

Battle of the Sexes?
How the Riding-Level Gender Context Shapes Toxic
Campaigning

by
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Abstract

The 2019 Canadian Federal Election saw no shortage of toxic and attack-style campaign communications. Much of this took place on Twitter, which has grown in popularity amongst both candidates and the public since 2015. Examining the tweets of every candidate in the election from the LPC, CPC, NDP, GPC, and PPC, this study seeks to understand which candidates are most likely to send out toxic tweets. I find that within parties, women are almost always more likely than men to send out toxic tweets. Most importantly, I find that the representation of women within ridings is key to understanding candidate toxicity online. On the one hand, women are more likely to be toxic than men in ridings dominated by men while on the other hand, the opposite is true for men: they are more likely to send out a toxic tweet than women in ridings where women constitute the majority.

Keywords: negative campaigning; Canadian politics; gender representation; gender stereotypes

This project is dedicated to my dear Grandma and the generations of strong women in my life who have shaped me.

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List of Acronyms

CPC	Conservative Party of Canada
GPC	Green Party of Canada
LPC	Liberal Party of Canada
NDP	New Democratic Party
PPC	People's Party of Canada
AMEs	Average marginal effects
MERs	Marginal effects at representative cases
MEMs	Marginal effects at the mean

Attack-Style Campaigns in the 2019 Canadian Federal Election

Over the course of the 2019 Canadian federal election, there was no shortage of scandals and nasty campaign ads focused on attacking other candidates. In fact, many observers of the Canadian federal election suggested that candidates had been particularly negative in their campaign tactics compared to other recent elections (Carman 2019; Connolly 2019). Most notably, the Conservatives created a widely distributed attack ad titled ‘Justin Trudeau is a fake feminist’ (CPC 2019), party leaders and candidates alike criticized each another on the basis of their positions on abortion (Bergeron-Oliver 2019; David Thurton 2019; Smith 2019; Zimonjic 2019), the release of Trudeau's blackface photos saw him receive mass criticism from candidates and leaders of all parties (Goodyear 2019; Jackson 2019; Ljunggren and Johnsonn 2019), and PPC candidates posted transphobic or sexist tweets and subsequently deleted their accounts post-backlash (CBC 2019).

The goal of this study is to understand which candidates are most likely to engage in toxic, attack-style campaigning, particularly as it relates to the candidate’s gender and the representation of women in their riding. In other words, what candidates are most likely to employ toxic, attack-style campaign communications directed at other candidates? Using the ‘Perspective’ API's toxicity machine learning model¹ and sentiment analysis on tweets and retweets from candidates in the 2019 Canadian federal election, I focus on how the representation of women in electoral ridings moderates the relationship between candidate gender and the likelihood of posting toxic, attack-style tweets directed at other candidates.

A key arena for campaign activity in the 2019 Canadian federal election was Twitter, with 75.4% of all Candidates from the Liberal, Conservative, New Democratic, Green, and People’s Parties having a twitter account over the course of the campaign. On average, each candidate with a Twitter account tweeted 302 times from June 21st to the

¹ See <https://www.perspectiveapi.com/#!/home> for further information on the scoring model

day of the election, October 21st, totaling 378,707 tweets from these candidates. Among these tweets, 124,143 mentioned or replied to another candidate running in the election. Given the core research question focused on toxic campaign behaviour directed at other candidates, I focus on the 21,337 tweets self-authored or retweeted from one candidate that mentions or replies to another candidate outside of their party.

This provides us with a unique and fruitful source of data to examine the degree to which candidates employ toxic and negative language directed at other candidates. In order for the tweet to be included, the candidate either had to directly use Twitter's 'reply' function, use the 'mention' function, or retweet a tweet from another user that directly mentions another candidate. Using the 'reply' function involves a candidate seeing a tweet by another candidate and replying to it directly and forming a 'thread'. In terms of 'mentioning' a candidate, this involves publishing a new tweet outside of a thread that 'tags' the other candidate using their handle. In analyzing the levels of toxic language in the tweets sent by candidates to other candidates over the course of the election, we can better understand both whether or not women or men are more likely to attack-tweet and how the representation of women in the candidate's riding moderates this relationship.

Toxicity in Campaigns

This study measures the degree to which candidates employ toxic language in their campaigns. Specifically, toxic language includes any comment, in this case, tweet, that utilizes rude, disrespectful, or unreasonable language that is likely to make a participant leave a discussion². Over the course of the 2019 Canadian federal election, candidates and parties certainly engaged in toxic and attack-style campaigning (Brean 2019), with a majority of voters saying they saw 'mostly negative' news about parties and their leaders during the campaign (Connolly 2019). With Trudeau's SNC-Lavalin and black face scandals, Scheer's citizenship under fire, various poorly-received

² This definition of a toxic tweet comes directly from the Perspective API Toxicity model's documentation. See <https://github.com/conversationai/perspectiveapi/blob/master/2-api/key-concepts.md>

comments from PPC candidates, and every leader's abortion stance in question, negative campaigning took over a large portion of coverage and focus of the election.

Unlike other academic contributions focused on negative and attack-style campaigning in elections, this project utilizes a machine learning approach to scoring the sentiment of tweets. Using the 'Perspective' API model's 'TOXICITY' attribute, I am able to perform large-scale scoring of tweets on the probability that they contain toxic language. This model for scoring tweets is a Convolutional Neural Network (CNN) trained model that was trained on a large body of comment-style text where human coders were asked to rate online comments on a scale from a "Very toxic" to a "Very healthy" contribution to a discussion.

The model was created by Jigsaw and Google's Counter Abuse Technology team and trained on several hundred thousand comments by thousands of human moderators. As mentioned above, in this model, toxicity is defined specifically as rude, disrespectful, or unreasonable language that is likely to make a participant leave a discussion. Using the large human-coded training dataset, this model scores both English and French tweets on a probability scale from 0 to 1 on the likelihood that the tweet will be perceived as toxic to a discussion. To be clear, it is not a measure of how toxic a comment is, but instead how likely a comment will be perceived as toxic.

Twitter in the 2019 Federal Election

Over the course of the election, 3-in-4 (75.1%, or 1,256 out of 1,669) candidates representing the Conservative Party (CPC), Liberal Party (LPC), New Democratic Party (NDP), Green Party (GPC), and People's Party (PPC) had twitter accounts. Across parties, 72.1% of women and 77.4% of men had accounts; however, this was not evenly distributed across parties. Only 59.0% of GPC women had accounts while 87.7% of PPC women did. As for men, the largest gap was between the GPC (only 62.2% of men had accounts) and the LPC (83.9% had accounts). Among these candidates with Twitter, the highest volume of tweets came from the PPC, with a grand total of 134,904 tweets between June 21st and October 21st. This comes in at an average of 513 tweets per user from the PPC (694 for women and 470 for men), compared to the overall average per-

user volume of 302. The CPC on the other hand only tweeted an average of 172 tweets per user over the election (176 for women and 171 for men).

The use of Twitter among the general Canadian public is also high, with mentions of the widely-used hashtag '#cdnpoli' growing 86% since the 2015 Canadian federal election (Austin 2019). This is a significant jump in use of this core election-related hashtag, providing support for the idea that Twitter is an important platform for candidates to broadcast their ideas and interact with other candidates where the general public is actually listening. In fact, on average, candidates in this study had 3,223 followers (not including party leaders), with the highest average being from the LPC (8,319) and the lowest being from the GPC (591). Further, Ryerson University's social media lab, based on a survey conducted in July 2017, found that 42% of online adults in Canada have their own Twitter account, with women being slightly more likely to have an account (Mai 2018). Based on the prevalence of Twitter accounts in the general population, the frequency of using election-related hashtags, and the number of tweets and prevalence of Twitter accounts among candidates, I argue that Twitter has become an important feature of Canadian campaign activity. As such, it provides a unique and valuable source of data to analyze candidate communications, specifically in relation to employing toxic and negative campaign tactics online.

Theoretical Foundations and Hypotheses

In order to answer the central research question, I will be focusing on core riding-level and individual candidate-level factors that, based on existing theoretical contributions, I predict will contribute to candidates' tendency to 'go negative' and engage in toxic, attack-style campaigning online. Current theoretical contributions examine two levels of analysis that prove to be important in predicting negative and attack-style campaigning: the riding context level (Ennsner-Jedenastik, Dolezal, and Miller 2017; Haselmayer and Jenny 2018; Walter 2013) and the individual candidate level (Benoit 1999; Dolezal, Muller, and Ennsner-Jedenastik 2017; Haselmayer 2019).

Research on negative, attack-style campaigning did not make a large debut until the mid-2000s in Political Science but has since become an eminent field of study (Haselmayer 2019). While there are plenty of studies examining the relationship between candidate gender and levels of negative campaign communication, there are very few that do so outside of the U.S. context. Further, very little work has been done to understand how the representation of women within ridings moderates this relationship. As such, this paper provides a useful contribution to the negative campaign literature by incorporating both gender and the gender context as key predictors of toxicity. In addition, few of these studies focus on social media specifically, and far fewer go further than either large-scale bag-of-words sentiment analysis or smaller-scale human-coded text. As a result, this study, which employs a more sophisticated machine learning model approach, examines social media rather than traditional media sources, and incorporates the gender context as a key predictor, adds both theoretical and methodological value to the field.

Gender and 'Going Negative'

The notion that women face disadvantages in the political arena is nothing new; in fact, scholars for decades have studied the presence of stereotypes when it comes to the coverage and evaluation of women running for office (Dolan 2004; Everitt and Gidengil 2003; Koenig et al. 2011; Schneider 2014). Historically, women have tended to receive less news coverage during elections compared to men and when they do receive

coverage, it is more negative (Kahn 1994; Kahn and Goldenberg 1991). In particular, Kahn and Goldberg find their coverage is more likely to focus on their viability as a candidate and the fact that they are unlikely to win, as opposed to their qualifications for holding office (1991). Often times, the reporting on women that does occur disproportionately focuses on their appearance and personal lives in comparison to reporting on men (Carlin and Winfrey 2009), whereas for men greater attention is paid to policy issues and their experience in politics (Braden 1996; D. G. Bystrom et al. 2004; Dunaway et al. 2013; Wasburn and Wasburn 2011).

The stereotypical female gender role, which is often presented in media reporting of candidates, prescribes that women have a lower leadership ability than men, creating an overall tendency for individuals to devalue women's capability in leadership positions, such as running in an election (Eagly and Karau 2002). Role congruity theory suggests that women experience an immediate disadvantage in their pursuit of public office as a result of the negative stereotypes held against women and the perception of candidacy as incongruent with their traditional gender role (Eagly and Karau 2002; Garcia-Retamero 2006). Nevertheless, even when women are seen as competent in representing women's issues, if their role is incongruent with deeply held norms about women's abilities, women are more likely to be viewed negatively than men (Rudman and Kilianski 2000). Similarly, even though these stereotypes, such as women being perceived as more liberal and trusting, can be considered positive (Matland and King 2002), they are nonetheless seen as incompatible with the masculine domain of electoral politics and thus, serve to be a thorn in women's legitimacy as candidates. As Fiber and Fox discuss, stereotypical "proper gender roles" of women, defined by their reproductive, sexual, and child-bearing capabilities, disadvantage women in the 'masculine' domain of the political arena (2005).

These gender differences in reporting in which gender stereotypes are projected onto women as being more caring, honest, and empathetic rather than tough and qualified to hold office have consequences for women's success in elections (Fox 1997; Kahn 1992; Lawless 2004). More specifically, voters perceive women as being less competent at dealing with issues like foreign policy and economics, which can significantly hinder their success (Lawless 2004). These stereotypes projected onto women through media, focusing on their appearance and lack of qualification for office, hurt women's chances of

gaining office due to the public's perception of women being incompatible with the masculine domain of politics (Lawless 2004). All in all, voters develop a particular gendered image of women based on stereotypes, which, being in conflict with traits associated with success in politics, weaken women's chances of winning an election (Fridkin and Kenney 2009).

On the one hand, some scholars lean into the idea that women candidates adhere to stereotypes attributed to them in order to avoid potential consequences of presenting themselves in a counter-stereotypical way. Thus, they expect that women will behave in a stereotypically 'feminine' way and avoid negative, attack-style campaigning (Trent, Friedenber, and Denton 2011). Additionally, some expect that these stereotypes about women's and men's behaviour are accurate reflections of reality to some degree, and provide little explanation further than the idea that men are more aggressive than women and more likely to negatively campaign (Lau and Pomper 2004). In fact, a fair body of work has supported the idea that men are more negative than women on the campaign trail, finding that women display lower levels of negative or attack-style campaign communication (Carlson 2007; Fox 1997; Lau and Pomper 2004; Parmelee and Bichard 2012; Witt, Paget, and Matthews 1994). The core idea is that women are aware of the electoral disadvantages reaped by women in general, especially when they campaign out-of-line with stereotypical perceptions of their behaviour projected onto them by voters. By campaigning in line with how voters expect women to behave, it is argued that these candidates are trying to maximize their success by campaigning in a stereotypically 'feminine' manner and avoiding toxic or negative language (Trent, Friedenber, and Denton 2011). This leads to the first hypothesis:

H_{1a}: Women display lower levels of toxicity when posting tweets directed at candidates outside of their party compared to men.

On the other hand, some scholars disagree that women will simply adopt stereotypical expectations of women's behaviour on the campaign trail (Carlson 2007; Evans and Clark 2016; Kahn 1993). While there is agreement that these stereotypes prevail in the way that voters view women running as candidates, they disagree on the consequences of these perceptions on women's campaign behaviour. Under the

constraints of being a woman running for office, some say that women will try and use this ‘out-group’ and non-normative status to their advantage by engaging in counter-stereotypical behaviour to distinguish themselves positively from other women candidates (Evans and Clark 2016). By participating in negative and attack-style campaigning, women are able to differentiate themselves from gender stereotypes of women that they perceive the public to see as incongruent with politics and electoral success and thus, increase their likelihood of being seen as a viable political candidate (Kahn 1993).

Upon examination of the tweets of congressional candidates during their campaigns for the 2012 U.S. House elections, women candidates were far more likely than men to engage in ‘attack-style’ negative tweeting in their campaigns (Evans and Clark 2016; Evans, Cordova, and Sipole 2014). Similarly, Kahn, in her study of candidates for the U.S. Senate between 1984 and 1986, also suggests women may be more likely, as self-perceived ‘underdogs’, to engage in negative attack-style campaigning (1993). The logic for women’s toxic campaigning lies in distancing themselves from stereotypes of women as more caring and empathetic, and thus, less aggressive in their campaigns compared to men. By engaging in negative and attack-style campaigning, they are able to minimize their ‘out-group’ status in the male-dominated political arena (Evans and Clark 2016) and ‘play ball’ against the men.

In fact, analyzing Canadian electoral coverage from the 1993, 1997, and 2000 federal elections reveals that when women simply engage in counter-stereotypical behaviour, such as being confrontational in debates, they receive far more coverage than women who maintain the status-quo (Everitt and Gidengil 2003). This provides further evidence that engaging in greater counter-stereotypical behaviour, such as attack-style and negative campaigning, can be an electoral strategy for women, including in the Canadian context. Further studies of the Canadian context find support for this notion. More specifically, that news media often present the election through a frame of intense competition, for example, by using sport-specific language, or that of war, a battlefield, or “boxing ring” which “assumes the male to be normative” (Sampert and Trimble 2003, 213). This extremely gendered form of coverage is common, and women who play into it by displaying assertiveness and confrontational behaviour are seen as acting

incongruently with gendered expectations, which itself is considered newsworthy, drawing more attention to them (Sampert and Trimble 2003).

Further evidence of women distinguishing themselves from gender stereotypes can be found in Bystrom and Kaid's study of video campaign ads of candidates in the U.S. Senate elections from 1990 to 1998. They find that women were particularly likely to use negative verbal attacks against other candidates in order to counteract stereotypes projected onto them as women for every election year in their analysis (2002). For example, in 1996, they find that 73% of men's ads were positive while only 36% of women's were (2002). These findings lead us to the second hypothesis, acting as a competing hypothesis for H_{1a} .

H_{1b}: Women display higher levels of toxicity when posting tweets directed at candidates outside of their party compared to men.

At the same time, there have also been studies that fail to find gender differences in the negativity of women's and men's campaigns (Proctor, Schenck-Hamlin, and Haase 1994; Walter 2013). Instead, they find that the party-level gender context matters for women and men's levels of negativity. In studying attack-style campaigning across four Austrian parliamentary elections from 2002-2013, Ennsner-Jedenastik and colleagues find that men are far more likely to be the target of attack-style campaign communications rather than women, but that women are less likely to engage in attack-style campaigning than men (2017). Interestingly, they also find that the gender context at the party-level predicts the likelihood of women within that party 'going negative'. More specifically, women from male-dominated parties attack other women candidates more often than women from gender-balanced parties (Ennsner-Jedenastik, Dolezal, and Miller 2017). But, when looking at men and women across all parties, they find that men are no less likely than women to attack other women candidates.

Similarly, Maier and Renner find that opponent gender is important for predicting men's uncivil language: men are more likely to launch uncivil attacks against male opponents than women (Maier and Renner 2018). These studies begin to scratch the surface of the idea that the gender context in an election may impact the degree to which women and men engage in negative campaigning, although at the party-level or against a

single opponent inside a riding. Instead, I argue below that the riding-level gender context (the proportion candidates in a riding that are women) is key to understanding the relationship between gender and toxicity in campaigning.

The Riding-Level Gender Context

In addition to the gender of the candidate publishing the tweet, the gender context of the riding, though seldomly studied, I believe plays a large role in the tendency of women and men to ‘go negative’. Very few scholars have focused on the gender context of the election in understanding negative campaigning, and those that do are largely based in the U.S. context, focusing on two-way races. As such, there is little theoretical groundwork to predict the ways in which women will campaign in ridings dominated by men versus those dominated by women, providing an interesting puzzle and opportunity to contribute to negative campaign literature.

Evans and Clark, studying the 2012 U.S. House elections, suggest that when candidates are running in ridings against women, they may be more likely to engage in attack-style tweeting than in ridings that have all-male candidates (2016). Evans and Clark suggest this is because of the idea that women are engaging in counter-stereotypical behaviour in these ridings, so there may be a greater prevalence of attack-style tweets in ridings with more women in them. Interestingly, Evans and Clark also find that as the proportion of candidates in a riding that are women increases, there is less discussion of ‘women’s issues’ “as this is no longer a characteristic on which women candidates can distinguish themselves from their competitors” (2016). Other than the fact that they find women are generally more likely to be negative in their campaigns and so, more women in a riding leads to more negativity, Evans and Clark provide little theoretical explanation on why this would be the case. They suggest women display counter-stereotypical behaviour in order to positively distinguish themselves from men and ‘fit in’ with the masculine domain of politics, but why would that be a tactic in a riding dominated by women?

Instead, I theorize that women may see a male-dominated riding as electorally threatening and strategically display masculine characteristics in their campaigns such as

negative and attack-style communications in order to show that they are a viable candidate by acting more like their male counterparts. By displaying more confrontational and aggressive behaviour, these women in male-dominated ridings are able to dissociate themselves from stereotypes projected onto them that position them as the weaker and less qualified candidate and ‘fit the mold’ of the traditional image of a candidate. But, in ridings dominated by women, there would be less motivation for women to distinguish themselves from other women to be more like the ‘typical’ candidate (a man), because most (or all) of their close competitors are up against the same stereotypes and expectations.

H_{2a}: Women display higher levels of toxicity than men in ridings where more men are running than women, and display lower levels of toxicity than men in ridings where more women are running than men.

But what about men? There is some evidence that men are less likely to attack when they are running against women than men. For example, focusing on U.S. congressional races, Kahn suggests that when men are running in ridings against women, they will be less likely to engage in attack-style campaigning. More specifically, when men are running against men, she found that they used personal attacks 18% of the time, compared to only 8% of the time when running against women (1993). Similarly, Fox, in his study of U.S. congressional races, finds that men do not utilize negative and attack-style campaign communication as heavily when running against women as compared to running against men (1997). He argues this is due to the fact that men are afraid to attack women for fear of negative perceptions from voters that they are “bullying” a woman (Fox 1997). In other words, there is a degree of performativity on part of men running against women in these two-way races, where men alter their campaign communication as a result of running against a woman in order to project a certain image of themselves as ‘gentlemanly’ to voters.

While this work does little in the way of understanding exactly how men will act in a system with more than two main parties, it gives us some indication of what to expect. In particular, the idea that men want to avoid looking like they are ganging up on or ‘bullying’ women (Fox 1997), especially in front of voters, suggests that men may be

less likely to display negative or toxic communications when in a male-dominated riding. But, when in a riding dominated by women, men may feel more threatened as the outsider, and less worried about looking like they are picking on a single female candidate. Instead, I expect that men will be more likely to display high levels of toxicity when the riding is dominated by women in order to emphasize their masculine characteristics to voters and play the role of a ‘typical’ candidate for political office.

H_{2b}: Men display higher levels of toxicity than women in ridings where more women are running than men, and display lower levels of toxicity than women in ridings where more men are running than women.

Data & Methods

In order to analyze the tweets for all candidates of the LPC, CPC, NDP, GPC, and PPC, I first collected the account handles for every candidate with an active account. Over the course of the campaign, I used the official party website of each party along with the Elections Canada confirmed candidates list³ to identify candidates running in each of the 338 ridings. For some party websites, they linked directly to candidate's social media accounts, including Twitter. But for some, this information was not included or was incomplete. As such, for any candidate that did not have a Twitter account linked directly on their official party website, I researched them separately to find the account. Many account handles were collected this way, as party websites often contained errors or had missing information.

Only personal accounts of candidates are included in this analysis, as opposed to riding association accounts with tweets written by staff. If the account indicated that the person writing the tweets was the actual candidate (and/or using first person language), the account was included. In addition to collecting the account handle, candidate gender also had to be collected. For the most part, official party websites included a photo of each candidate, which served as the basis of coding gender. If the candidate was clearly feminine-presenting, they were coded as a woman and if they were clearly masculine-presenting, they were coded as a man. For candidates where I was unsure or the website did not supply a picture, I consulted news articles that referenced the candidate's gender and as a last resort, listened to radio interviews with the candidate (if they had them) to try and identify gender based on their voice (this was the case for only one candidate: a man from the PPC).

To collect the tweets, I applied for and was granted a Twitter developer account to use with the R package "Rtweet", which provides a secure connection to Twitter's API to scrape up to 3,200 of a user's tweets at a time, regardless of how old the tweets are (unlike other R packages which restrict the ability to scrape tweets by time rather than volume). These tweets then underwent pre-processing, which consists of a number of

³ See <https://www.elections.ca/content.aspx?section=ele&dir=pas/43ge/can&document=index&lang=e>

steps depending on what aspect of the analysis was being executed. Since the core goal of this project is to analyze replies, mentions, and retweets mentioning candidates outside of their party, I coded each tweet on whether it was mentioning a candidate in the election, whether the candidate they were mentioning was a woman or a man, and whether the candidate they were mentioning was from their party or another party. These variables were used to subset the tweets down to the corpus of interest: tweets from candidates mentioning other candidates outside of their party.

Rather than simply measuring the overall sentiment of tweets using the basic bag-of-words approach to identify the proportion of negative versus positive words in tweets, I perform a more nuanced analysis of tweet sentiment. To do so, I employ the PeRerspective API's toxicity attribute. Using this trained machine learning model, I can measure the perceived impact of a comment (in this case, a tweet) on a conversation. The model attribute that will be employed is the "TOXICITY" attribute from the PeRerspective model, which classifies the probability that "a comment is a rude, disrespectful, or unreasonable comment that is likely to make people leave a discussion". This package has been specifically designed to analyze "comments" or in other words, things like a single post to a comment section on a webpage, which aligns well with Twitter's structure. The model used to score comments is a Convolutional Neural Network (CNN) model trained with word-vector inputs. The model has been trained using hundreds of thousands of comments from online forums such as Wikipedia and the New York Times. Each of these comments has been human-coded to train the model.

The model scores individual comments (tweets) on a continuous probability scale from 0 to 1. The model returns "model attribute scores" for each tweet where a higher value (on the 0 to 1 scale) indicates a greater likelihood of the attribute level. In other words, the model predicts the probability that a tweet will be perceived as rude, disrespectful, or unreasonable. The scores achieved from the model on each of the tweets are categorized as either 'toxic' (probability of being perceived as toxic > 0.50) or 'nontoxic' (probability of being perceived as toxic < 0.50) and used as the dependent variable of a binary logistic regression model. Using this model, we can investigate whether or not women are more likely to employ toxic language during the electoral campaign, and how the gender context in their riding relates to their level of toxicity.

Note that the model does not predict how toxic different candidates are in their tweets, but rather the likelihood that they will send out a toxic tweet.

The regression coefficients are presented in Average Marginal Effects (AMEs) for clearer interpretation. The output of logistic regression results in coefficients in natural log-odds, which are notoriously difficult to interpret. Instead, I present AMEs which calculate the marginal effect of x on y for every observation across all possible levels of the covariates and take the average. In other words, for a model predicting the likelihood of posting a toxic tweet with ‘gender’ and ‘proportion of women in the riding’ as predictors, the AME of gender would be the average marginal effect of gender for each observation across all observed levels of women’s representation. While there are many specifications and variations of calculating AMEs, this analysis calculates the marginal effects of x at each observation and then takes the mean of these individual marginal effects in order to acquire the overall marginal effect for each key predictor, rather than calculating the marginal effects at the means (MEMs). But, to better understand how the effect of gender varies across specific levels of women’s representation in ridings, I also calculate Marginal Effects at Representative cases (MERs), which allows us to gain insights into how women tweet in ridings that are dominated by men, have gender balance, or those that are dominated by women.

For further descriptive context, I also perform ‘keyness’ analysis to better understand the nature of toxic vs. non-toxic tweets made by candidates. In this case, tweets are sorted into two corpora: the target corpus and the reference corpus. Next, English and French ‘stopwords’ are removed from each tweet, each corpus is tokenized, a separate document-frequency matrix is created for each body of tweets, and finally, target word collocation is performed. More specifically, we can identify unique terms used in the target corpus compared to the reference corpus where each term (word) is assigned a chi-squared statistic for the degree to which it is unique to the target corpus (in other words, how much more the word is used in the target compared to the reference, relative to the size of each corpus). In doing so, we can identify language that is employed more often in toxic versus non-toxic tweets. The analysis below first focuses on descriptive statistics of tweets mentioning other candidates, the language that makes toxic tweets

unique, the toxicity of tweets mentioning other candidates overall, and the core model analyzing how gender and the gender context relate to toxic campaigning.

Analysis

The Canadian Electoral Twitterverse

Table 1: Summary Tweet Volume

Party	Candidates Running (#)	Candidates Running (%)	Have Twitter (#)	Have Twitter (%)	Total Tweets	Avg # of Tweets	Mentions Other Candidate	Avg Mentions Other Candidate	Mentions Candidate Outside Party	Avg Mentions Candidate Outside Party
Liberal Party										
Women	133	39.3	110	82.7	37,628	342	11,663	106	665	6
Men	205	60.7	172	83.9	49,912	290	15,550	90	1,216	7
Total	338	100.0	282	83.4	87,540	310	27,213	96	1,881	7
Conservative Party										
Women	104	30.8	80	76.9	14,051	176	3,939	49	421	5
Men	234	69.2	191	81.6	32,676	171	9,550	50	1,165	6
Total	338	100.0	271	80.2	46,727	172	13,489	50	1,586	6
New Democratic Party										
Women	164	48.5	111	67.7	28,604	258	7,299	66	1,042	9
Men	174	51.5	128	73.6	28,902	226	7,965	62	1,586	12
Total	338	100.0	239	70.7	57,506	241	15,264	64	2,628	11
Green Party										
Women	156	46.4	92	59.0	28,887	314	5,848	64	1,085	12
Men	180	53.6	112	62.2	23,143	207	4,898	44	1,139	10
Total	336	100.0	204	60.7	52,030	255	10,746	53	2,224	11
People's Party										
Women	57	17.9	50	87.7	34,690	694	12,629	253	2,348	47
Men	261	82.1	213	81.6	100,214	470	44,796	210	10,321	48
Total	318	100.0	263	82.7	134,904	513	57,425	218	12,669	48

Throughout the four months leading up to the federal election, the 1,254 candidates with Twitter accounts tweeted a total of 378,707 tweets, resulting in an average of 302 tweets sent per candidate. Of these tweets and retweets, 124,137 of them mention or reply to another candidate running in the election. So, around 32.8% of all tweets involve some sort of interaction with other candidates in the election, whether inside or outside of the candidate's party. It is evident that candidates are more likely to tweet at other members of their own party than candidates outside of their party as 20,988 (16.9% of all 'reply' or 'mention' tweets) are sent from candidates mentioning another

candidate outside of their party. Out of the 1,254 candidates who have a Twitter account, 918 of them tweeted at a candidate outside of their party. In order to understand what candidates are most likely to engage in toxic, attack-style campaigning, particularly as it relates to the candidate's gender and the gender context in the riding, this set of 20,988 tweets are the focus of the analysis.

Table 2: Example Candidate Tweets

Party	Sample Tweet	Score
PPC	JustinTrudeau CanTeachersFed Can't wait until the next time this entitled a**hole shows his face in Saskatchewan.	0.93
GPC	AnotherStam AndrewScheer You get ticket # 00001 on the Bullsh*t Express! Check your baggage to the left as you board ...	0.92
PPC	MaryamMonsef You're pathetic.	0.91
CPC	dbeggs13 JustinTrudeau I'm 100% certain that never happened. And this is the first time I've said this on twitter to anybody: You are a vulgar idiot. Please quote me on your resume.	0.90
PPC	AndrewScheer You are so awkward and lame that my skin hurts when I see you	0.89
GPC	AndrewScheer Good grief. The Bullsh*t Train has left the station.	0.79
CPC	RalphGoodale Your government is CORRUPT you have ZERO credibility. You have significant issues to deal with like Organized Crime infiltrating your corrupt government. You support ISIS who has completed horrendous crimes on LGBTQ2S community. Stop being incredibly hypocritical.	0.74
LPC	AndrewScheer What a crock of fish, all u do is lie to Canadians, accept your role as Jason Kenny's place holder	0.74
NDP	This thread is an INSULT For goodness sakes, SeamusORegan, your leader promised a new relationship between #Canada and #FisrtNations All we have seen is more of the same #Disrespect #BrokenPromises We haven't forgotten #ThanksForYourDonation Your party is #SHAMEFUL	0.65
CPC	MarcMillerVM you have an issue with CPC_HQ selecting a photo of indigenous woman to represent rural Canada? Quite the racist & sexist comment. I take great issue with this. You have bigger problems than a stock photo that is common practice in advertising.	0.64
GPC	PascalLeroux JustinTrudeau It's not a dumb moment but a racist one, when he did that, "with his privilege" as he calls it, he knew it was racist, and thus everytime. RACISM has serious consequences on the victims, this is our PM, how many victims you think those picture made? Let's not change the subject.	0.56
LPC	We are looking for 2 things here. Acknowledgement, and apology. Things completely missing in AndrewScheer -He is not a leader. He is a peddler of lies, fiction and hatred. Something we see ripping apart the USA. #ChooseForward https://t.co/zdfccLnQ8l	0.56
LPC	Stop beating around the bush and be honest, AndrewScheer. You don't believe in climate change and that's why you don't have any plan on the environment. #cdnpoli https://t.co/mxAYOJOo6e	0.50
GPC	This material from BobSaroya are not campaign ads, but garbage propaganda paid from #markham #unionville tax dollars. This is not opposition holding government accountability. It's just trash. We deserve better politicians. #elxn43 #cdnpoli Respect tax dollars. https://t.co/7FWN0ZomZj	0.50
CPC	MaryamMonsef & cafreeland - what are your thoughts/feelings around what your candidate from Sydney Victoria said? How long will women like you stand by men like him who pretend to be feminists, but then disrespect and degrade women? Haven't you had enough? #fakefeminism	0.40
NDP	trapdinawrpool If I remember correctly, didn't the JustinTrudeau Liberals promise to end the boil water advisories on ALL reserves in their first term? https://t.co/8kWvfdBCL4	0.25
GPC	DarrenBurchill AndyFillmoreHFX liberal_party I support meeting the climate targets we have to meet. Have to. I do not like nuclear. I think we have better options. And - yes - there will be some inconveniences. But there are lots of opportunities to make life better on all fronts too. Lots.	0.15
NDP	And that's a wrap on forum number 5. In my closing statement, I mentioned how many forums each Kelowna, Lake Country candidate has attended in full thus far. GPC Travis Ashley - 4/5 PPC PpcBarr - 4/5 Con. TracyGrayKLC - 2/5 Lib. FuhrMP - 5/5 NDP JustinKulik - 5/5 #elxn43	0.09
NDP	When all participants in a #debate treat each other with respect, everyone benefits Thanks GinettePT MPMarilynGladu and purdygreenKC for a healthy discussion on #Healthcare at FamPhysCan #elxn43 #canhealth #cdnpoli #NDP2019 #J54PM	0.06
LPC	Pleased to participate in tonight's #100Debates in #YorkCentre alongside #NDP candidate AndreaVasquezj. An important opportunity to address critical environmental issues like climate change & more. Thanks to HeschelSchool & Beth David Synagogue for organizing. #elxn43 https://t.co/0jXMYkKA9	0.01

Among these tweets, those classified as 'toxic', meaning they have been scored as having a probability greater than 0.50 of being perceived as toxic to a discussion and cause someone to withdraw, account for 11.80% overall. Table 2 shows a sample of tweets at different toxicity scores in order to better understand what type of campaign communication is classified as toxic and non-toxic. Interestingly, these tweets stand out in more ways than one. Compared to non-toxic tweets, they are far more likely to garner attention and distribution. In fact, on average, toxic tweets receive 32 favourites and 372 retweets compared to non-toxic tweets, which receive 15 favourites and 74 retweets on average. While women are more likely to be mentioned in a non-toxic tweet than a toxic tweet, it is the opposite for men. Of these tweets, 32.7% are non-toxic tweets towards women and 24.3% are toxic tweets towards women. For men, 88.0% are non-toxic tweets towards them and 91.9% are toxic tweets towards them. In other words, when a man is tweeted at by a counter-partisan candidate, it is more likely that it will be a toxic tweet than a non-toxic tweet. As far as the gender of the candidate sending the tweet, corresponding to H_{1a} and H_{1b} , toxic tweets account for 10.8% of women's tweets and 12.2% of men's tweets, giving some preliminary support for H_{1b} that men are more likely to post a toxic tweet than women.

Table 3: Within-Party Toxicity

Party	Toxic Tweets (%)
Liberal Party	
Women	3.10
Men	2.88
Total	2.96
Conservative Party	
Women	9.92
Men	6.59
Total	7.45
New Democratic Party	
Women	6.00
Men	6.78
Total	6.44
Green Party	
Women	6.37
Men	6.25
Total	6.31

People's Party	
Women	18.11
Men	15.71
Total	16.14

But, there are substantial party differences in the prevalence of toxic tweets, as seen in table 3. The party that is most likely to send toxic tweets is the PPC: 16.14% of their tweets are classified as toxic. The next highest is among CPC candidates, with 7.45% of their tweets. They are followed by the NDP (6.44%) and the GPC (6.31%), and finally, only 2.96% of LPC candidate tweets are toxic. However, upon closer examination, when controlling for party affiliation it appears that women may actually be more likely to send toxic tweets than men. In every party except for the NDP, women actually show higher levels of toxicity than men. This provides support for H_{1a} . The greatest gender gap in tweet toxicity can be found within the CPC and PPC. Among Conservatives, 6.59% of men's tweets compared to 9.92% of women's tweets are toxic. For PPC candidates, 15.71% of men's tweets are toxic and 18.11% of women's tweets are toxic. So, overall, the candidates with the highest concentration of toxic tweets mentioning other candidates outside of their party are PPC women.

In order to better understand what type of language characterizes a toxic tweet, a keyness analysis of toxic versus non-toxic tweets has been calculated. As is mentioned above, keyness analysis compares the prevalence of a single token (a word) in two bodies of tweets: a target and a reference group. A chi-squared value is assigned to each token to signify the degree to which the token is unique to the target group over the reference group. But, this does not tell the whole story. Along with the chi-squared values of key tokens, figure 1 shows the frequency of the token in the target group (toxic tweets) to get a better sense of how unique the term is *and how much it is actually used in toxic tweets*. As a result, we discover that 'hypocrite' and 'racist' are both highly prevalent in toxic tweets and are part of the language that characterizes these tweets more broadly. In other words, compared to a non-toxic tweet, toxic tweets are much more likely to include accusations or declarations of hypocrisy and/or racism. Interestingly, the token with the next highest chi-squared value and frequency is "white". Other tokens that characterize toxic tweets include "homophobic", "supremacists", "blackface", "gay", and "corrupt".

Keyness Analysis: Unique Terms in Toxic Tweets Mentioning Other Candidates

Note: Reference category is non-toxic tweets

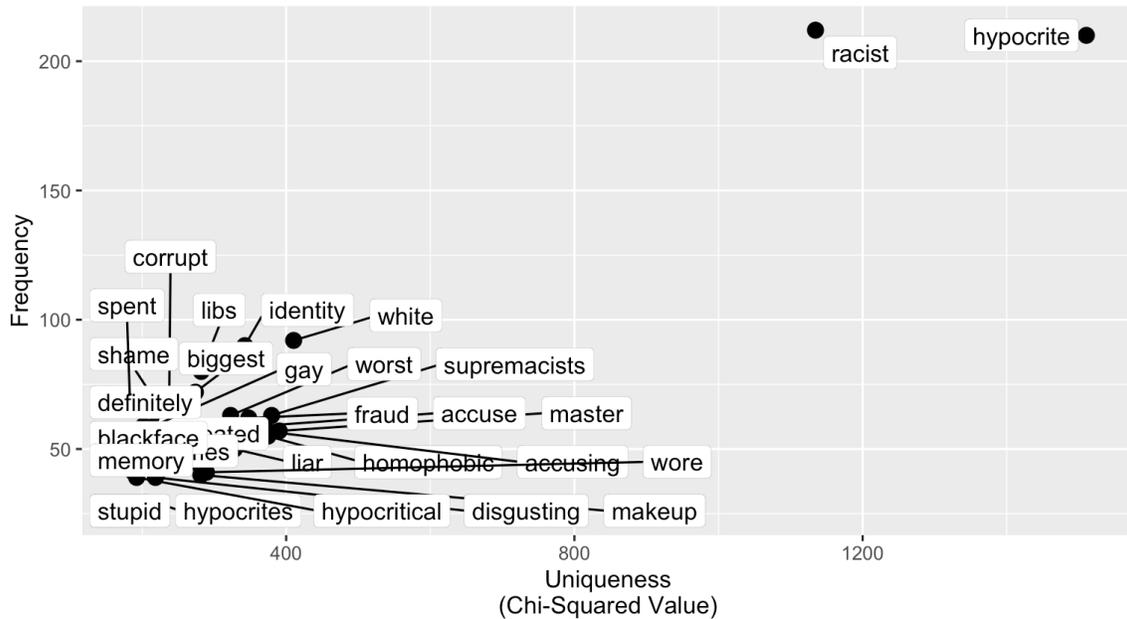


Figure 1 Keyness Analysis of Toxic Tweets

Gender and Toxicity

Figure 2 further investigates the relationship between gender and toxicity to try and shed light on H_{1a} and H_{1b} . This density plot displays the distribution of tweet toxicity scores by gender. To be clear, the 0-1 toxicity scale runs from least likely to be perceived as toxic (0) to the most likely to be perceived as toxic (1). When examining this density plot, it becomes clear that gender on its own does not provide large differences in the prevalence of toxic tweets. But, there are some small differences between men and women's density across different values of toxicity. Firstly, at the lowest end of the scale where x is between 0 and 0.18 (very low probability of being perceived as toxic), women show a higher density of tweets than men. In other words, a greater concentration of women's tweets fall in the lower toxicity range compared to men's tweets. Secondly, on the high-end of the toxicity scale where levels are between 0.53 and 0.85, men, compared to women, show higher density. Taken together, this suggests that when not controlling for any other factors, men, instead of women, are more likely to send toxic tweets. But, overall, these differences appear very small and generally

indicate that men's and women's baseline distribution of likelihood to send out a toxic tweet is very similar.

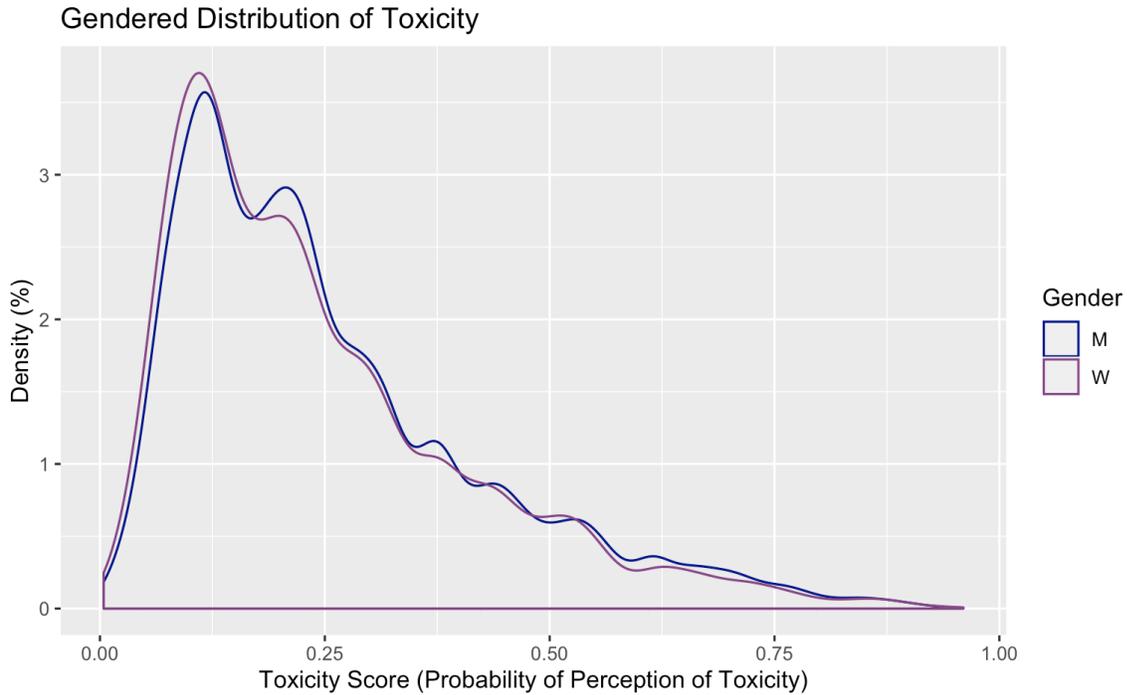


Figure 2 Distribution of Tweet Toxicity by Gender

The Core Theory: What About the Gender Context?

But, the key relationship of interest is how gender and the gender context relate to tweet toxicity. Before presenting the full model which controls for other factors such as incumbency and party affiliation and adds the key interaction effect, I analyze this relationship on its own. Figure 3 provides a plot of the average marginal effects (AMEs) of each of the key predictors in a binomial logistic regression model predicting the likelihood of posting a toxic tweet. In other words, it shows the average effect of gender and the gender context on the likelihood of posting a toxic tweet across all values of x . For example, the AME of Gender (W) takes the AME of the candidate being a woman at each level of the proportion of women in a riding that actually exists in the dataset and averages it. So, it calculates a different AME of being a woman across every different gender context and takes the average effect of being a woman.

As a result, we see that across these different contexts, women, on average, are 1.79% ($p < 0.05$) less likely to post a toxic tweet compared to men, providing support for H_{1a} . In addition, when ridings are dominated by women, the likelihood of candidates posting a toxic tweet is 3.27% ($p < 0.05$) higher compared to ridings that are dominated by men. Since there are no men tweeting in ridings with 100% of their candidates being women, this AME actually represents the change in likelihood of a toxic tweet being posted for a woman in an all-woman riding compared to a man in an all-man riding. The full model, including an interaction between gender and the gender context sheds far more light on the nature of this relationship and how the gender context shapes tweet toxicity for men and women separately.

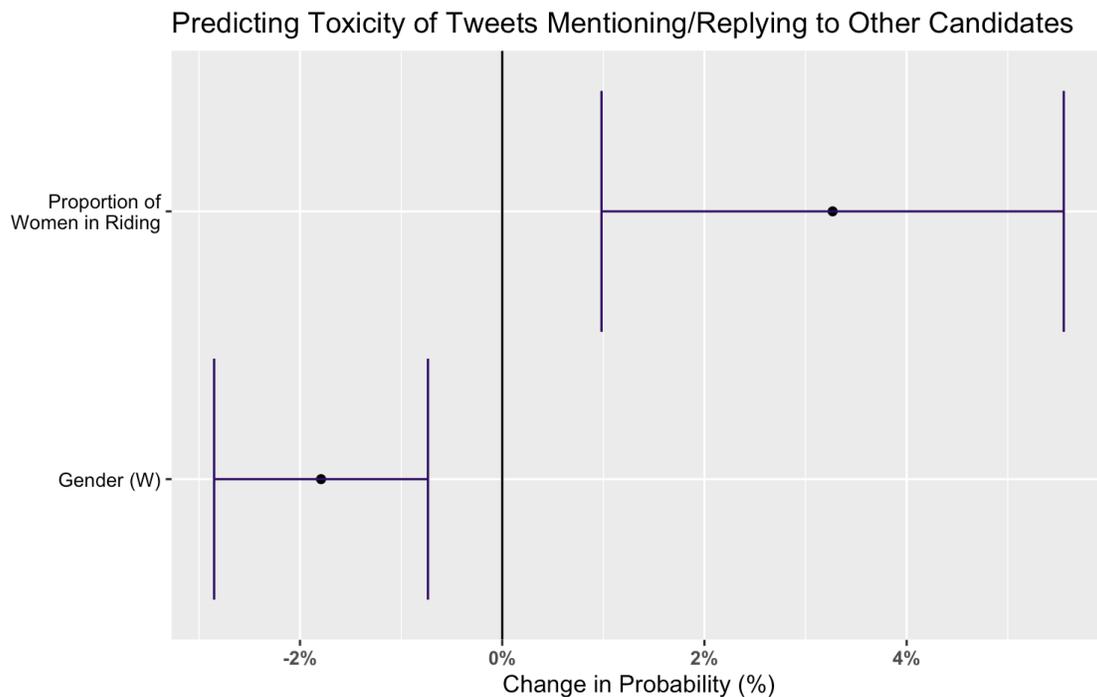


Figure 3 Average Marginal Effects: Gender and the Gender Context

The Full Model: What Candidates Are Most Toxic?

Finally, the full model controls for a variety of factors including party affiliation, incumbency status, gender, whether the candidate is competitive in their district, whether the target of the tweet is a woman, and the gender context (proportion of women in the riding). Note that the proportion of women in a riding is treated as a continuous variable, as there are actually many different combinations of the number of men and women in

ridings from major parties, resulting in a continuous numeric variable. Like the model above looking only at the core theory variables, figure 4 presents the AMEs of key predictors in a binomial logistic regression model predicting the likelihood of posting a toxic tweet.

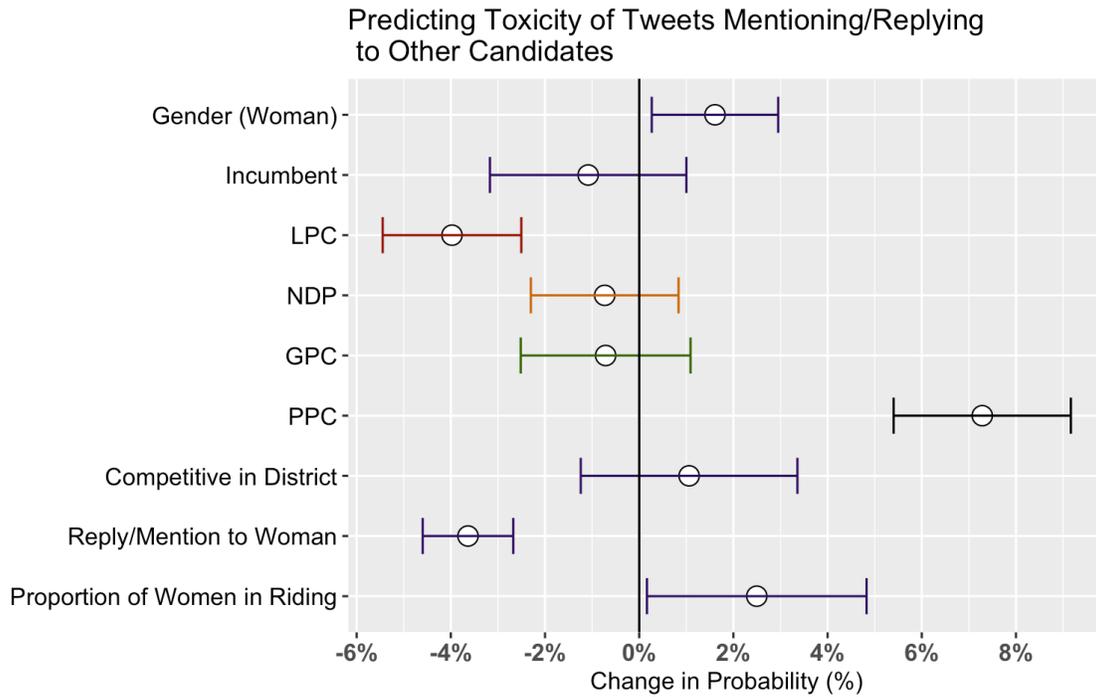


Figure 4 Average Marginal Effects: The Full Model

Looking at this full model, we see several descriptive findings carry over. Firstly, for tweets sent by both men and women, if they mention another candidate that is a woman, they are 3.64% ($p < 0.05$) less likely to be toxic than if they do not mention a woman. Secondly, political party affiliation expectations prevail. Note that the CPC is the reference category. As we would expect from previous analysis, PPC candidates are 7.28% ($p < 0.05$) more likely than CPC candidates to post a toxic tweet while LPC candidates are 3.98% ($p < 0.05$) less likely to post a toxic tweet. Candidates from the NDP and GPC are slightly less likely than CPC candidates to post a toxic tweet; however, are not statistically significant. These findings are consistent with expectations from the descriptive analysis that suggested that PPC candidates had the highest levels of toxicity while the LPC had the lowest.

Thus far, the analysis has provided mixed evidence for H_{1a} and H_{1b} . It is not particularly clear whether or not men or women are more toxic in their tweets mentioning other candidates outside of their party. While basic bivariate analysis of gender and toxicity support H_{1a} that men are more toxic, any analyses controlling for party suggest that women are consistently more toxic. But, in the full model, the average marginal effect of being a woman candidate over a man suggest that they are 1.61% ($p < 0.05$) more likely to post a toxic tweet. In other words, across all values and categories of the key predictors (including party and the gender context), the average effect of being a woman is actually positive in predicting tweet toxicity, lending further support to H_{1b} . At the same time, the proportion of women in a riding coefficient of +2.50% ($p < 0.05$) suggests that candidates in ridings dominated by women are more likely to send toxic tweets. But, to get a true sense of the relationship between gender, the gender context, and toxicity, we must examine the effects plot of the interaction between gender and the gender context. This way, we can address H_{2a} and H_{2b} .

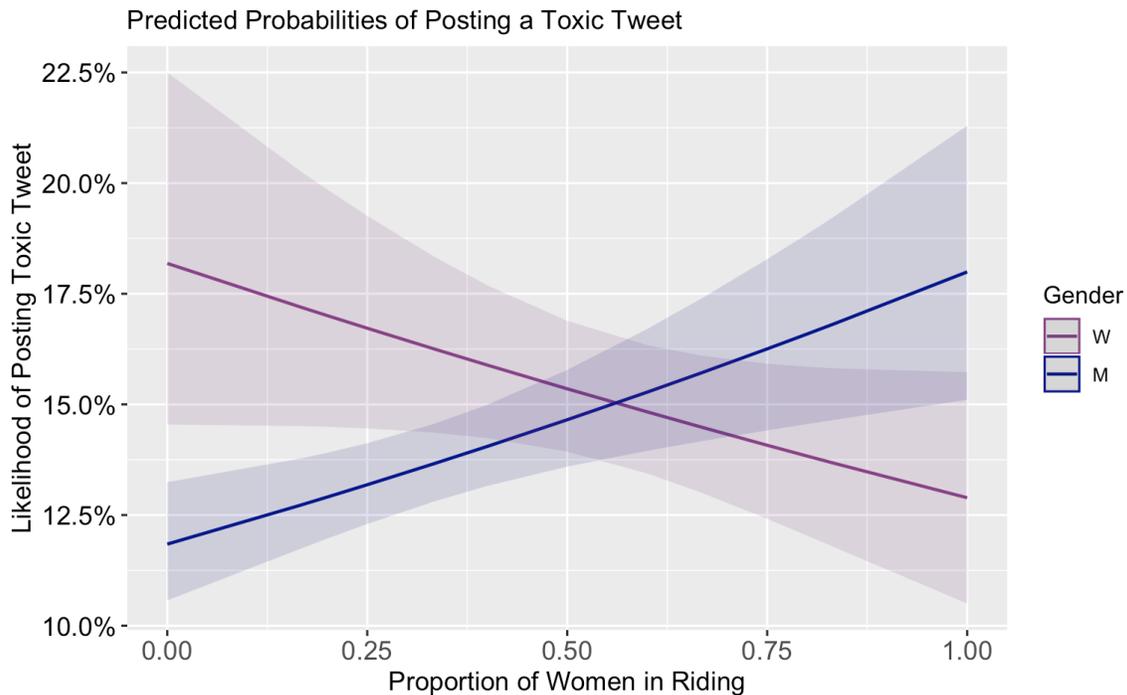


Figure 5 Predicted Probabilities of Posting a Toxic Tweet

Figure 5 presents the predicted probability plot corresponding to an interaction term between gender and the gender context to understand how the gender context impacts the behaviour of women candidates compared to men. Note that this interaction

term is statistically significant at 99.9% confidence ($p < 0.001$). As we can see, men's and women's likelihood of sending toxic tweets differ across the gender context. At the lowest end of the scale, where ridings are dominated by men, women are far more likely than men to send toxic tweets. More importantly, women are more likely in ridings dominated by men to send a toxic tweet than in those dominated by women. Keep in mind that there are no women in ridings that have 0% representation of women. Thus, it is more helpful to look at the predicted probability of sending a tweet at the lowest 'real' representation of women in the dataset, which is 16.7% representation ($x = 0.167$). In this gender context, the probability of sending a toxic tweet is 17.2% for women compared to 12.7% for men (4.5% difference in probability). This supports H_{2a} and H_{2b} that taken together, predict ridings with low representation of women will see higher toxicity by women and lower toxicity by men.

Where there is high representation of women (83.3% of candidates), as predicted, women are less likely than men to send out a toxic tweet. More specifically, women in ridings with 83.3% representation have a predicted probability of 13.7% of sending a toxic tweet while men have a predicted probability of 16.8%. So, in these woman-dominated ridings men are 3.1% more likely than women to send a toxic tweet. Finally, in ridings where there is equal representation of women and men we see similar likelihood between men and women that they will send out a toxic tweet. For women, the probability of sending a toxic tweet in a gender-balanced riding is 15.4% and for men it is 14.7%. Overall, the binomial logistic interaction coefficient and resulting predicted probability plot provide support for H_{2a} and H_{2b} , suggesting that the likelihood of candidates to send out toxic tweet depends, in part, on the gender context under which they are campaigning in their riding.

Lastly, table 4 calculates marginal effects at representative cases (MERs) to further support the predicted probability plot interpreted above. As mentioned previously, MERs are simply AMEs calculated at different levels of a specified variable. As such, in order to further understand how gender and the gender context predict toxicity, we can examine the effect of being a woman across several gender contexts. As a result, we get a table of MERs showing us the predicted change of probability of posting a toxic tweet

compared to men as a result of being a woman in ridings with varying levels of gender representation.

Table 4: Marginal Effects at Representative Cases of Women’s Representation

Proportion of Women	Gender (W)	Reply/Mention to Woman	Competitive	Incumbent
0.0	4.88	-3.47	1.01	-1.03
0.2	3.15	-3.60	1.05	-1.07
0.4	1.41	-3.75	1.09	-1.12
0.6	-0.34	-3.90	1.14	-1.16
0.8	-2.12	-4.07	1.18	-1.22
1.0	-3.93	-4.24	1.24	-1.27

Each cell in this table represents the AME of the corresponding coefficient at a specified level of 'Proportion of Women'. The levels of women's representation that the MERs are calculated at have been selected because a large proportion of candidates fall into ridings with these specified levels of representation. Looking at the bolded 'Gender (W)' column, we see that in ridings with 20% women, women are 3.15% more likely to post a toxic tweet compared to men. At 40% representation of women, women are only 1.41% more likely than men to post a toxic tweet. But, once we tip the gender-balance in favour of women to 60% representation, they are less likely than men by 0.34% to post a toxic tweet. Lastly, in ridings dominated by women with 80% representation, they are 2.12% less likely to post a toxic tweet compared to men. This, in combination with the predicted probability plot of the interaction term, provide consistent evidence of a heterogenous gender effect when examining the relationship between the gender context in Canadian electoral ridings and levels of toxicity.

Discussion

My findings suggest that overall, it is unclear how gender relates to toxicity in the aggregate; however, it is at different levels of women's representation where a clearer image of gender differences in toxicity comes through. On the one hand, supporting *H_{1a}*, men overall show slightly higher levels of toxicity compared to women. This can be explained by the idea that women candidates strategically adhere to stereotypes attributed to them in order to avoid the potential consequences of campaigning in a counter-stereotypical way (Carlson 2007; Fox 1997; Lau and Pomper 2004; Parmelee and Bichard 2012; Trent, Friedenber, and Denton 2011). In other words, it is possible that women suppress toxic language in their campaigns more than men in order to avoid the electoral disadvantages of distancing themselves from traditional gender stereotypes. On the other hand, simply looking at gender differences within parties shows that women were more toxic than men in every case except for amongst NDP candidates, providing support for *H_{1b}*. It is possible instead that women strategically participate in toxic campaigning in order to differentiate themselves from the same gender stereotypes that they perceive the public see as incongruent with politics and electoral success (D. G. Bystrom et al. 2004; Evans and Clark 2016; Kahn 1993). Overall, it is unclear the nature of the effect of being a woman on toxicity; however, examining the gender context reveals substantial differences.

Building on the work of Evans and Clark (2016), I examine how the gender context relates to women's tendency to 'go negative'. Evans and Clark (2016) suggest that since they find women tweet more attack-style and negative communications overall, ridings with women in them will have a greater presence of negative and toxic language. But, this only tells a small part of the story. I argue and find support for the idea that in woman-dominated ridings, men may feel more threatened as the outsider and less concerned about 'ganging up on' or 'bullying' women in the ridings with negative and toxic campaign communication. Instead, they go out of their way to emphasize their normative masculine characteristics to voters and play the role of a 'typical' electoral candidate. But, this is not necessary for them in male-dominated ridings since they are

less threatened by women's high presence as candidates and want to avoid projecting an image of them treating women badly through toxic and negative tweets.

All the while, a similar gender-threat dimension may be acting upon women: women see male-dominated ridings as electorally threatening and strategically engage in toxic, male-stereotypical behaviour in order to differentiate themselves from the idea that women are weaker, have lower leadership ability, and do not 'fit the mold' of a candidate. At the same time, in women-dominated ridings there is little motivation for women to distinguish themselves from these stereotypes and a lack of threat from men, leading to a lower propensity to send out toxic, counter-stereotypical campaign communication. Overall, these findings suggest that campaign communications delivered to the public from candidates are shaped, in part, by the gender dynamics at the riding-level. This finding is not yet established in other literature on negative campaigning, thus providing an important contribution to the field.

As mentioned previously, very few studies in the negative campaign literature focus on any political context outside of the United States. Additionally, little has been done in the way of understanding how the gender context contributes to campaign communications, especially in countries outside of the US. Future work should aim to incorporate both of these shortfalls, focusing on the heterogeneous effects of gender based on the gender context in political systems with greater than two competitive political parties. While this study provides a first-pass at understanding the dimensions of gender and the gender context in a non-American setting, further work is needed to more consistently characterize the nature of this relationship.

Conclusion

This study has sought to answer a core research question: What candidates are most likely to employ toxic, attack-style campaign communications directed at other candidates? In analyzing this question, I have made several key findings. Firstly, PPC candidates are consistently more likely to be toxic compared to candidates from all other parties. Secondly, Liberal candidates are the least likely to tweet toxic communications. Thirdly, tweets that reply to or mention women are less likely to contain toxic content. Most importantly, overall, it is not clear whether men or women are more likely to employ toxic campaign communications. But, in line with hypotheses H_{2a} and H_{2b} , analyzing the riding-level gender context reveals significant heterogeneous effects of gender: women are more likely to be toxic than men in male-dominated ridings and men are more likely to be toxic than women in female-dominated ridings.

This core finding and study more broadly provide a significant contribution to existing literature on negative campaign communications in a number of ways. First, literature actually focusing on this dimension of campaign communications are scant, providing a starting point for future researchers. Second, this study demonstrates the use of advanced methodological techniques and applications to understand negative campaigning. Research that aims to study a large body of text typically experiences tension between analyzing a small number of hand-coded text or a large number of bag-of-words scored texts simply identifying and counting negative and positive words. But, this work contributes to the field by using a trained algorithm accessed through the Perspective API to score tweets. Lastly, calculating average marginal effects, rather than interpreting odds-ratios of logistic models provide a more intuitive and accessible way to communicate results to readers. All-in-all, this study possesses a number of unique attributes to add to existing work in the field both methodologically and theoretically, providing a valuable contribution.

While this work provides theoretically interesting and statistically significant findings, it analyzes only one electoral context at one point in time. A challenge of working with social media data such as Twitter is the inability to retroactively collect

tweets across large gaps in time. As such, this study is limited in its scope to a single election; however, future work should try and build upon this study across time to better understand how this relationship between the gender context and campaign communication prevails. In other words, it is crucial that future work proactively collects social media data across political contexts and time in order to get a larger picture of negative campaign activity. Secondly, this study is limited in the sense that it analyzes all tweets made by candidates towards candidates outside of their parties. Instead, future work should aim to better understand backlash-effects of toxic campaigning in threads between candidates who tweet back-and-forth at each other in a toxic tone. Understanding which candidates act as 'instigators' and 'defenders' online may reveal important differences across candidate characteristics and in particular, candidate gender.

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