

Tweets and Votes: A Study of the 2011 Singapore General Election

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Abstract

This study focuses on the uses of Twitter during the elections, examining whether the messages posted online are reflective of the climate of public opinion. Using Twitter data obtained during the official campaign period of the 2011 Singapore General Election, we test the predictive power of tweets in forecasting the election results. In line with some previous studies, we find that during the elections the Twittersphere represents a rich source of data for gauging public opinion and that the frequency of tweets mentioning names of political parties, political candidates and contested constituencies could be used to make predictions about the share of votes at the national level, although the accuracy of the predictions was significantly lower than in the studies done in Germany and the UK. At the level of constituency the predictive power of tweets was much weaker, although still better than chance. The findings suggest that the context in which the elections take place also matters, and that issues like media freedoms, competitiveness of the elections and specifics of the electoral system may lead to certain over- and under-estimations of voting sentiment. The implications for future research are discussed.

1. Introduction

As with every new and widespread communication technology, especially those involving the internet, Twitter has attracted the attention of both pundits and academics. Frequently referred to as a “microblogging” service with elements of a social network site [5], Twitter is primarily known for trending topics related to celebrities, brands and pop culture. Still, in recent years, political uses of Twitter have also come into the public spotlight. For instance, Twitter received a lot of attention from commentators during the 2011 “Arab

Spring” [18] and during the 2009 Iran election protests [4, 12, 21], and at one point the US State Department asked Twitter to delay scheduled maintenance of the service, which would have required downtime, in order to allow Iranians to continue using the service [21].

What is the role of Twitter in political life? Aside from perhaps providing us with direct real-time access to information on demonstrations, protests and revolutions in authoritarian countries, can the Twittersphere help us understand the climate of public opinion around the world?

Given that Twitter is increasingly appropriated for both conversation and collaboration [11], and that tweets can be seen as an electronic word-of-mouth communication [13], it is likely that we can learn something about political sentiment by eavesdropping on these conversations. Typical uses of Twitter, including daily chatter, information sharing, reporting news and conversing [13], can all contain indicators of political opinion and sentiment. This is particularly true during the times of elections, when citizens are more likely to discuss politicians, parties and political issues online. Scholars have argued that Twitter can be used as a “social sensor” to make predictions about electoral outcomes [17]. With 65 million tweets a day by June, 2010 [24], Twitter represents a substantial corpus of textual data which is still open to large-scale crawling and subsequent analysis.

In this study, we aim to utilize the research capability of Twitter and examine whether a simple analysis of political tweets can aid in prediction of the results of the 2011 Singapore General Election.

2. Background

2.1. Twitter

What is Twitter and what do people do with it? Twitter is free to use, and allows users to send

“tweets”, which itself became the verb of choice, text messages of 140 text characters or less. You can follow other users, search for words in current tweets, retweet the tweets of others, tweet all the time or not at all. Other users may follow you, and the number of followers one has is an unofficial, although not the most accurate measure of, popularity.

Although generally easy to understand, there are some odd specifics to Twitter that are worth mentioning. For one, unlike the web, it has no deep history. If you want to search for topics on Twitter, you can only search the most recent tweets. Although the US Library of Congress has decided to create an archive of all tweets with the cooperation of Twitter, Twitter has had a somewhat contentious relation with academics. Twitter sees the tweets as its property, and since it does not generate revenue from subscriptions, the tweets are all it has. Giving anyone access to those tweets, even academics, is not in Twitter’s current plans. Still its open API allows researchers and others to crawl Twitter data and preserve it for subsequent analysis.

As an academic topic, Twitter is relatively new, dating back only to 2006 [2]. There is nonetheless a fair amount of work that has been done involving Twitter, with a variety of theoretical approaches, research methods, and questions investigated. Generally speaking, the specific affordances of Twitter are novel, but the human behavior behind its use is not, and several studies have uncovered interesting social patterns emerging from Twitter use.

Honeycutt and Herring [11] found how, although Twitter was not designed for ease of back-and-forth conversation, Twitter users do indeed tweet in a conversational manner with other users. Boyd, Golder, and Lotan [5] studied how people retweet in conversations using different approaches or styles for different purposes. Conversation is something that Twitter users want, and they are willing to work within Twitter’s mechanics and create their own norms in order to do so. Java, Song, Finin, and Tseng [13] found that Twitterers tweet about daily activities and for information sharing purposes, studying it as a topological network. Again we see a conversational turn to the use of Twitter.

Twitter is not just used for daily chatter, but it also serves as a news platform, disseminating small snippets of information and web links in real time. Kwak, Lee, Park, and Moon [18] found that 85% of Twitter’s “trending topics” are actually mainstream headline news. But the “big media” are not the only sources of news information found on Twitter. Zhao et al. [26] found that news items which received little

coverage in the mainstream media received greater coverage in Twitter. It is possible that the trending topics (the most popular topics measured by keywords) are indeed mainstream news items, but that Twitter simultaneously allows room for items that are less-popular in the mainstream news. Many of these news items get amplified in the Twittersphere through retweets, hashtags and discussions among users.

Some studies have examined Twitter trends in a more commercial light. Jansen, Zhang, Sobel, and Chowdury [12] found that Twitter could be used by commercial accounts for spreading their brand’s word of mouth and for users to voice their opinions about brands. Asur and Huberman [3] found that Twitter could actually be used to predict movie box office sales, based on the number of tweets about movies.

2.2. Twitter and politics

Twitter has also been a focus for those interested in politics and internet use. Recently, Himelboim, McCreery and Smith [10] found homogenous ideological clustering within Twitter, such that Twitter users were usually exposed to political beliefs that they already held. Other work focuses on tweets during election times. Kim [15] found three main uses of Twitter during the 2010 Korean elections: for political information-seeking, for entertainment, and for social utility. Even during elections, people still use Twitter for a variety of reasons, and use is not monolithic despite the specific focus of any particular piece of research.

Cozma and Chen [6] found that political incumbents and challengers used Twitter in different ways during the US 2010 midterm elections. Incumbents focused more on current events, while challengers more often attacked the incumbents. Looking at the same elections, researchers at the Pew Research Center [20] found that political tweets often were a call to action, encouraging citizens to vote. In this light Twitter is seen as a providing a new platform for citizen mobilization. The above studies demonstrated that Twitter has become an integral part of the political communication environment in many countries, offering a very rich source of information for those interested in public opinion and political behavior.

Romero, Meeder, and Kleinberg [22] found that the Twitter hashtags for politically controversial topics were persistent across time and that people would use the hashtags if they noted their use. Bollen, Mao, and Pepe [4] found that real-world political events

resonated in the Twittersphere, with an immediate effect on people's mood as expressed through their tweets. Taken together, we see that political events are reflected in tweets and that these topics can be sustained there.

2.3. Electoral predictions using Twitter data

Recently, several studies have examined whether the content and structure of Twitter can be used to predict the results of elections in Germany [23], Portugal [7], the United Kingdom [25] and the United States [19, 10]. The studies of German and UK elections using a simple count of tweets mentioning a candidate or a party, reported predictions that were as accurate as traditional opinion polls, with the mean absolute error (MAE) for the vote share of less than 2% at the national level. At the level of constituencies and individual candidates, the predictions in UK were less accurate, partly due to the smaller data pool upon which they were based [25]. A study done in the context of Portuguese elections suggests that the volume of tweets from both news organizations and ordinary citizens followed the results from national opinions polls [7]. The findings from a recent US study paint a different picture, however, reporting MAE as high as 17% for Twitter volume, and suggesting that without solid explanatory models such predictions are unlikely to be useful in the long run [9].

This criticism is warranted, as most studies utilizing Twitter to predict social, economic and political outcomes have largely been data-driven rather than theory-driven. This is not to say that some studies have not provided explanatory models [17], but in general researchers have focused on methodological, computational and analytical issues. One of the (meta)theoretical approaches is the Dynamic Social Impact Theory [19], which was used for multi-agent modeling of public opinion formation during the elections [7].

2.4. Background on the 2011 Singapore general election

According to the Freedom House, Singapore is classified as a "partly free" society, in which the parliamentary elections are held periodically, free of irregularities and fraud, but with the ruling People's Action Party (PAP) dominating the political process [8]. Although the government has retained tight control over all print and broadcast media, it has generally refrained from regulating the online sphere, which has

lead to the blossoming of politically-oriented websites, blogs, news aggregators and social media pages (including Twitter accounts). It is worth noting that most of these online sources are oppositionally-inclined, offering critical and satirical views of the ruling party and the government.

Voting in Singapore is compulsory for all citizens above 21 and the electoral system is a version of the Westminster system, characterized by the majoritarian, first-past-the-post method of electing MPs. There are two types of electoral divisions in Singapore: Single Member Constituencies (SMCs) and Group Member Constituencies (GRCs). In the former type, voters elect a single MP, while in the later they elect a group of MPs. The ruling PAP has won every single parliamentary election (typically held every five years) since 1965 with wide margins, and has ruled with no opposition members in the parliament until 1984. In fact, parliamentary seats have frequently been left uncontested in the elections, allowing the ruling party MPs to win them by default.

Still, for the 2011 General Election, with the exception of one GRC, all parliamentary seats were contested by the opposition parties, making it the most competitive parliamentary election in the history of Singapore. On the nomination day (April 27, 2011), seven political parties registered their candidates with the Elections Department. In addition to the ruling People's Action Party (PAP), those were: Workers' Party (WP), Singapore People's Party (SPP), Singapore Democratic Party (SDP), Singapore Democratic Alliance (SDA), The Reform Party (RP), and National Solidarity Party (NSP).

3. Research Questions

In this study, we aim to test whether the frequency of tweets could be used to predict the outcome of the elections, taking into account the specific political context and electoral system of Singapore. The research questions are designed to address both the national level and the constituency level electoral outcomes.

RQ1: Is the share of Twitter messages mentioning political parties and their candidates predictive of their respective share of the vote at the national level?

RQ2: Is the relative frequency of Twitter messages mentioning the names of opposition candidates predictive of the opposition's share of the vote at the constituency level?

4. Methodology

4.1. Data collection

To obtain the data used in the analysis, we developed our own Twitter crawler using the Perl programming language, a MySQL database, and the application programming interface (API) provided by Twitter. Starting in April 2011, we obtained tweets published by a set of selected Singapore-based Twitter users, denoted as U , who are interested in the General Election. The user set consists of fifty nine “core” users (U_{core}) who are more likely to tweet about the General Election than other Twitter users. Specifically, the users in U comprise “core” political Twitter users (U_{core}) and their immediate neighbors in Twitter network (U_{link}). We assumed that U_{core} are people who have a high affinity to politics and, therefore, are expected to heavily tweet about the election and other political activities. These users are known political figures, political candidates, political parties and organizations, activists, journalists, and bloggers. A similar approach was used in the study of the UK elections in 2010 [25]. We asked two post-doctoral researchers who are familiar with Singapore’s politics to manually compile U_{core} from several sources, such as the official party websites, Facebook pages, Wikipedia articles, political blogs, lists of political users selected by other Twitter users, etc.

Next, we used U_{core} as the initial seeds to find other politically engaged Twitter users by crawling their incoming and outgoing follow-links, i.e., their *followers* (those following U_{core}) and *friends* (those followed by U_{core}). That is, U_{link} represents a set of users who express certain degree of interest in politics by following or being followed by U_{core} . In this step, the Twitter REST API (<http://dev.twitter.com>) was employed to automatically construct U_{link} . Since U_{link} may contain some non-Singapore users, we further refined their members by including only those who explicitly specify Singapore as a location in their Twitter profile. In the end, approximately 13,000 unique users were included in U . The crawling process was carried out on a daily basis and the members of U were regularly updated according to changes in U_{link} after each round. From April 2011 through May 2011, the size of U grew to more than 20,000 unique users.

For each user in U , we automatically collected the user’s tweets using the Twitter REST API. Due to the limit imposed by the Twitter API, the maximum number of available tweets for any user is 3,200 at a specific time. Since the data were crawled on a daily

basis, we were able to obtain a near-complete snapshot of tweets published by the selected users during the peak period of the election, covering April 1, 2011 to May 7, 2011 (polling day). More than 4.4 million tweets were published by the users in U during this period. The tweeting of the selected users increased over time and continued to rise after the polling day. Particularly, many tweets related to the election results. By the end of May 2011, the size our tweet collection had grown to over 7 million tweets. Note that these tweets include both political and non-political content depending on the interests of specific users.

4.2. Measures

We computed the daily and cumulative counts of the tweets mentioning different political keywords. These included constituency names, candidate names, and party names as well as their acronyms, e.g., People’s Action Party (PAP), etc. We followed well-grounded rules of data collection and justifiable choices regarding which political parties and candidates to include, using the data collected only during the official period of the election campaign [14]. The tweets used in the analysis cover the period from April 27, 2011, (the nomination day) through May 7, 2011 (the polling day). During this period, almost 1.5 million tweets were collected, and a total of 110,815 political tweets were identified and analyzed in this study. We focused on the names of seven political parties and the candidates contesting the elections as well as the names of 26 contested SMCs and GRCs. Moreover, we also computed the normalized tweet counts for these keywords by dividing their frequency by the number of voters in the respective constituency.

5. Findings

First, we observed the totals for the number of tweets received by each political party and its candidates, and the number of votes that party received in the election (Table 1).

Converting these to percentages allowed for easier analysis and comparison with the findings from the previously reported studies of the elections in Germany and the UK [27, 29] (Table 2).

As asked in RQ1 (is the share of Twitter messages mentioning political parties and their candidates predictive of their respective share of the vote at the national level?), we can see that indeed there is a relationship between the share of Twitter messages as

captured by our method and the resulting vote, as measured by ranks and percentages (Table 2).

Table 1. Tweets and votes among political parties

Party	Tweets	Votes
WP	18702	258510
SPP	3959	62639
SDP	9938	97362
SDA	1625	55988
RP	4684	86294
NSP	12441	242682
PAP*	38424	1212154
Total	89773	2015629

*Ruling party

Although in general the share of tweets reflected the share of votes relatively closely, there were several deviations. Namely, when we measured the difference between the percentage of Tweets in the sample and the percentage of votes received for each party, we noticed that the ruling party, the PAP, received a far smaller percentage of tweets than its percentage of votes, and two out of six opposition parties in turn

received a significantly larger percentage of tweets than they did percentage of the vote (Table 2). The mean absolute error (MAE) of prediction was 5.23 percent.

Table 2. Percentages of tweets and votes among political parties

Party	% tweets	% votes	% error
WP	20.83 (2)	12.83 (2)	8.00
SPP	4.41 (6)	3.11 (6)	1.30
SDP	11.07 (4)	4.83 (4)	6.24
SDA	1.81 (7)	2.78 (7)	-0.97
RP	5.22 (5)	4.28 (5)	0.94
NSP	13.86 (3)	12.04 (3)	1.82
PAP*	42.8 (1)	60.14 (1)	-17.34
MAE			5.23

Note. Numbers in brackets indicate relative rank
*Ruling party. MAE = mean absolute error.

In further support of RQ1, when looked at with a slightly different analytical lens, the linear relation between the number of tweets during the run-up to the election and the number of votes in the election was strong, with an R^2 of 0.912 (Figure 1).

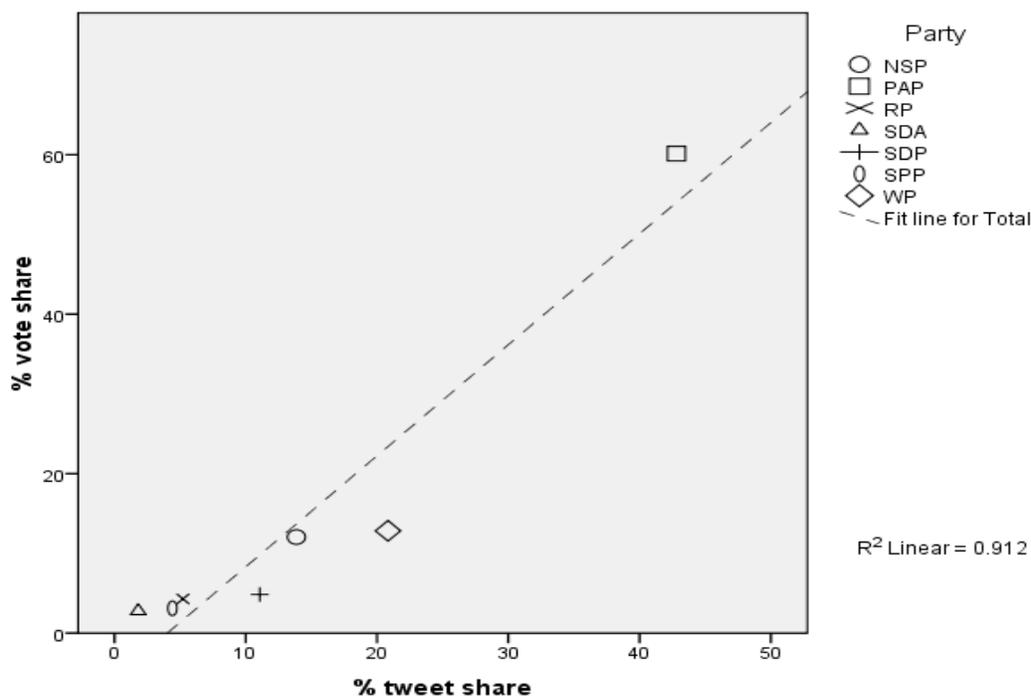


Figure 1. Share of tweets and votes at the national level

RQ2 dealt with the names of political candidates and votes at the constituency level (is the frequency of Twitter messages mentioning the names of opposition candidates predictive of the opposition's share of the vote at the constituency level?). In our initial analysis, there were several interesting findings. We found no significant correlation between the percentage of the vote for the opposition (i.e. the inverse of the vote for the ruling party) and the per-voter tweets mentioning the ruling party, PAP (Table 3). In contrast we did see a moderate and significant correlation between the percentage break of the vote and the number of tweets per voter for the opposition.

We also found a strong and significant correlation between the number of tweets per voter for the opposition parties and the number of tweets per voter for the ruling party. Similarly, we find that tweets mentioning the names of constituencies were significantly correlated with both the opposition's vote share and tweet frequency per voter.

When considering the relationship between the number of tweets about the opposition and the number of opposition votes at the level of Singapore's 26 constituencies, the relationship was not as strong as we saw in the RQ1 analysis. Although visually it is easy to

see a linear pattern, it is somewhat diffuse and the R^2 is reduced to 0.173, with several prominent outliers (Figure 2). Still, the volume of tweets correctly predicted the PAP victory in 18 out of 26 races, which was a statistically significant result ($\chi^2 = 3.85, p < .05$).

Table 3. Correlations between share of tweets and votes at the constituency level (ruling party vs. opposition)

	% vote opp.	Opp. tweets	PAP tweets	Const. tweets
% vote opp.	1	.416*	.294	.764**
Opp. tweets		1	.803**	.211
PAP tweets			1	-.006
Const. tweets				1

N=26 (26 constituencies)

* $p < .05$ (2-tailed), ** $p < .01$ (2-tailed)

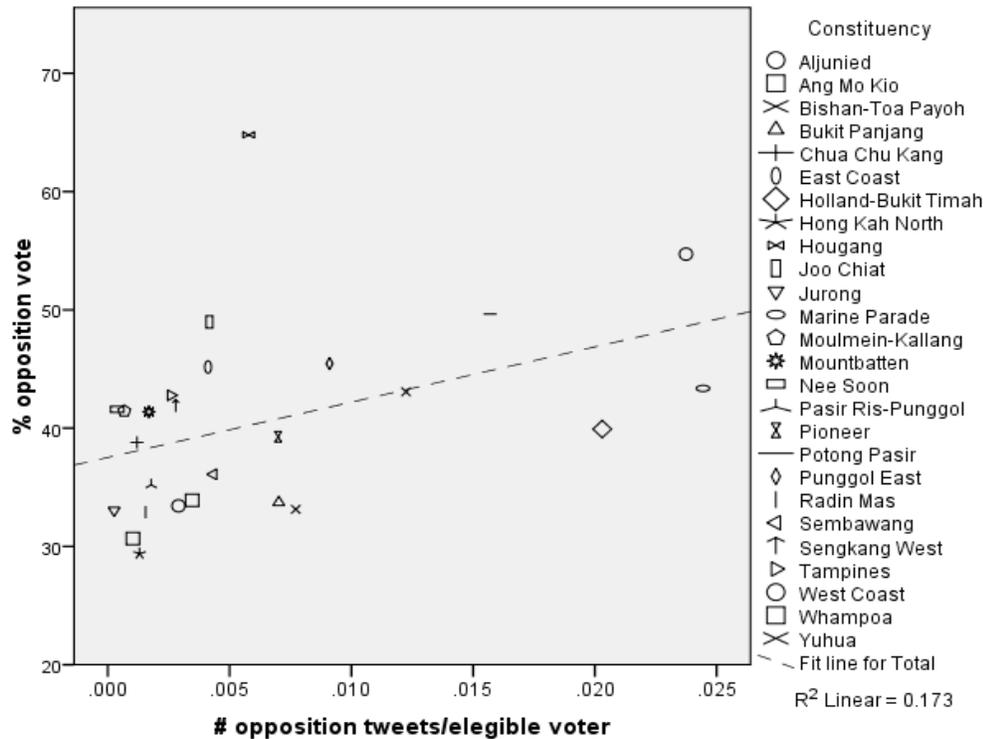


Figure 2. Share of votes and tweets at the constituency level (% vote opposition)

6. Discussion

Overall, we found that tweets could be used to predict votes, although more so on the national level than the constituency level. The rank order of the number of tweets a party received was indeed fully predictive of the rank order of the votes it received on election day. Given that our tweet-capturing occurred up to the polling date, this is a time-ordered sequence that implies predictive power, although we are not suggesting that Twitter drove voter behavior, simply that it is reflective of it.

It is important to note that the mean absolute error (MAE) in our study was significantly higher than the one reported by Tumasjan et al. [23] (5.23 vs. 1.65, respectively), with errors ranging from less than 1 percent to more than 17 percent. What are the possible explanations for this difference in the accuracy of predictions?

First, our data crawling method was quite different from the method employed by Tumasjan et al. [23], possibly giving greater weight to more politically active (and oppositionally-inclined) Twitter users. In the Singaporean context, with its relatively controlled mainstream media, the opposition parties such as the Workers' Party (WP) and the Singapore Democratic Party (SDP) were overhyped on Twitter compared to their relative strength in the polls, while the ruling People's Action Party (PAP) failed to get its fair share of tweets. This could be a result of the focused effort of the opposition parties and online activists to counterbalance the dominant position of the ruling party in the mainstream media. A closer look at our data reveals that seven out of ten most popular Twitter accounts, ranked by the number of followers, were those providing critical and satirical commentary and promoting the opposition. Furthermore, it is also possible that Twitter was acting as a vent for those who were excited about the elections and wished to talk about the opposition parties, as their voices could not be heard as easily in the mainstream media. New media can act as a discussion space for those citizens who are kept out of older, traditional, media forms, enabling those citizens to engage topics not covered in traditional media. In addition, because of the compulsory nature of voting in Singapore and weak traditions of political engagement, political preferences of disengaged citizens are likely to be of greater importance on the election day, when their decisions make a real, visible impact.

At the level of individual constituencies, we also saw a moderate correlation between the percentage of

the vote for the opposition and the tweets the opposition received, but with numerous outliers. Sample size is an obvious reason for the diminished accuracy here, as several constituency estimates were based on only few dozen tweets. Furthermore, some of the outliers were the key electoral battlegrounds, while others were constituencies contested by highly visible new candidates receiving a disproportionate amount of attention in both social and traditional media. Tumasjan et al. [24] suggest that the inclusion of outliers, i.e. those political parties (and personalities) that enjoy short-lived media popularity without real substantive support among citizens, may bias the results.

Interestingly, the frequency of tweets containing the names of constituencies was a strong predictor of the opposition vote share, indicating that in the context of Singapore even generic election-related buzz on Twitter was predictive of pro-opposition sentiment.

Lastly, a strong correlation between the number of tweets for the opposition parties and the number of tweets for the ruling party suggests that these tweets likely represent election-related conversations, indicative of excitement about the candidates at the local level. Sentiment analysis of these messages could shed more light on how political parties and candidates were actually evaluated by voters.

7. Conclusions

Our findings suggest that while there is a moderately strong correspondence between the share of tweets and share of votes at the national level, this relationship is much weaker at the constituency level. We suggest that Twitter data may be more suitable for making macro-level assessments of political sentiment than for predicting specific outcomes of local elections which are more volatile and more easily skewed by a few influential Twitterers. This is particularly true when estimates are based on a small number of tweets, which was indeed the case for many of the constituencies analyzed in this study. Given the complexity of electoral systems and arbitrariness of many electoral boundaries, paired with imprecise geolocation data supplied by Twitter users, it seems futile to make specific predictions. Still, our results indicate that the frequency of tweets could be used as a rough indicator of trends and sentiments at the local level.

We also believe that the predictive quality of Twitter data depends on the level of political democracy, media freedoms, and competitiveness of

elections. In the case of mature, stable democracies with a free press, Twitter is more likely to represent a valid indicator of national (macro) political sentiment than in authoritarian countries with a controlled press. In the latter case, Twitter data is more likely to be skewed against the government, as the 2009 events surrounding the elections in Iran vividly illustrated [18]. Lastly, we think that compulsory voting negatively affects the predictive power of political tweets as the estimates are likely to be biased against those who are not politically active online, but are still obligated to express their preference in the voting booth.

Still, while traditional opinion polls are readily available in most liberal democracies, they are rarely published in countries with a controlled press. For citizens of those countries, then, social media analytics may offer a viable substitute. To illustrate this point, even in the case of Singapore, no polling data was published before the elections; instead, citizens relied on several online gauges of Twitter sentiment provided by the local social media analytics/advertising firms to satisfy their electoral curiosities. Furthermore, it is important to acknowledge that even the polling experts are increasingly considering alternatives to traditional polling, partly because a sizable number of citizens can no longer be reached via standard telephone landlines. Recent work by Ansolabehere and Schaffner [1] indicates that online opt-in panels can be as accurate as traditional random-digital dialing (RDD) surveys, even though they do not utilize probability sampling techniques, but instead utilize sample matching. Clearly, greater flexibility is warranted when approaching the question of sample representativeness in future studies.

In conclusion we suggest that if certain conditions are met then the analysis of Twitter messages could represent an inexpensive, unobtrusive and reasonably accurate method for gauging political sentiment. However, suitable theoretical frameworks need to be developed in order to fully understand the processes behind public opinion formation on Twitter. Future research should also focus on specifying robust data collection methods and rigorous analytical approaches that yield the most accurate predictions of political sentiment. With the worldwide popularity of Twitter and its open API, Twitter is ideally suited for comparative research. We encourage the research community to actively pursue this opportunity.

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