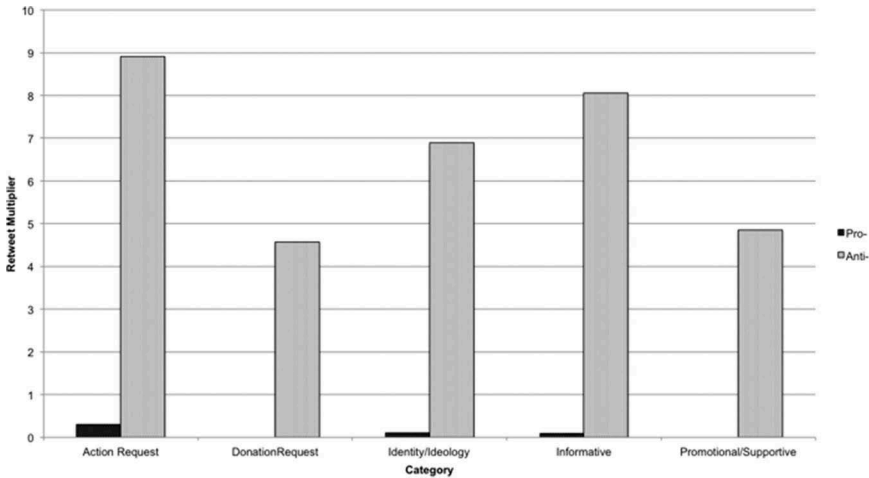

Figure 4. Retweets by group type.

Figure 5. Retweets by category and group type.

Finally, we used an OLS regression to show if categories predicted retweets. The following models were used to assess the predictors of anti-Keystone XL and pro-Keystone XL retweets.

$$antiRT(count) \sim Action + Identity + Donation + Info$$

$$proRT(count) \sim Action + Info$$

The results from the OLS regression are shown in Table 6. In the case of pro-Keystone XL retweets, neither the 'donation' tweet nor any of the 'promotional' tweets were retweeted, so these categories were excluded from the regression. As the variables in both regressions are dummy variables, baseline categories were set as the comparison. For anti-

Table 6. Predicting Keystone XL retweets.

Variables	Anti-Keystone XL retweet	Pro-Keystone XL retweet
Action	4.265*	10.511*
	(1.984)	(5.118)
Identity	3.346	–
	(1.583)	
Donation	0.040	–
	(3.656)	
Info	1.438	9.629
	(1.572)	(5.791)
Intercept	22.662***	16.371***
	(1.429)	(2.926)
N	3603	61
Adjusted R^2	0.0009	0.052

Standard errors shown in parenthesis, Significance 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Keystone XL retweets, this was 'promotional,' and for pro-Keystone XL retweets, this was 'identity'.

As shown in the results, on average, 'action' tweets received four more retweets by the anti groups than 'promotional' tweets did. Similarly, 'identity' tweets were retweeted by these groups three more times than a 'promotional' tweet was. 'Donation' and 'info' tweets were also more apt to be retweeted by these organizations, but not statistically significantly more than 'promotional' ($p = 0.05$). It is important to note here that the adjusted R^2 is very small, meaning this model does not capture much of the variation explaining retweets. That being said, when it comes to retweets, the organizations appear to have prioritized tweets indicative of 'action' or 'identity'. So, if they were interacting with the community, it was to advertise what members of the community have done or to co-opt community identity materials (to stake a claim in terms of community bounds).

In the case of pro-Keystone XL retweets, 'action' tweets were retweeted by these groups on average 10.5 times more than 'identity' tweets were, and this difference is statistically significant. While 'info' tweets averaged nearly 10 more retweets than 'identity' tweets, this difference is not statistically significant ($p = 0.05$). This model accounts for slightly more, but still very little, variation (adjusted $R^2 = 5\%$). Pro groups appeared to prioritize 'action' requests clearly over identity reinforcing messages.

Discussion

According to our analysis, there is mixed support for our three primary hypotheses. Our first hypothesis is concerned with interaction between groups, other groups, and individuals. Our results indicate that anti-Keystone XL groups were significantly more likely to interact with other groups and individuals through links and retweets than pro-Keystone XL groups were. Overall, there was very little interactivity on the pro group side.

Our second hypothesis specifies that anti-Keystone XL groups, compared with pro groups, should be more likely to contribute tweets suggesting ways for citizen involvement, such as action and donation requests. According to the results, both pro and anti groups utilized this strategy as part of their repertoires of action, with pro groups relying on action requests slightly more than anti groups. In addition, both groups rarely solicited donations, but anti groups were more likely to do so than pro groups.

In response to hypothesis three, both sides of the issue relied on identity/ ideological reinforcing tweets. At the same time, only anti groups really relied on these types of tweets in retweets. Anti groups both tweeted and

retweeted tweets that were identity reinforcing, but pro groups did not rely on the same approach with retweet activity.

Finally, there are clear differences in the types of tweets the anti groups and pro groups tended to retweet/share with the rest of the movement. While anti groups were nearly four times more likely to retweet 'action' and 'identity' tweets than 'promotional' tweets, pro groups were 10 times more likely to retweet 'action' tweets than 'identity' tweets. Again, this points to stark differences in strategy.

Conclusion

This research serves to aid our understanding of how groups are responding to social media in their repertoires of action. Specifically, by analyzing an environmental issue fraught with political controversy, which has evolved over a number of years, we were able to demonstrate interesting differences between groups on both sides of this debate.

Despite differences in activity levels, pro- and anti-Keystone XL strategies were relatively similar. In line with the expectations of Bennett and Segerberg (2011, 2012) and others, groups on both sides of the issue appear to have been responding to social media users who seek out environments that are identity reinforcing. While we suspected that tweets suggesting opportunities to get involved would be more common among anti groups, this was not entirely the case. Both sides relied on action requests, with pro groups often asking individuals to contact their Congressperson, and anti groups often citing opportunities to participate in protest. Where we do see a difference is in the donation request category. Anti groups asked for donations via Twitter, but the pro groups did not. This difference likely comes down to variation in resources, with the anti groups more reliant on grass-roots participation and funding, and pro groups backed by corporations and elites. In addition, there was substantive interaction between individual users and anti groups hoping to promote a pro-environmental message, something that did not occur as much on the pro side. Such efforts, central to the theory of 'connective action' run the risk of breaking up the movement. However, they do not inundate efforts on the part of either side of the issue.

Karpf (2012) dismisses many scholars' notion that social media use is a leftist phenomenon. Our findings support his conclusions; it is apparent in the case of Keystone XL, an issue very much divided between left and right, that both sides of the issue turned to Twitter to advance their agendas. Moreover, while we may expect that the anti-Keystone XL movement would be even more likely to take advantage of the 'personalized nature' of social media in order to fight the *status quo*, the findings do not bear this out. While there was more interaction in general between groups and

individual users opposed to Keystone XL, in line with 'connective action,' groups in favor of the pipeline were just as likely to rely on tweets that were ideological/identity reinforcing, a sign that they were also seeking to leverage the potential advantages of 'connective action.' Such nuanced differences suggest a multitude of opportunities for political science and communication scholars to continue to advance the way in which social media is influencing communication strategies and the political process more generally.

This work can be expanded in a number of ways. First, initial review suggests more nuanced differences between local versus national groups on both sides of the issue. We intend to tease out these differences to build on our theoretical understanding of how groups adapt to social media. In addition, similar work needs to be carried out across a range of issues to determine when the theory relied on here holds up, when it does not, and why. In line with this, it will be important to investigate an issue over time, identifying periods when one repertoire of action may dominate over others. In sum, the evidence presented here is consistent with many of the expectations about how social media is changing political communication and participation. At least in the case of the debate over Keystone XL, groups are relying on this new medium to frame the issue and mobilize support among the public and elites. Twitter users have an expectation for how they can participate politically in this new environment, in a more flexible and personalized manner than before. While they are still adapting to this shift, the response on the part of groups reflects this reality.

Notes

1. In July 2010, the Enbridge pipeline spilled 840,000 gallons of 'DilBit' into Michigan's Kalamazoo River (Parfomak *et al.* 2013).
2. In 2012, TransCanada proposed a new route through Nebraska, which was deemed unconstitutional by a Nebraska court (Colman 2014). Following this, the State Department submitted its assessment of the new route, claiming no significant climate impacts, but the EPA continues to challenge this (Eilperin 2013). In March 2013, Mother Jones criticized the EIS, noting that the contractor was previously paid by TransCanada (Kroll 2013).
3. After data collection on this project had concluded, the US Congress passed a bill that forced President Obama to approve the project. Citing Constitutional concerns, Obama vetoed the bill, which the Senate failed to override (Davenport 2015).
4. Consider efforts by Latin American environmental groups to promote access to natural resources and environmental quality (Christen *et al.* 1998), how environmental groups were allowed to participate in NAFTA negotiations (Evans and Kay 2008), and the role of various groups in the cap and trade debate in the US (Skocpol 2013).
5. According to Dunlap and Mertig (1992), the amount of diversity found in the environmental movement questions the extent to which it can be called 'one' movement and yet coalitions are possible for particular issues. See Mitchell *et al.* (1991), Carmin (1999), and Carmin and Balser (2002) for examples of fragmentation.
6. Daniel Faber (2007) notes the difficulty of balancing the potential of coalitions between social and environmental movements with the possibility of greater fragmentation.
7. Training was conducted separately and jointly by the co-authors to ensure consistency.
8. Figures 1 and 2 plot the weighted moving average of the Tweet count, not the raw Tweet count.

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