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Who wags the dog? Polarizing political rhetoric in a multicultural Canadian society

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Abstract

In the run up to an election campaign, politicians start spending heavily to frame themselves and their own policies favourably and their opponents negatively. In first-past-the-post systems particularly, candidates use inflaming political rhetoric to vilify their opponents and try to increase their support base for the upcoming elections. Within a multicultural audience, strongly inflaming rhetoric can both ring hollow as many disregard it, and still increase segregation and polarization amongst certain segments of society. Focusing on content shared on Twitter by Ontarians in the build up to the 2018 summer provincial, we evaluate the current scale of polarization and whether the "echo chamber" hypothesis applies to the Canadian case. Furthermore, we assess the ability of political leaders to disseminate content beyond their direct followers, commenting on the potential for increased polarization in the province as a result. We find that Ontario society is marginally polarized along a conservative-liberal axis, and reveal methods that will be used to evaluate the content shared in the upcoming Provincial election.

1 Introduction

Polarization has been widely observed in Social Media platforms, as users self-segregate themselves into often isolated communities of like-minded individuals. Political polarization, where individuals become detached from contrasting political opinions and stuck inside "echo-chambers" and "filter-bubbles", has received widespread attention from academics (Adamic & Glance, 2005; Livne, Simmons, Adar, & Adamic, 2011) and mainstream media (Viner, 2017). However, while widely observed, including in Canada (Gruzd & Roy, 2014), the scale of the issue varies between geographies; and its impact on society is still being widely debated (Barberá, 2014; Bakshy, Messing, & Adamic, 2015; Colleoni, Rozza, & Arvidsson, 2014; Sunstein, 2017).

At the same time, elections frequently elicit polarizing language from political candidates who use inflaming and divisive rhetoric to define themselves, their party, and their platforms by negatively portraying and vilifying their opponents. Social Media have changed how democratic elections are waged, greatly expanding the reach and potential impact of candidates, allowing them to both adapt the content of their message to different platforms and isolated audiences and to spread their message to a wider voting base, enhancing their ability to influence the public (Stier, Bleier, Lietz, & Strohmaier, 2018; Dubois & Gaffney, 2014). Furthermore, elite polarization has been demonstrated as capable of acting as a catalyst for wider mass polarization (Abramowitz & Saunders, 2008). At the same time, social media has also played an equalizing role on the political information distribution monopoly by providing a platform for organized segments of the population to mobilize and engage their candidates directly and lobby for policies that suit their interests (Dür & Mateo, 2014; Jeffares, 2014). However, as the central position of politicians, and the traditional media who widely report on their actions, including through on-line social networks, has been maintained, this has resulted in the maintenance of politicians as gatekeepers and information broadcasters (Jürgens, Jungherr, & Schoen, 2011) within social networks and their continued ability to widely disperse political rhetoric, polarizing or not, during election campaigns.

The purpose of this working paper is to shed light on how rhetoric around elections distributed by main political candidates influences the discussed agenda of a country's politically engaged Social Media public. Tracing the causes of the growth of polarization is an important pre-requisite to the larger debate on whether social media supports or harms social cohesion in society. Both academic and public discourse is divided on the issue (J. Tucker, 2018). On the one hand, evidence pointing to the creation of "echo-chambers" or "filter bubbles" (Bakshy et al., 2015), where users self-segregate themselves into isolated communities with like-minded individuals has been well documented across many geographic regions (Colleoni et al., 2014). On the other, the spread of information across community lines has continued (Barberá, 2014), and the breakdown of isolation amongst some virtual social groups, even supporting the mobilization and coordination of mass protest actions (Jost et al., 2018), has also been demonstrated. While it is accepted that both attributes coexist (Barberá, Jost, Nagler, Tucker, & Bonneau, 2015), in recent years discourse amongst the public and especially the media has shifted towards a more negative perception of platforms such as Twitter, as they can act as enablers of abusive governments (J. A. Tucker, Theocharis, Roberts, & Barberá, 2017) and even 'endanger democracy' (Sunstein, 2017).

While the topic has attracted considerable attention from scholars, much of the focus has been on highly polarized societies such as the United States (Conover et al., 2011; Bakshy et al., 2015; Jungherr, 2016; Abramowitz & Saunders, 2008), with little attention directed towards Canada (Gruzd & Roy, 2014) or similar pluralistic societies. Given their stable and inclusive populations, we hypothesise that shifts in polarization as a result of divisive election rhetoric, while subtle, can be more noticeable and visibly demonstrable in such countries. Canada in particular, is a useful object of analysis due to its highly inclusive and pluralistic society (Adams, 2007), with the country often scoring high in international indices on this regard.¹ There is however evidence of discord, as Canada has witnessed popular grass-roots organizers and social media mobilized political actions, such as the 2012 Quebec student protests, dubbed the 'Maple spring' (Raynauld, Lalancette, & Tourigny-Koné, 2016), or the 'Idle No More' Aboriginal protest movement (Raynauld, Richez, & Boudreau Morris, 2018). Furthermore, populist and anti-inclusive political rhetoric has also been espoused by some politicians, such as Kellie Leitch's proposal for a "Canadian values" test during the last federal election. While this specific instance was not widely embraced by Canadian society at the time, recent polls have indicated that populist sentiment is attendant in the country.² The recent election of Doug Ford as the leader of the Ontario Progressive Conservative party of Ontario on March 12th, 2018, with his use of populist and simple 'working man' rhetoric leading some journalists to compare him to Donald Trump (Dehaas, 2018), underlines the presence of populism and roots of discord in the country.

Canadians' use of Social Media is well demonstrated. For instance, two thirds of Canadians use Facebook and over a fifth use Twitter on a weekly basis. ³ This research specifically focuses on Twitter due to its inherent public nature and high adoption, both as an official tool used by politicians in Canada to disseminate information and engage with their electorate, as well as its use by politically engaged Canadians. Unlike more popular platforms such as Facebook and LinkedIn, Twitter is an inherently public

¹For instance in 2015, Canada was 6th in the Migrant Integration Policy Index, and 1st in anti-discrimination. Source:http://www.mipex.eu/canada

 $^{^{2}}$ A February 5, 2018 report by Ekos Politics and the Canadian Press revealed a noticeable rise in the recent expression of populism in Canada. Source: http://www.ekospolitics.com/wp-content/uploads/crossroads_of_hope_and_fear_february_5_2018.pdf

³To the knowledge of the authors, no single poll covers this topic comprehensively, however the pattern is clear from a diverse set of surveys: According to Canada's national statistics agency (Statistics Canada), 92% of Ontarians are active internet users (2016 General Social Survey), and back in 2012, 67% of Canadians used the internet to access social networking sites (2012 Canadian Internet Use Survey, the latest completed); According polling organizations such as Pollara in 2017, 91% of Canadians use at least one social media network, with 34% having a Twitter profile (38% of Ontarians), and 30% of social media users follow political parties and politicians. Source: http://canadiansinternet.com/social-media-use-in-canada-2017/

micro-blogging platform and has been widely embraced in Canadian politics. Indeed politicians in the country were early adopters, taking up this new medium for municipal, provincial and federal elections (Raynauld & Greenberg, 2014). Active citizens and protest groups also favour Twitter, especially as a means to coordinate protest actions (Raynauld et al., 2018), including utilizing Twitter metadata such as hashtags to help spread information beyond the organizers' immediate followers (Small, 2011). The adoption of automated tools such as bots to distribute or obscure information has also been witnessed in Canada (McKelvey & Dubois, 2017).

This paper focuses on the province of Ontario, the most populous of all Canadian provinces, as its key characteristics make it a interesting, informative, and relevant case study. On the one hand it has a highly diverse population, being the home to over half of foreign born Canadians, as well as attracting on average over 40% of all new immigrants entering the country.⁴ On the other hand, the province has been experiencing polarization in both its economy and political scene over the past several years. For instance it has the highest income inequality in the country,⁵ and politically, the ruling Liberal party, after 15 years in power, are very poorly viewed by Ontarians.⁶ To compensate for this, and a set of political scandals, the governing Liberal party has been introducing legislation and policies during 2017-18 to positively position the party for the July 2018 provincial election.

The Ontario pre-election period is hence particularly interesting, as it has resulted in a combination of both a rich discussion on widespread policy areas, as well as a due share of polarizing rhetoric and events from all sides. While the campaign has not formally begun, the governing Liberal party is limited from explicit electioneering and instead focuses on releasing major policy and legislative changes. These changes have led to broad discussions by both the opposition parties on actual policy change being implemented. For instance the implementation of a \$14 minimum wage throughout the province on January 1, 2018 resulted in the opposition parties, the New Democrat party (NDP) and Progressive Conservatives (PCs), having to expressing their opposition to the governing Liberals by reacting with a set rhetorical approach so as to highlight specific negative affects of the change. As such arguments are often repeated and discussed by the wider political society on Social Media, these policy discussions allow us to evaluate how shifts in rhetoric and major policy announcements affect the opinions of Canadian Social Media users.

1.1 Research question

The research sheds light on whether discussions seeded or influenced by political leaders of the three main political parties in Ontario, the PCs, the Liberals, and the NDP, affected the overall expressed opinions on Social Media.⁷ Particularly, we evaluate **the scale of polarization present in on-line Ontario society today, evaluating the potential for increasing polarization as a result of political rhetoric spread by Ontario politicians**. This is done both generally against the overall discussion by all social media users, but also in relation to the network structure and political polarization on-line. Given these consideration, we focus our investigation on three key parts:

• to frame the discussion, we first ask whether polarization previously detected in the case of Canada still exists in on-line social networks, particularly in Ontario;

 $^{^{4}}$ According to the 2011 Census, 53.3% of foreign born Canadians live in the province, and 43.1% of immigrants choose Ontario, a stable pattern from previous years. Source: http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-010-x/99-010-x2011001-eng.cfm

⁵According to a 2013 Conference Board of Canada report, Ontario had the highest Gini coefficient amongst all provinces. Source: http://www.conferenceboard.ca/hcp/provincial/society/income-inequality.aspx

⁶For instance, a poll by Angus Reid Institute on March 24, 2017 showed a record low approval rate for Kathleen Wynne, the Liberal Premier of Ontario, of 12%, much lower than the support of any other Premier in Canada.

⁷Of the three parties', there are five individuals considered: Kathleen Wynne of the governing Liberal party, Andrea Horwath of the Ontario NDP party, and three leaders of the PC party: Patrick Brown, Victor Fedeli (interim leader following the resignation of Patrick Brown), and Doug Ford. Furthermore, the sample of data collection is still ongoing. Hence in this research we focus on Patrick Brown, while also commenting on Doug Ford where metrics allow.

- to evaluate the potential for influence, we assess how Ontarians react to newly introduced policies and resonant political information;
- finally, we determine the impact of political leaders in distributing information and political statements, commenting on their ability to set the agenda in on-line discussions.

The operationalization of these research questions requires several tasks. (1) We detect the natural communities present in the friendship network of users discussing Ontario politics. Particular attention is given to indicators of polarization, including homophily for the overall network, to validate whether the "echo chamber" theory applies to Ontario political discussions on Twitter. (2) In the context of a rapid release of numerous policies and laws, as well as a turbulent and eventful pre-election period, we examine how Ontarians react to political information. The segregation of the detected communities will thus also be scrutinized, as variation in the language shared by users in different communities reacting to the varying events will demonstrate if communities are homogeneous groups of like-minded individuals with similar political and ideological preferences, or simply a collage of loosely affiliated accounts. (3) Within the overall identified network structure, we also observe how users in various communities react to agenda setting by leaders. Particularly, we identify whether rhetorical statements by political leaders have demonstrated ability to set an agenda amongst different communities. We conclude with comments about the ability of political leaders in Canada to foster polarizing opinions within on-line social networks and the potential effectiveness of utilized political strategies.

2 Data and methodology

2.1 Social Media data

This research is based on data collected from the Twitter Streaming and REST Application Program Interface (APIs). Between December 10, 2017 and February 20, 2018, the Streaming API was used to collect live tweets relevant to Ontario politics. As such, hashtags commonly used to denote Ontario politics (such as #ONpoli) and Twitter accounts of the leaders of the three largest political parties in Ontario, as well as the parties actual Twitter accounts, were included (Table 1). At the same time, the GET friends feature of the REST API was used to collect the friendship connections of all captured users. To isolate captured data to Ontario from the overall collected sample required further pre-processing. For instance as quotes includes tweets that might have nothing to do with Ontario politics, we filtered the overall sample using each users' specified location to focus strictly on those users residing in the province. This resulted in a final dataset of 101,417 users linked to each other through 10,762,288 follower links, sharing 299,431 tweets, 90,760 quotes, and 473,884 retweets. ⁸

2.2 Polarization and homophily

Firstly, this research evaluates whether polarization in the political network of Canadian Twitter users, first identified by Gruzd and Roy (2014) using a tiny sample of users discussing the 2011 Federal Election and widely observed internationally (Colleoni et al., 2014; Zherebtsov & Goussev, 2017; Adamic & Glance, 2005; Kwak, Lee, Park, & Moon, 2010), is still valid, as well as assesses its scale. As the "echo-chamber" hypothesis posits that individuals are expected to follow, but also have discussions with predominantly like-minded individuals, we focus on evaluating the natural communities formed by users self-selecting who they follow on Twitter. Follower relationships represent listening to what a specific user shares and are the foundation of the Twitter network, with users expected to follow users who are either authoritative, produce topically relevant (Dubois & Gaffney, 2014; Myers & Leskovec, 2014) information, or those they agree with. The latter has been explained psychologically as a mechanism by which users minimize their

⁸As quoting a tweet allows a user to add commentary to another users' tweet and for them to be displayed together, we noticed this was highly adopted to express opinions about policy announcements or statements of Ontario political leaders.

Table 1:	Keywords	for the	collection	of Tweets	from	the	Streaming	API
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Category/Political party	Keywords			
General political discussions	onpoli, QueensPark			
Ontario Progressive Conservative (PC) party	OntarioPCParty, PCPO, brownbarrie, VicFedeliMPP, VictorFedeli ⁹			
Ontario Liberal party	OntarioNDP, ONDP, AndreaHorwath			
Ontario New Democrat Party (NDP)	OntLiberal, Kathleen_Wynne			

cognitive dissonance to avoid facing with discordant opinions (Festinger, 1954), resulting in self-isolation towards like-minded individuals, also known as the 'filter bubble'.

Detection of communities is done using the *Infomap* algorithm, a well performing algorithm (Lancichinetti & Fortunato, 2009) appropriate due to the directional nature of the follow relationships (Rosvall, Axelsson, & Bergstrom, 2009), and visualized using the *ForceAtlas2* force directed layout (Jacomy, Venturini, Heymann, & Bastian, 2014). To numerically evaluate the scale of polarization in the network, the modularity statistic is calculated, providing an indicator between -1/2 and 1 for the strength of the division of the network into isolated node clusters. Due to the insufficiency of modularity and community detection methods to independently validate the presence of polarization in networks (Guerra, Meira Jr, Cardie, & Kleinberg, 2013), especially in light of the recognized homogenety and inclusiveness of Canadian society, several supporting methods are also utilized. Hashtags are hence used, as well as to support the evaluation of how different communities react to newly introduced policies or political information.

Specific attention is directed towards the 'leaders' of the Ontario political scene as evidence on Canada has showed that leaders play an important and influential role in the social-network of the country (Dubois & Gaffney, 2014). We hence focus on the official accounts of the three political parties and the party's leaders leaders accounts as well. This includes assessing the network of the users who follow the political leader accounts, an informative approach as it validates whether there are political and ideological overlap between the detected community structure and the preference for political information that users obtain by following one of the three political leaders/party accounts. Alternative methods also include qualitative evaluation of the content shared by users within specific communities, notably retweets. The political and ideological preferences, as well as polarization of the network can be observed if users from different communities demonstrate dissimilar preferences to retweet specific leaders. While political leaders are retweeted for various reasons, including homophily, informativeness, the credibility of the leader, or general interest in the topic the leader shares (Boehmer & Tandoc Jr, 2015; Boyd, Golder, & Lotan, 2010), the ability to disseminate content outside of the leaders' immediate followers and into other communities can be considered a key election strategy. As such, the node distance method, also known as the degree of separation, is utilized to determine how influential a specific political leader is. While Twitter is generally understood to be a tight network with an average of 3.5 degrees of separation (Kwak et al., 2010), the average distance between users who retweet a leaders' content and the leader themselves is a useful indicator of the inclination to positively react to a leaders' content.

2.3 Analysis of Text

Hashtags are not a perfect method of categorizing Twitter content, as users either don't always use them, or don't use them accurately and consistently. To support the assessment of polarization and whether political leaders can disseminate content to affect the discussed agenda within the wider network, we adopt Natural Language Processing methods to extracting the topic attributes that Ontarians discuss in their tweets. Evaluating the entities of a topic (or sub-topics) is combined the detected communities to summarize the opinions of that specific group, as well as its dynamics over time. The latter is particularly useful in combination with distance analysis, it depicts whether political leaders affect a shift in the discussion occurring within a community.

An established methodological approach to extract topic entities is opinion mining, widely utilized in Computational Linguistics and becoming adopted in Political Science research as well (Grimmer & Stewart, 2013). While opinion mining is part of a larger set of NLP methods, including categorizing a set of documents by topic of discussion (Roberts, Stewart, & Tingley, 2016), or modeling sentiment to support the topic categories and extracted entities, we prioritize entities due to the often factual discussions occurring on each policy and political event. Indeed in policy discussions, factual arguments about the benefits or weaknesses of a specific approach predominate, often one side describing one set of benefits, while the other describing its weaknesses.

Due to the challenges of extracting entities from tweets, we adopt common linguistic heuristics (Poria, Cambria, & Gelbukh, 2016). Particularly, we (1) pre-process each tweet to remove Twitter particularities (hashtags, urls, RT tags, etc) and noise, to model as closely as possible clean edited text. (2) We utilized the spaCy parser due to its high accuracy (Choi, Tetreault, & Stent, 2015; Honnibal & Johnson, 2015), and (3) extracted topic entities commonly understood to be nouns and noun chunks (Patel, Prabhu, & Bhowmick, 2015; Poria et al., 2016), as well as named entities (such as Names).¹⁰ Finally, (4) we adopted further heuristics, such as removal of stop words from identified entities to improve accuracy.¹¹ The resulting list of topic entities were linked to the tweets they originated from, allowing us to detail which community they were shared in and at what time.

3 Initial Findings and Discussion

3.1 Polarization in Canada

Nominally, politically active society in Ontario reveals itself to be moderately homogeneous and not highly polarized. Visualizing the friendship network of Ontarians who shared content related to Ontario politics (Figure 1) reveals a striking coalesce, as the majority of the network is grouped together, unlike polarized networks of US (Livne et al., 2011; Conover et al., 2011) or Russian (Zherebtsov & Goussev, 2017) political users. Community detection supports this, as one dominant political community of users is present in the very centre, with a small plethora of other communities surrounding it. Furthermore, the network reveals quite low indicators of segregation through a low modularity coefficient (of 0.298), demonstrating that while there are distinct communities, there is high interconnectedness between each. Investigation of the six largest and most active communities defines the segregation that does exist, demonstrating that the polarization that does exist in Ontario on-line political society is strongly correlated along ideological lines, visible in a right-left, or conservative-liberal axis.

The largest and most central of communities (Figure 1), which we refer to as Central, encapsulated almost half of all the users in the network and distributed on average half the content (Table 2). This community displayed a mix of content and sentiment on all topics, and included users who follow all political parties. This community shares pro-liberal and left ideological sentiment, however also disseminating a considerable amount of pro-conservative (or Progressive Conservative) content, demonstrating the pluralism of Canadian society. However, the larger proportion of users from this group who support the Liberal and the NDP parties compared to lower support for the PCs (Table 3) indicates the close correlation of Liberal and NDP policies, as a 'shift left' is an active Liberal election strategy in 2018 observed within mainstream

¹⁰For instance a tweet often has multiple entities, such as 'minimum wage', 'inflation' and 'jobs'. The use of noun chunks versus strictly nouns provides added detail as 'wage' alone is less informative.

¹¹For instance 'minimum wage' and 'the minimum wage' were identified separately.



Figure 1: Friendship network of users discussing Ontario politics

Modularity of network: 0.2980

media (Radwanski, 2018). On the right, two conservative communities are observable. The light-purple (4th) we classify as more central or moderate of the two, as the community displays high support for Patrick Brown (the former leader of the PC party), as well as the official PC party account. The out-most community, green(2nd), reveals stronger anti-Liberal and pro-Conservative rhetoric. Strong support for Doug Ford pervades this community, and few users within this group retweeted Patrick Brown or expressed strong support for his policies and him personally. Finally, on the very left, we categorize the dark-green (8th) community as a pro-Unions left-leaning group, in part due to its users reacting positively to the NDP and somewhat in a somewhat muted fashion to the Liberals and Kathleen Wynne specifically, but also due to several Ontario Teachers' being the central 'influencers' of this community. Furthermore, the community strongly favours school and education related topics and related content.

Two further communities are important to mention, due in part to the size and strength of their participation in Ontario political discussions, as well as revealing further polarization of opinions and preferences in Canadian society. We categorize the Teal (1st) community as generally pro-left but unsupportive of Kathleen Wynne or the Liberal government, its users' often shared derision for policy decisions of the Liberal government, often commenting on the historical record of the Liberal government or distrust in Kathleen Wynne in properly manage a specific change. The light-orange community (5th), similar to the dark-green (8th) community, exhibits support for left-policies and parties, including the NDP and the Liberals, but shares content predominantly on the healthcare topic, including requirements of doctors and costs they need incur and patient-care.

While overall Canadian society is somewhat polarized across the conservative-liberal axis, the political accounts of the three main political parties attract followers and users to retweet their content from the central and largest community (Table 3). Furthermore, identifying the users who followed either the official account of one of the three main political parties or the party leader to evaluate interaction of followers by political party (Figure 2). We find that there is a high quantity of overlap between the followers of specific parties, demonstrating the importance of the three political leaders as key information disseminators for the overall network, as well as the high scale of political homogeneity in Ontario. The scale of overlap further demonstrates that despite the ideological right-left polarization present, political leaders are not highly segregated from each other.

3.2 Communities reaction to policies

Between November and March of 2017-18, the span of the collected sample, several salient political events have dominated the discussion occurring on-line in Ontario, causing spikes of activity far exceeding daily average rates (Figure 3). To further evaluate the detected communities and validate the observed right-left polarization axis, as well as contextualize the impact of leaders in setting the discussed agenda, we focus on three information events, two policy related and one political. Firstly, we focus on the 'minimum wage' debate, evaluating general preferences for specific policy attributes and hashtags within each community. This event is informative as legislation on raising minimum wage to \$14 an hour, with plans to raise it further to \$15, is a key re-election strategy for the Liberal government, and has caused a large discussion on-line on the policy. Furthermore, Kathleen Wynne, the Premier of Ontario, rhetorically attacked several Tim Hortons' franchisees on Twitter on January 4th and 5th, 2018 due to their announcement to cut paid breaks of their workers following the January 1st minimum wage hike. Being a Canadian icon, Tim Hortons is also highly adored by many Canadians, with the rhetorical attack polarizing opinions and segregating Ontarians as either for or against the policy and the Premier. Secondly, we evaluate on-line discussion on Hydro One and electricity, as the costs for this utility have been highly political over the past several years amidst relatively high rates compared to other provinces in the Country. In a bid to lower rates, the Liberal government has launched a strategy to subsidize costs, which went into effect on January 1, 2017.¹² Finally, we also focus on the conversations resultant form Doug Ford winning the leadership race

 $^{^{12} {\}rm For}\ {\rm more}\ {\rm information},\ {\rm see}\ {\rm summary}\ {\rm on}\ {\rm the}\ {\rm issue}\ {\rm of}\ {\rm electricity}\ {\rm and}\ {\rm costs}\ {\rm for}\ {\rm the}\ {\rm province:}\ {\rm https://www.theglobeandmail.com/news/national/why-does-electricity-cost-so-much-in-ontario/article33453270/}$

Community colour (num- ber)	Number of users	Number of tweets	Number of retweets	Av. num. of tweets per account	Av. num. of retweets per account
Central (0)	44,209	164,839	214,009	3.73	4.84
	(43.6%)	(55.1%)	(45.2%)		
Teal (1)	$4,\!621$	$3,\!809$	5,070	0.82	1.10
	(4.6%)	(1.3%)	(1.1%)		
Green (2)	8,364	$10,\!893$	$16,\!557$	1.30	1.98
	(8.2%)	(3.6%)	(3.5%)		
Ligh-purple (4)	3,867	$58,\!480$	109,053	15.12	28.20
	(3.8%)	(19.5%)	(23.0%)		
Light-orange (5)	2,165	5,165	$14,\!625$	2.39	6.76
	(2.1%)	(1.7%)	(3.1%)		
Dark-green (8)	1,586	1,914	5,435	1.21	3.43
	(1.6%)	(0.6%)	(1.1%)		
Total	$101,\!417$	$299,\!431$	$473,\!884$	2.95	4.67

Table 2: Ontario pre-election period, statistics by community

Note, the number of users column displays the users who tweet or retweet, hence the average tweets per user may be below 1, indicating that a large quantity of users simply retweeted others' content but did not author their own tweets.

Note also, we did not include information on the dark-orange community as it was not consistenly partof the Ontario political scene. This group was made up of Iranian-Canadians displaying support for the 2017-18 Iranian protests, due to their small size and lack of continuity, with their activity peaking in close correlation with the December/January protests.

Table 3: "Echo chamber" statistics: proportion of users who follow party accounts by community

Community	% Liberal	% Liberal	$\% \ \mathbf{PC}$	% PC	$\% \ \mathbf{NDP}$	$\% \ \text{NDP}$
name (number)	followers	retweetors	friends	retweetors	friends	retweetors
Central (0)	70.4%	78.1%	67.0%	59.5%	71.8%	73.6%
Teal (1)	1.2%	1.6%	0.7%	0.4%	0.8%	0.9%
Green (2)	0.9%	0.5%	2.4%	3.7%	0.4%	0.1%
Light-purple (4)	2.9%	2.6%	9.1%	20.5%	2.6%	0.6%
Light-orange (5)	3.3%	1.5%	2.8%	1.5%	2.6%	0.8%
Dark-green (8)	2.9%	1.6%	0.9%	0.2%	2.8%	4.2%
Total	18,316	$16,\!277$	11,364	14,965	10,705	13,434

From the captured sample, the number of users who follow or retweeted either the party leader or the official party account by community were determined as a percentage of all followers/retweetors for that party.

Note, while outside the timeline of this working paper (cut off, February 20, 2018), replacing Patrick Brown with Doug Ford as the leader users, the dynamic of users who retweet PCs changed: Central (0) community declined to 36.7%, the green (2) community grew to 11.1% and the Conservative (4) community increased to 37.5%.



Figure 2: Venn diagram of users who follow the three main Political parties

Of all users in the captured sample of 101,417 users, 25,992 were identified to follow at least one of the official political party accounts (either the official party account or the party leader). The above numbers display the proportion of users who fall into a specific set.

Note: this data was based on Patrick Brown as the leader of the PC party and not Doug Ford.



Figure 3: Overall activity rates on Ontario politics, December 10, 2017-March 29, 2018

of the PC party on March 10th, 2018. The three events, the two former policy oriented, and latter political, were quite resonant in Ontario political discussions, with the latter even attracting National, and possibly international media attention.

3.2.1 'Minimum wage' debate

Debate around expanding minimum wage and supporting low income earners, a policy commonly supported by ideologically left-leaning governments and parties, explains the divergence of opinions of the event along detected ideological and community lines (Figure 4). Communities 0 (central), 8 (teachers), and to a lesser extent 5 (healthcare) expressed support for the policy. For instance the Central community's top hashtags include #15andFairness, #LivingWage, #boycottTimHortons, and #IStandWithTimHortonsWorkers¹³ (Figure 4a), and topic entities such as 'minimum wage', 'workers' or 'living wage' (Figure 4b). Content popular in community 8 (teachers) included similar sentiment, with #15 and Fairness as the most highly utilized hashtag within the group. The teal (1st) community was also supportive of the policy. The conservative communities however demonstrated quite negative reaction to the policy change, with the Green (2nd) group virulently opposing the policy and outlining the negative costs to business as a result. Furthermore, the differences between the moderate and more extreme conservative communities was revealed in part due to the preference for different content between the two. The moderate conservatives (4th) engaged in a more policy-related discussion, focused on the main #minimumwage and #onpoli hashtags, whereas users in the green (2nd) community focused their emotional reactions around the individuals, using #wynne and #liberals hashtags as their main coordinating topics.

¹³The boycott issue came about as a result of the rhetorical attack by Kathleen Wynne, with many people calling for a boycott of the Tim Hortons locations run by the franchisees cutting paid breaks for workers.

Figure 4: Minimum wage debate

(a) Top hashtags by community



(b) Top discussion entities by community



Note, only the top hashtags and attributes are displayed (those with at least 1% usage by the users in the community relative to the total number of hashtags or attributes used). Alongside the heatmap, this approach visibly demonstrates only those topics which are most important to the community.

3.2.2 Hydro One and electricity costs

Hydro One and electricity costs are important for Ontarians for two reasons. On the one hand, this topic has become an central Ontario election issue due to the high costs borne by Ontarians for this utility. On the other, the topic is highly complex and nuanced, hence potentially providing a more complex picture of the opinion sets expressed in each community and further assessing the detected right-left ideological polarization. Part of the discussion stems around the topics such as cost increases resultant in part to policy mistakes made by the Liberal government over the preceding 15 years, a controversial subsidy on electricity, and the privatization of Hydro One, an electricity transmission utility. The importance of the topic has been underscored by the PC party committing to investigate the topic, and the NDP making re-nationalization of Hydro One a policy platform for this upcoming election. Indeed, in our captured sample, every political leader except Doug Ford has shared content on this topic.¹⁴

We found that the topic was surprisingly not highly resonant or interesting to Ontarians during the time-span of the captured discussions, as most communities did not debate the issue to a high extent. We identified the largest interest in the topic from the Central (0), the light-purple (moderate conservatives, or 4th), and to a lesser extent from the Green (2nd) communities.¹⁵ Within these three groups, we did not detect differences in the opinions expressed on this topic aligned with the right-left ideological axis. While the two Conservative communities did express a larger relative dismay at high electricity costs by discussing different topic-entities, especially the Green (2nd) group, qualitative analysis of the content shared within each community revealed that this has more to do with specific language choice rather than opinions expressed. As users in the central community expressed similar negative opinions on the topic, including on the merits of privatization, as users in the two conservative communities, we hypothesize that the negative perception of high electricity costs as a Liberal failure resulted the topic not causing opinion polarization throughout the network.

3.2.3 Election Doug Ford as leader of the PC party

Doug Ford is a well recognized politician in Ontario and to an extent, nationally as well. Ford is known in part as the brother of former Toronto mayor Rob Ford, but also for the right-wing, populist and simplistic rhetoric he uses (Shelley, 2018). Indeed statements about being able to save large public expenditures, cut costs, and how his experience running a private sector business would support his public sector career has often caused negative comparisons between him and Donald Trump in Canadian media (Dehaas, 2018). As expected, Doug Ford as a topic of discussion on-line reveals polarization across community lines partly in-line with the ideological right-left axis. The conservative communities, Light-purple (4th) and especially Green (2nd) communities expressed a highly positive reaction to his successful selection as PC party leader (Figure 6). Hashtags including #DougFordforPremier, #WynneMustGo, and #Ford4Premier were used by users in these groups. On the other hand, the much more pro-left communities of Dark Green (8th, teachers), Teal (1st, left but anti-Liberal), and light-orange (5th, healthcare), instead distributed strong anti-Ford rhetoric, including #NeverFord, #DrugFord, #AnyoneButFord. Where the same hashtags were used, such as #fordnation, opinions were split by community, with pro-Ford communities expressing positive, and anti-Ford communities expressing negative sentiment. The central (0) community displayed a range of opinions, in part due to being the most central group encompassing most Ontarians, but possibly also due to the low popularity of the governing Liberals and Kathleen Wynne in the province at this time. On the one hand, a certain proportion welcomed the success of Ford and displayed anti-Liberal sentiment. On the other, a large amount of anti-Ford rhetoric was also shared.

 $^{^{14}\}mathrm{The}$ PCs tweeted 31 times, NDP 25 times, and Liberals 6 times on this topic.

¹⁵These three communities shared a total of just over 2100 tweets on the topic.

		Communities	
attribute	Central (0)	Green (2)	Light-purple (4)
hydro	6.658%	4.624%	7.062%
ontario	2.096%	2.312%	2.109%
hydro rates	1.789%	3.468%	1.618%
privatization	2.354%		
hydro bills	1.403%	4.624%	1.864%
people	1.419%	1.734%	0.932%
hydro bill	1.096%	4.046%	1.275%
hydro one	1.338%		
electricity	0.919%		1.324%
wynne	0.725%	1.156%	1.815%
province	0.725%		
taxes			0.932%
kathleen wynne	0.613%	1.156%	
cost		1.156%	
money			0.736%
liberals			0.785%
high hydro rates			0.736%
minimum wage		1.156%	
business		1.156%	
thanks		1.156%	
carbon tax		1.156%	
toronto		1.156%	
christmas		1.734%	
second job		1.156%	

Figure 5: Top topic entities by community, Hydro One and electricity costs

3.3 Impact of Leaders

To evaluate the potential for 'influence' of the main political leaders in Ontario, we evaluate the average distance of users who retweet their content (Table 4). Distance, colloquially known as 'degrees of separation', is understood as the number of connections between two users.¹⁶ Adopting the average distance of users who retweet content of the main political leaders and party accounts provides a statistically aggregated indicators of the capacity of the leader's message to be seen beyond his/her immediate followers. While it is important to consider the indicator in relation to the nominal number of followers the leader has, as a very high number of followers may lower the average degree of spread content, the moderate number of nominal followers Canadian political accounts have (in relation to the large followings often enjoyed by multinational political leaders), as well as the low and almost balanced number of followers within the captured Ontario network (Figure 2) allows us to evaluate accounts in relation to the impact of the majority of politicians is quite low, averaging at a distance of 1.3 degrees. Interestingly however, Doug Ford and the official account of the PC party demonstrate the highest and second highest average distance of retweets, respectfully, indicating the ability to reach and influence a larger audience.

4 Conclusion and comments for further research

This paper discussed the presence of polarization in Ontario society, evaluating how on-line communities on Twitter debate political information relating to the upcoming provincial election. We found that Ontario society is polarized along a right-left, or conservative-liberal, axis. This polarization is visible in the community structure of users self-selecting who they follow, hence creating groups with like-minded individuals. The scale of polarization however we found was low, particularly as homophily in the overall

 $^{^{16}}$ If two users are connected, this results in a length of one, whereas the link is through another user, than the resultant length is 2.

			Commu	unities		
hashtag	Central (0)	Teal (1)	Green (2)	Ligh-purple (4)	Light-orange (5)	Dark Green (8)
dougford	16.14%	26.92%	9.19%	4.33%	5.77%	22.95%
fordnation	14.12%	4.62%	23.37%	14.13%	7.69%	14.75%
onpoli	11.23%	14.62%	12.10%	9.64%	13.46%	9.84%
fordhorde	5.22%					
fordiswithus	4.83%					
рсро	4.59%			1.93%	1.92%	1.64%
pcpoldr	3.22%				1.92%	
ford4premier	2.91%		3.95%			
ontario	2.64%		2.01%	1.55%	1.92%	
notford	1.47%	1.54%				3.28%
ford	1.41%		1.10%		3.85%	
topoli	1.40%			4.17%		
cdnpoli	1.39%	3 08%	1 62%			
onnc	1.22%	0.0070	2.0270			
wynnemustao	1 01%		5 76%	7 11%		
toronto	1.0170		5.7070	1 66%		
offordablebousing				4.0070	2 9506	1 6/06
anordablenousing			2 2204		5.03%	1.04%
saveontario			2.55%		2.0504	
ontariopcparty					3.85%	0.040/
nevertord		4 5 40/				9.84%
robford		1.54%	4 6004			
wynne			1.62%			
neverdougford		1.54%				
dougfordforpremier			7.51%	6.13%		
trump		2.31%			1.92%	
drugford		11.54%				
pcleadership		1.54%				
moga			1.68%			
anyonebutford		3.85%			3.85%	
brantford					1.92%	
liberalsmustgo				4.10%		
liberals					1.92%	
fordmath						3.28%
bewareofdoug					5.77%	
trudeaumustgo				4.65%		
climatechange					3.85%	
healthcare					1.92%	
affordability					5.77%	
osstf						1.64%
trudeau			1 75%			
metoo			2.7070			1 64%
accessibility					5 77%	2.0170
etfo					5.7776	3 28%
notoford						1 6406
toomford			1 6006			1.04%
1Eandfairmaga			1.00%			1 € 404
LJanurairness						1.04%
climatechangelsreal						1.04%
onted						1.64%
aero						1.64%
Detterschools					0.051	1.64%
cannotattord					3.85%	
childcare					1.92%	
corrupt				4.11%		
emergency					1.92%	
fearford					5.77%	
gofordnationgo						1.64%
gorddownie						1.64%

Figure 6: Top hashtags by community, discussions involving Doug Ford

Political Account	Nominal number of	Average distance of retweets in		
	followers	captured sample		
@Kathleen_Wynne	243,935	1.2370		
@OntLiberal	28,935	1.2476		
@AndreaHorwath	$86,\!149$	1.2990		
@OntarioNDP	32,309	1.2578		
@brownbarrie	$45,\!654$	1.2648		
@fordnation	$38,\!298$	1.6909		
@OntarioPCParty	$32,\!535$	1.3440		

Table 4: Leaders' impact, average distance of users who retweet their content

Average degree was determined by evaluating the distance between the leaders' accounts and the users who retweeted their content. A degree of 1 means the user follows the leader.

network showed high interconnectedness, with the followers of key political leaders overlapping to a considerable extent. We thus conclude that "echo chambers" are not a large issue in on-line Twitter political network, especially as the majority of Ontarians showed a general tendency to follow each other and be grouped into a large central community. At the same time, we found that the detected communities still reacted as expected to political information along the right-left axis, with Conservatives displaying at times populist and anti-Liberal opinions, and the Liberal/NDP left exhibiting support for liberal and socialist policies. Finally, we also found that the PC party has demonstrated high 'influence' in on-line discussions, revealing high potential to disseminate pre-election rhetoric far beyond their immediate followers.

Further investigation of this topic to be completed after the July election and will adopt the above methodology, as well as several support methods to expand the scope of the analysis. Firstly, extraction of sentiment would greatly enhance the explanatory ability of the extracted topic entities (Roberts et al., 2016), as sentiment about a specific topic attribute would add insight when topics are highly politicized. Furthermore, it would support analysis of the strength of affiliation of a community with a specific position, especially in light of the detected left-right political axis of Ontario Twitter users. Secondly, we will expand the current approach of three case studies to encompass a larger set of policies recently enacted by the Liberal government, including tuition fee limitations, or enhanced drug coverage. These would allow us to further test the alignment of political opinions within the right-left ideological axis. Finally, evaluation of the sub-structure of detected communities would yield valuable insight on the ideological or opinion particularities within each community. For instance, within the largest detected community, this would potentially yield added insight when various opinions are expressed within the group.

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