








The Effect of Exogenous Shocks on the Administration of Online Voting: Evidence from Ontario, Canada

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Abstract. This paper examines the impact of two exogenous shocks – a 2018 technical incident that took place in Ontario, Canada, and the COVID-19 pandemic – on the administration of local elections in Ontario. Drawing upon survey and focus group data, this paper concludes that these two exogenous shocks affected the perception and adoption of online voting on the municipal level in differential ways. We find that the COVID-19 pandemic had a greater perceived effect upon the decision to adopt online voting than the 2018 technical incident. However, the perceived effects of the 2018 technical incident were just as likely to be felt in unaffected municipalities as they were in those that had been directly affected. Municipalities that had not used online voting in 2018 and medium-sized cities were more negatively affected by the 2018 technical incident. In contrast, the perceived effects of the COVID-19 pandemic did not hinge upon the previous use of online voting, city size, or the urban/rural divide.

Keywords: Online voting · Technical incident · COVID-19 · Exogenous shocks · Policy window · Canada · Ontario

1 Introduction

Contextual circumstances can and do influence how administrators run elections. Whether reacting to economic crises [1], war [2], natural disasters [3], or public health emergencies [4], election officials around the world have had to pivot during periods of uncertainty to continue to offer regular, free, and fair elections. In particular, the COVID-19 pandemic has pushed election officials to make changes to election rules and

processes that they may not have made otherwise – including the expeditious adoption of remote voting methods such as postal and online voting [5]. The COVID-19 pandemic has also encouraged governments to streamline and modernize election processes by adopting other types of election and voting technologies. Yet, while certain events push governments to deploy election technologies sooner than they might have otherwise, the growing implementation of voting technologies brings with it the increased likelihood of technical incidents – a type of exogenous shock that may impact the ways that officials administer elections. In fact, as governments and election management bodies (EMBs) embrace voting technologies, the possibility for technical incidents increases. Recent examples of such events occurred during New South Wales’s 2021 local elections in Australia [6–8], in the 2018 Pakistani general election [9], and, of relevance to this work, in Ontario’s 2018 municipal elections [10].

During Ontario’s 2018 municipal elections,¹ a technical issue with an online and telephone voting election service caused a voting outage in 43 municipalities across the province, forcing local election administrators to take contingency measures to ensure that all voters had a chance to participate (herein referred to as the “2018 technical incident”). Though the affected municipalities represent only a fraction of those that employed online voting in 2018, the technical incident was widely reported about in the media and caught the attention of administrators from across the province. Two years later, in 2020, Ontario was also impacted by the COVID-19 pandemic. Calls for health and safety measures altered the ways that officials carried out elections, including in the adoption and use of election technologies.

With a particular focus on online voting, this paper explores how these two shocks – the 2018 technical incident and the COVID-19 pandemic – may have: (1) impacted the administration of electronic elections in Ontario and, (2) been perceived differently across Ontario’s municipalities. Ontario provides an intriguing case in which to study the impact of these shocks because of its large number of municipalities² that account for both urban and rural communities, small and large population sizes, and varying levels of voting technology usage. Although much research has examined the effects of the COVID-19 pandemic on election administration, this case allows us to directly compare the effects of the pandemic and a technical incident to see if and how they matter differently. This comparison, made among the same set of survey respondents, offers a novel contribution to research on the effects of unpredictable circumstances on small-scale elections reforms, including the adoption of electronic voting technologies.

We hypothesize that each shock has exerted different pressures on administrators and elections. It is likely that the 2018 technical incident increased insecurities about online voting and therefore presumably discouraged municipal uptake, while the COVID-19 pandemic encouraged local governments to adopt, or at least consider adopting, online voting. These forces are countervailing, and it is possible that both mattered, neither did, or that one mattered more than the other. We find that the COVID-19 pandemic had a greater perceived effect upon decisions of whether to adopt online voting than the 2018 technical incident, especially for those municipalities whose voting plans had been affected by the 2018 voting outage. However, these two shocks had different effects

¹ All regular municipal elections in a province occur at the same time.

² Ontario has 444 municipalities.

on different types of municipalities. Given the persistence of the pandemic and the increasing frequency with which technical incidents occur, our results offer important insights for both scholars and policymakers.

2 Context: Municipal Elections in Canada

Canada is a federation where municipalities are established and have their authority defined by their respective provincial governments. As such, the authority, decision-making power, and very existence of municipalities is a product of provincial legislation (i.e., they are ‘creatures of the provinces’). This power extends to the regulation of municipal elections, wherein each province has one enabling piece of municipal legislation. In Ontario, the *Municipal Act* guides municipalities in most policy and legal domains. However, the *Municipal Elections Act* sets out the rules, timing, and procedures for running local elections across the province. Section 42(3) of the *Municipal Elections Act* provides for the use of alternative voting methods during municipal elections if the council of the municipality has approved the use of such methods. Likewise, Sect. 11(2) of the *Municipal Elections Act* places the responsibility for conducting the election upon the Clerk.³

In Ontario, there is substantial uptake of online and telephone voting among municipalities. Along with Estonia and Switzerland, Canada has one of the longest standing deployments of online voting in the world. The use of online voting in binding elections in Canada began in 2003, when 12 municipalities in Ontario adopted the technology. Since then, use of online voting has grown steadily across municipalities in Ontario.⁴ In the 2018 Ontario municipal elections, 177 municipalities offered online voting, accounting for about 45% of cities and towns and 29% of the 9.4 million voters in the province [10]. In 2022, the number of municipalities offering online voting in Ontario will cross the majority threshold, with an estimated 220 out of 414 doing so.⁵ In addition, many municipalities in Nova Scotia and Ontario use telephone voting as a complimentary channel, especially in communities where internet connectivity is poor or not available, or electors’ digital literacy is of concern. In a majority of the municipalities employing online and/or telephone voting, paper ballots have been eliminated altogether [10].

Ontario is a unique case to study online voting development. It has a large population (comparative to other provinces and territories), a high number of municipalities (444), and the legislative framework under which it abides allows for its municipalities to make individual decisions about the voting methods they employ. In fact, since 2003, Ontario has had one of the longest standing experimentations with online voting. In contrast to most other jurisdictions where online voting adoption is implemented simultaneously,

³ The Clerk is one of two statutory roles required for each Ontario municipality. The Clerk manages services, policy processes, elections, and matters of legislative compliance in their respective municipality.

⁴ The province of Nova Scotia also uses online voting in most of its municipalities. In 2020, 39 of the 46 municipal elections held in Nova Scotia were conducted online. Although there are 48 municipalities in Nova Scotia, two municipalities had committed to using online voting, but all races were acclaimed in the 2020 election.

⁵ There are 444 municipalities in Ontario. 414 of them are responsible for running local elections.

uptake in Ontario has been varied: although a growing number of municipalities have introduced the voting reform, some have switched back to paper ballots.

Despite this, Ontario has the most online voting uptake in Canada and has become a hub for electronic elections worldwide. Presently, it is the most extensive case of online voting deployment globally, and Canada is the only country wherein certain jurisdictions run online elections remotely with no paper ballot option. Given these considerations, and the fact that a technical incident occurred in the most recent Ontario municipal elections, the province provides a unique case to study the effects of exogenous shocks on the administration of local elections. Furthermore, since there is a forthcoming municipal election in October 2022, the local officials surveyed and interviewed for this paper had already made decisions about which voting modes will be used. This allowed us to learn about the first-hand considerations that factored into decision-making processes around the use of online voting for the upcoming election.

2.1 The 2018 Technical Incident

On October 22, 2018 – municipal election day in Ontario – voting websites supported by Dominion Voting Systems, one of four primary voting technology vendors in the province, slowed to an extent that it prevented voters from casting their online ballots. The slowdown occurred just before 6:00 pm EST (the polls were set to close at 8:00 pm EST) and resulted in the voting websites of 43 municipalities either not working or operating so slowly that casting a ballot was either very difficult or not possible. The company issued a press release explaining that the slowdown was the result of an unauthorized restriction in bandwidth by a third-party IT subcontractor, which had limited it to about one-tenth what it should have been [11]. This mistake, however, only caused network issues during high online traffic on election day.

While technical incidents had transpired in previous Canadian municipal elections, none had been of such magnitude. For one, the 2018 technical incident resulted in greater extensions in voting than had occurred previously. Second, because of the trend to eliminate paper voting, many municipalities did not have a non-electronic option for voters to use, giving those communities no other option but to declare a state of emergency under the *Municipal Elections Act* in order to extend voting eligibility to include the following day.⁶ These emergency declarations made national news and sparked discussion about whether online voting uptake in Ontario municipalities would consequently be curbed or halted [12].

2.2 The COVID-19 Pandemic

In Canada, the COVID-19 pandemic was declared a public health emergency in March 2020 when the respiratory illness began to spread, filling hospitals and resulting in a record number of deaths [13]. In response, 80 countries around the world postponed a variety of elections [5], and many more modified delivery or undertook reforms to offer

⁶ Declaring a state of emergency is a requirement if a municipality wants to continue an election past election day. 35 municipalities declared a state of emergency in 2018.

regular elections that were accessible to voters. In Canada, the COVID-19 pandemic equally affected how elections were and are run at all levels of government.

At the federal level, Canada's national electoral management body, Elections Canada, approved a series of administrative changes to respond to public health concerns, including implementing physical distancing and other safety guidelines at polling stations, providing all electors with single-use pencils and masks upon entry to a polling station, increasing the capacity of the vote-by-mail system and providing prepaid postage to electors choosing to vote-by-mail, and offering virtual training for election workers [14]. The agency, however, did not consider introducing or mandating either online or telephone voting, citing a significant planning/implementation process constrained by its current operational capacity [14].

For these reasons, calls for early provincial elections in both New Brunswick and British Columbia during the height of the pandemic were met with resistance and public debate about whether elections should be carried out during public emergencies [15]. According to a study conducted by Garnett et al. (2021), between 50% and 60% of respondents agreed that governments, if given the option, should not have called an election during the COVID-19 pandemic.

To mitigate health and safety concerns, provincial election agencies also implemented special voting arrangements, including the adoption of voting-by-mail in New Brunswick [16], British Columbia [17], and Newfoundland and Labrador. Likewise, British Columbia's use of telephone voting saw a significant uptick from previous elections in which such technology was also offered [18]. Given that Saskatchewan's election was held on a fixed date, its EMB prepared several legislative changes to facilitate safe voting, including the modification of mail-in voting requirements and the implementation of additional advance polling opportunities [19]. In addition to these modifications, the COVID-19 pandemic caused provincial election agencies to look more closely at the use of technology in the election process by convening committees [20], developing regulations [21], and/or conducting research [22].

Municipally, elections were also affected by the COVID-19 pandemic. Local elections in New Brunswick, for example, were postponed for over six months in 2020 [23]. While elections held around the same time in Nova Scotia also raised concerns, most of its municipalities used online and telephone voting, which mitigated major delays in the election process. Overall, the COVID-19 pandemic has and continues to serve as a shock to Canadian elections, resulting in modifications or reforms to the voting process.

3 Literature Review

Generally, the machinery of elections tends to be remarkably stable. Policy systems and political processes themselves are often characterized by steadiness and incrementalism, which means drastic change is infrequent. Simply put, reforms to electoral systems, as well as other changes to the structure of elections, are relatively rare occurrences across democracies [24]. Canada is no exception to this trend, despite increasing calls for electoral reforms at national and sub-national levels of government. These calls, which brush up against the longstanding stability of Canadian electoral institutions, have, however, increasingly resulted in smaller scale administrative reform. Reforms

to the ways that elections are carried out are often the result of incremental change, although others have also occurred in response to unexpected events. These unexpected events – often referred to as “exogenous shocks” in policy literature – may realign policy systems or policy thinking and are therefore often responsible for the conditions that allow for institutional/organizational change [25–27]. Importantly, many argue that this applies to electoral reform as well [28]. Since the onset of the COVID-19 pandemic, a major exogenous shock, at least 80 countries and territories have postponed national and/or subnational elections [20, 29]. This has led to substantial policy reform, including in Scotland and Wales, where the expeditious passing of the 2020 *Coronavirus Act*⁷ legislated the deployment of “emergency powers” to postpone elections to: (1) slow the spread of the virus; (2) reduce resourcing and administrative burden on public bodies; and (3) limit the impact of staffing shortages on the delivery of public services [31].

The *Coronavirus Act* is but one example of the impact that exogenous shocks may have on policymaking processes, which, research suggests, tend to reconfigure policy spaces or subsystems [26]. These circumstances are referred to as “policy windows”: moments in time when an issue captures the attention of decision-makers. Policy windows increase the likelihood that different policy and policy initiatives will merge, creating policy action and often breaking a pre-established status, generally under the guise of policy entrepreneurs who recognize opportunity and act accordingly [32, 33].

Much like the COVID-19 pandemic, technical incidents can also act as sizeable shocks to elections. In fact, the more that efforts to modernize elections involve the adoption of technologies [34], the greater the potential for the occurrence of serious technical incidents. The security of electronic voting has raised particular concern about system vulnerabilities [35, 36], authentication and verification issues [37, 38], and electoral fraud [39]. These issues have been identified not only in Canada, but also in Switzerland [40], Estonia [35], Australia [8], Finland [41], and India [42], among others. Some of these technical shocks have resulted in extensive delays and closures of voting booths [43, 44], and, in certain instances, have fueled public skepticism about election integrity [45]. In serious cases, technical shocks have also led jurisdictions to either halt plans for electoral reform (i.e., Switzerland) or to completely abandon intentions to adopt online voting (i.e., United Kingdom, Norway, and Australia). James and Alihodzic (2020) explain that both technical and logistics issues, even when having occurred without the simultaneous presence of other exogenous shocks, have historically resulted in policy change, including during the 2019 Nigerian Presidential Election and the 1996 post-war Bosnian elections.

For these reasons, both the COVID-19 pandemic and the 2018 technical incident can be classified as exogenous shocks that may lead to the opening of policy windows to voting reform. As such, local clerks, politicians, and administrators could be seen as policy actors who have the power to take advantage of policy windows to change course on the implementation of voting methods in certain communities. Given widespread tendencies to postpone or cancel elections in the wake of exogenous shocks and major emergency situations, including natural disasters, war, and military coups [46], policy windows ought to figure centrally in research on electoral administration and reform. In fact, there has been no shortage of articles examining how the COVID-19 pandemic has

⁷ The *Coronavirus Act* received royal assent in 2020.

led to fundamental upheaval in several policy domains [47–50]. Under these conditions, policy directions or ideas that once seemed fundamentally unworkable or risky may suddenly become viable.

However, while policy windows create an opportunity for policy action, actors still need to take advantage of those openings. The literature refers to actors who take such advantages as “policy entrepreneurs” [32]. These actors possess the knowledge, power, tenacity, and luck to exploit key opportunities and, by mustering the resources to take advantage of them, can enact crucial policy change [51]. This may explain why changes in policy tend not to be uniform across jurisdictions, even when those jurisdictions experience the same or similar events. Policy entrepreneurship necessarily creates policy or regulatory differentiation, even with the same forces acting upon multiple jurisdictions.

The adoption of online voting across Ontario municipalities is a prime example of regulatory differentiation in action. As a major shift in electoral administration, online voting has gained traction, in certain municipalities, because of its potential to offer benefits to the democratic process, even if it may also pose a significant risk to those same systems.

To date, most of the literature examining online voting focuses on its effects on voters [52], cost-efficiency [53], or security concerns [54, 55]. By comparison, studies focused on online voting deployment in Europe tend to examine voter participation and trends in turnout [56], the impact of such technologies over time [57], and the actors involved in governance and administration [58]. There is limited literature available on the interaction between the adoption of online voting and exogenous shocks, which, as this paper hypothesizes, may exert different pressures on administrators and EMBs to adopt or not adopt electronic voting methods.

4 Data and Methods

This paper takes a mixed methods approach that relies on both quantitative and qualitative analysis. Drawing upon data from a survey and a focus group with municipal elections administrators, we examine whether the COVID-19 pandemic and a 2018 technical incident have served as countervailing forces on local elections in Ontario, Canada to gauge their perceived impact on the administration of those local elections. Within research on municipal elections, insight from administrators is rare. Although they are crucial decision-makers who play a central role in the carrying out of democratic responsibilities, their insight on election processes is understudied. For this reason, this dataset is both novel and important to develop a better understanding of the decision-making processes that inform election administration, and the considerations taken when engaging in small-scale election reforms, including those necessary to respond to exogenous shocks.

The survey informing this study was administered between April 21 and May 27, 2022, to local officials responsible for election governance in Ontario. To identify potential survey respondents, we obtained a contact list from the Association of Municipal Managers, Clerks, and Treasurers of Ontario (AMCTO) which provided the contact information of 682 individuals responsible for the administration of local elections across Ontario’s 444 municipalities. A total of 676 valid emails were sent with an invitation to

take part in the survey, and two reminder emails were sent thereafter, each one week apart. 281 respondents completed the survey (from 217 municipalities), indicating a response rate of 41%. Surveys were coded and distributed via the Qualtrics interface and included questions regarding the rationale for online voting adoption, including its benefits and challenges, how the 2018 technical incident and the COVID-19 pandemic affected the administration of local elections, and some attitudinal and demographic items. Questions related to the 2018 technical incident and COVID-19 pandemic allowed us to compare the perceived effects (both magnitude and direction) upon the likelihood of adopting or maintaining an online voting option in Ontario's local elections now and into the future.

Our sample includes a good cross-section of municipalities from which administrators run elections: 54.3% of respondents in our sample are from municipalities with populations fewer than 10,000 persons, 34.3% between 10,000 and 99,000 persons, and 11.3% with over 100,000 persons ($N = 25$). This aligns with the general make-up of Ontario municipalities given that many of them (approximately 70%) have populations fewer than 10,000. This large number of survey respondents from a representative cross-section of Ontario municipalities allows us to approximate the total municipal population more closely. This is a particular strength of this dataset, because it allows us to draw larger conclusions about the effects of the 2018 technical incident and the COVID-19 pandemic on the administration of elections, generally.

Administrators who completed the survey report being experienced in the administration of municipal elections, with only 13% indicating that they had been involved in local elections administration for one year or less. A majority of respondents – 55% – indicated having at least 10 years of experience (the remaining 32% having spent 2 to 9 years in such a role).

To gain additional explanatory insight and augment the open-ended responses posed in the survey, we also carried out a focus group with members from AMCTO's Election Working Group: a consortium of municipal officials responsible for the administration of elections that meet regularly to discuss issues and share best practices and other strategies for election planning, implementation, and evaluation. Prior to taking part, participants were provided with a focus group guide outlining four themes for discussion: (1) the state of electronic voting in Ontario municipalities; (2) voting methods and the 2018 technical incident; (3) voting methods and the COVID-19 pandemic; and (4) the future of local elections in Ontario.

The focus group consisted of six participants from five cities that varied in size and who have different histories of voting method use and opinions on online voting. Two of the five cities had not adopted online voting in their municipality's local election, and likewise indicated having no desire to use the technology in upcoming local elections. One city had not used online voting methods previously but regretted the decision not to include it as a voting option in the 2022 municipal election. The final two communities had previously used online voting and were affected by the 2018 technical incident.

The analysis below proceeds in three parts. Firstly, we consider the perceived impact of both the 2018 technical incident and the COVID-19 pandemic upon decisions to use online voting in the upcoming 2022 municipal elections. We present frequency distributions to survey questions that reveal perceptions of the direction and magnitude of these effects upon the likelihood that municipalities decided to adopt online voting for

the upcoming 2022 municipal elections. Second, we merge the direction and magnitude variables (by multiplying them) to create a new, composite indicator that taps into both perceived direction and magnitude of the effects of each of the exogenous shocks. Two composite variables (one for the COVID-19 pandemic and one for the 2018 technical incident) then serve as outcome variables in regression models where they are regressed onto a series of city-level variables: population, urbanity, and online voting usage. Finally, to add explanatory insight to the survey results, we draw upon the focus group discussion and open-ended survey comments.

5 Results

5.1 The 2018 Technical Incident

Survey respondents were asked separate questions about whether the 2018 technical incident and concerns about the COVID-19 pandemic had an effect on the likelihood that online voting was going to be adopted in their municipality in the upcoming 2022 election (response options were ‘more likely’, ‘less likely’, and ‘did not make a difference’). Table 1 contains the frequency distributions for these questions.

Table 1. Perceived direction of impact of shocks upon likelihood of use of online voting

	Technical incident	COVID-19
Less likely	19.2%	0.0%
No effect	80.8%	52.7%
More likely	0.0%	47.3%
N	240	241

Table 1 indicates two notable findings: First, it confirms that the perceived impact of the two shocks are indeed pulling in opposite directions. Roughly one-fifth of administrators thought that the 2018 technical incident decreased the likelihood of adopting online voting, and not a single respondent thought it made it more likely. As for the effects of the COVID-19 pandemic, nearly half of respondents thought it made the use of online voting more likely, and no one replied that it made it ‘less likely’. There are clear directional effects here. Secondly, election administrators were much more likely to believe that the COVID-19 pandemic influenced online voting decisions than the 2018 technical incident. Over 80% reported that the incident had no effect, while fewer than half took this opinion of the COVID-19 pandemic. Combining responses from these questions, we see that respondents were also considerably more likely to say that the COVID-19 pandemic had an effect, but the 2018 technical incident did not, rather than the other way around. 38.5% of respondents thought that the COVID-19 pandemic was the only factor that affected the adoption of online voting, while just 9.7% thought only the 2018 technical incident mattered (8.4% said that both mattered, while 43.4% said

that neither did).⁸ We therefore see a significant difference in the perceived impact of the two shocks.

One interesting question to consider is whether respondents from municipalities that were affected by the 2018 technical incident perceived the 2018 technical incident to have a greater impact on the likelihood of using online voting than those in municipalities that were not affected. A total of 40 officials from 29 municipalities affected by the 2018 technical incident responded to the survey. The remaining respondents administered elections in municipalities that were not affected by the 2018 technical incident. Interestingly, despite these varied orientations to the 2018 technical incident, we see no statistically significant differences between responses from administrators from the two types of municipalities. Put simply, though the 2018 technical incident only affected a small share of Ontario's municipalities, its perceived effects were just as likely to be felt in unaffected municipalities as they are in those that were directly affected.

Thinking about the magnitude of effects, we can elaborate upon these findings by examining the results of a second set of survey questions that asked respondents *how much* of an impact the two shocks had on the administration of elections (response options were 'a lot', 'somewhat', 'a little', and 'not at all'). Table 2 contains the frequency distributions for these two variables.

Table 2. Perceived magnitude of impact of shocks on decision to use online voting in 2022

	Technical incident	COVID-19
None	71.7%	53.1%
A little	7.1%	9.5%
Somewhat	12.1%	23.7%
A lot	9.2%	13.7%
N	240	241

Table 2 provides further evidence that the COVID-19 pandemic is perceived to have more of an impact than the 2018 technical incident on the municipalities in our sample. Rates of 'a lot' and 'somewhat' responses are considerably higher for the COVID-19 pandemic than the 2018 technical incident. A chi-square test reveals that the differences between these distributions is significant at $p < 0.01$.

Overall, then, we see differences in the perceived effects of these shocks both in terms of direction and magnitude. Survey respondents were considerably more likely to say that the COVID-19 pandemic had an effect upon the decision-making in their municipalities than they were to say the same about the 2018 technical incident. Of these, respondents from communities affected by the 2018 technical incident perceive both shocks to have had a greater impact than those that were unaffected, with the belief that the COVID-19 pandemic had a larger influence on likelihood of use. Respondents were also of the opinion that the pandemic had a stronger impact upon their decisions. Results clearly show that the shocks had different effects.

⁸ N = 180.

5.2 Do Effects Differ Across Municipal Types?

Having studied impacts of direction and magnitude, we turn to evaluating whether the perceived effects of the two exogenous shocks differed depending upon the context in which decisions on voting methods were made. Municipalities in Ontario have vastly different characteristics which we expect may influence opinions of the perceived impact of the two exogenous shocks. In particular, we expect that three factors might affect these calculations.

First, it is conceivable that the impact of the exogenous shocks might hinge upon whether online voting was in place in a previous election (including and especially during the 2018 municipal election). Municipalities deciding whether to adopt online voting for the first time might be expected to deliberate differently than those who have used such a system in the past. Inertia (or path dependency) is a powerful force in any institution. Second, the population size of a municipality may matter. Larger cities have more resources and may be able to cover the costs of in-person elections more easily. Finally, we consider whether cities are classified as urban, suburban, or rural. One might expect that the density of cities may factor heavily into decisions on voting methods. Though it is conceivable that other contextual factors will matter, given the modest size of our sample, we focus on three contextual factors only. Survey respondents were asked questions that address all these factors, and their responses were used to create a series of dummy variables.

These indicators serve as independent variables in a series of two regression models – one for the 2018 technical incident and another for the COVID-19 pandemic. The dependent variables are the aforementioned composite ‘perceived impact’ variables, calculated by multiplying the ‘direction’ and ‘magnitude’ variables considered directly above. Multiplying these separate variables allows us to create a new, single variable, that taps into both direction and strength of perceived effects. In theory, these variables range from -1 , which indicates ‘a lot’ of negative effect (making online voting less likely) to 1 (‘a lot’ of positive effect). A value of 0 indicates no perceived impact. In practice, however, the COVID-19 pandemic variable has only positive values, since no respondents took the view that the COVID-19 pandemic decreased the likelihood of the use of online voting. All values for the 2018 technical incident variable are negative, for the same reason (no respondents thought it made online voting more likely) (See Fig. 1).

Table 3 shows the results of the two OLS regression models. Perhaps the most immediately striking result in the table is that none of the explanatory variables are related to the perceived impact of the COVID-19 pandemic. Neither the system previously used, population size, or urbanity seem to have mattered for deliberations over whether to use online voting in the upcoming 2022 municipal elections. In this instance, the null findings are quite meaningful, as they suggest that the effects of the COVID-19 pandemic on the likelihood of adopting online voting were the same across all types of municipalities. Clearly, the effects of the COVID-19 pandemic are profound and equally wide-reaching.

The null findings are also noteworthy because they are vastly different from those observed for the 2018 technical incident model. Here we see that the perceived effects of the 2018 technical incident are context dependent in two dimensions. First, the perceived impact of the 2018 technical incident upon the likelihood of using online voting is in the positive direction in municipalities that used the system in 2018, as compared to

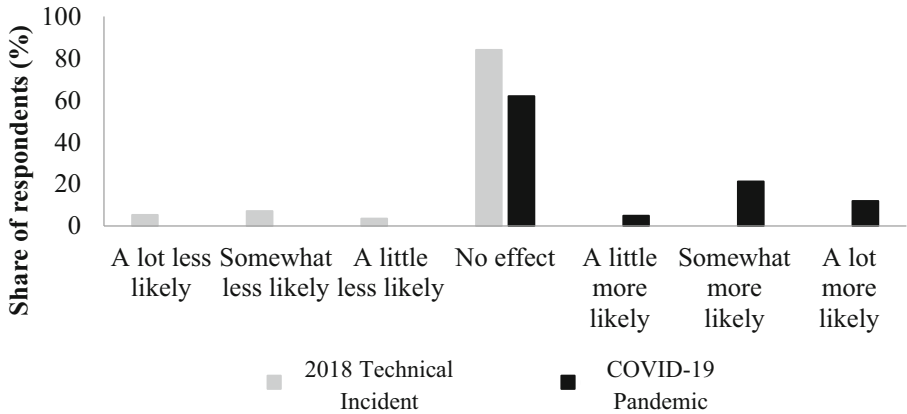


Fig. 1. Frequency distributions for 2018 technical incident and COVID-19 pandemic variables⁹

Table 3. Context and perceived impact of shocks

		Technical incident	COVID-19
	Used online voting in 2018	0.11 (0.04)**	0.02 (0.05)
<i>Baseline = < 10,000</i>	Population > 10,000, < 100,000	-0.09 (0.04)*	0.09 (0.06)
	Population > 100,000	0.07 (0.08)	0.08 (0.11)
<i>Baseline = Rural</i>	Urban	-0.09 (0.06)	-0.08 (0.08)
	Suburban	-0.08 (0.07)	-0.04 (0.09)
	Constant	-0.12 (0.03)**	0.26 (0.04)**
	N	221	223
	Adjusted R2	0.0534	-0.0089

those that did not. Given that the highest value for the outcome variable here is 0, this result can be interpreted to suggest that the incident had a greater perceived effect (in the negative direction) in those cities that had not previously used online voting. This finding aligns with previous research on electoral administration [59] that suggests that administrators tend to favour the electoral systems they have experience with. If taken to be true, this cognitive bias may explain why, in our case, that administrators in cities that have already adopted online voting were less affected by the 2018 technical incident than are those who have no prior experience running an online election.

Population size also appears to have affected deliberations. Medium sized municipalities were affected more (in the negative direction) than either smaller or larger municipalities. Concerns over the 2018 technical incident had a particularly significant

⁹ The mean value for the composite 2018 technical incident variable is -0.11, and standard deviation is 0.28. For the COVID-19 pandemic variable, the mean is 0.28, and standard deviation is 0.38.

effect in medium sized municipalities. We suspect that this may stem from medium sized municipalities' greater likelihood of having employed online voting in 2018, meaning that they were more likely to have personally experienced the 2018 technical incident, or to have been particularly sensitive to it. In fact, amongst our sample, rates of use of online voting in 2018 were markedly higher in medium sized municipalities (56.5%, N = 108) than either small (44.4%, N = 69) or large (30.0%, N = 20) municipalities. Given that the small and large groups had relatively lower rates of online voting use, there was less room for the 2018 technical incident to negatively affect the likelihood of using such a system in the upcoming 2022 municipal elections. In contrast, as rates of previous use in medium sized cities were much higher, there was greater potential for the system becoming less likely in 2022.

5.3 Open Ended Responses and Focus Group Insights

To gain additional insight to enhance the survey data results, we consulted responses to two open-ended questions from the survey that asked respondents to provide additional detail about why the 2018 technical incident or the COVID-19 pandemic influenced their decision to either use or not use online voting. To understand the thinking of municipal administrators more deeply, we draw upon feedback provided in the focus group discussion.

The sentiments communicated by the focus group echo and further explain the findings above in three ways. First, participants reported that the 2018 technical incident did not have much of an effect on the administration of their elections. Even administrators from municipalities that were directly affected by the 2018 technical incident commented that they would have no issue hiring the company again and expressed that "there are issues with everything. We had a big issue with mail-in voting kits in 2010."

Another municipal administrator explained that "there's not many options, so you're forced to go with one of the [existing] vendors in the space." Comments suggested that the outage was part and parcel of using technology in elections and not unlike other issues that may arise with paper or mail-in ballots. Some cities that had not used online voting felt similarly. Municipal administrators also emphasized that while the outage affected things, it only impacted the timeliness of the results and not their reliability. These feelings were equally captured in open-ended responses provided in the survey. A comment from one respondent aptly summarizes this perspective: "Over the years [we] have used all methods of voting, and problems have happened with each voting method. Therefore, a problem with electronic voting would not affect my decision on what voting method to use."

On the other hand, for some municipalities that had not used online voting in the 2018 election, the voting outage reinforced – and in some instances strengthened – the justification not to use the voting method, albeit those with that view were in the minority. However, even when the 2018 technical incident was cited, it was not positioned as the main reason for non-adoption. As one administrator whose municipality had never used online voting and has no plans to use it in the future commented, "the 2018 voting incident was a red flag in our report, but it wasn't the main reason [for non-adoption]." Instead, the primary justification to not adopt online voting centered on reliable access to the internet. A quote from one survey respondent clearly captures this point of view:

“Our main reason for no internet voting is lack of Internet infrastructure. The incident would certainly be a learning experience to ensure a better experience in the future.” While many of the municipalities with this view are smaller, rural communities, others from large urban centers expressed similar concerns. Overall, the 2018 technical incident was perceived mostly as the “cost of doing business.” For a small minority, however, it did result in rolling back adoption, halting further implementation, or abandoning online voting altogether. Four of the communities that took our survey switched back from online to paper ballots.

A second notable finding communicated in the focus group and open-ended survey responses that mirrors the results above is that the COVID-19 pandemic had more of an impact on the adoption of online voting than the 2018 technical incident, although it did not push all communities to adopt the voting mode. The largest group of open-ended comments focused on explaining why municipalities felt compelled to adopt online voting in response to the pandemic. The feelings around doing so were expressed by one respondent who commented that “not knowing at what stage the pandemic would be at election time, we made a point of advising council that internet and telephone voting was immune to the pandemic.” Another respondent spoke of some of the challenges other remote voting modes like mail voting can pose: “as an election administrator, this was very important to have included in the 2022 election, even if it wasn’t the only method, as there are always issues with Canada Post strikes near elections...”¹⁰ This sentiment was emphasized by the focus group who observed that the COVID-19 pandemic has made it harder to get paper election materials and that the cost of paper ballots has nearly doubled. Clearly, supply-chain issues and reliability of postal service were also considerations that caused some municipalities to lean towards offering online voting.

Many of the administrators who had already used online voting communicated that the COVID-19 pandemic further reinforced their feelings that it was a positive addition to the voting process because of its ability to foster accessibility for electors. Note that many of these respondents represented municipalities that had been affected by the 2018 technical incident. One focus group participant, whose community was likewise impacted by the 2018 technical incident, pointed out that the COVID-19 pandemic had naturally pushed people to use the internet to buy groceries and pay bills, which brought greater public trust and comfort in technology. The administrator expressed that their community was much more “relaxed” about the use of online voting in the upcoming 2022 municipal elections because of the COVID-19 pandemic. However, many municipalities adapted to the pandemic in other ways, and thus did not feel compelled to adopt online voting. These municipalities indicated either introducing or continuing to use mail voting, special ballots, and other precautions, including additional cleaning procedures at polling stations to provide safe and accessible elections.

Finally, the focus group discussions and open-ended responses can help us understand why medium-sized municipalities were more negatively affected by the 2018 technical incident than others. Regarding population size, smaller municipalities either (1) offered online voting but tended to be less concerned about potential technical issues given that their elections are relatively “low stakes”, or (2) did not or could not offer online voting because of unstable internet access and other connectivity issues. As one

¹⁰ Canada Post is a Crown corporation that functions as the primary postal operator in Canada.

administrator commented, “there is not sufficient internet coverage in our municipality to make online voting a viable option.” This latter sentiment was a common theme in many comments.

By contrast, larger municipalities either run paper-based votes because: (1) they view their elections as being “high stakes” and therefore have greater concerns about hacking or election interference, or (2) offer online voting, but have more capacity and resources to carry out precautionary technical assessments, audits, and research before implementation. As one administrator noted, “the Dominion incident was disappointing and serious, but avoidable with proper vendor vetting, in our view. Our municipality undertakes a robust and intensive vendor vetting process that leads to confidence in the provider we ultimately choose.” This comment captures the additional knowledge and vetting capacity of larger municipalities with IT teams and staff, compared to smaller municipalities where those services tend to be subcontracted or performed by staff who also hold other roles and responsibilities.

Surprisingly, access to stable internet was also the primary concern of the largest municipality that participated in our focus group. This municipality likewise held strong convictions about online voting security, especially after witnessing other municipalities adopt online voting methods and then switch back to paper ballots. This reversion was articulated as another “red flag” when considering adopting online voting, albeit secondary to worries over internet access. Lastly, for those communities that had not previously used online voting, the 2018 technical incident seemed to reinforce negative impressions of the voting technology. This perspective is perhaps best relayed from the following comment: “online voting was not considered - period.”

6 Discussion and Concluding Thoughts

This paper considers the impact of a 2018 technical incident and the COVID-19 pandemic on the administration of municipal elections in Ontario. In focusing our study on online voting, this paper explores how these shocks exerted pressures on municipal administrators and elections. Using survey and focus group data, we find that the COVID-19 pandemic had a greater perceived effect upon decisions of whether to adopt online voting than the 2018 technical incident. However, municipalities that had not used online voting in 2018 and medium-sized cities were more negatively affected by the 2018 technical incident. Interestingly, our findings also show that the perceived effects of the 2018 technical incident are just as likely to be felt in unaffected municipalities as they are in those that were directly affected. In contrast, the perceived effects of the COVID-19 pandemic did not hinge upon the previous use of online voting, city size, or the urban/rural divide.

It is somewhat surprising that municipalities, particularly those that were directly affected by the 2018 technical incident, did not perceive it to have a greater effect on their likelihood of use and 2022 decision-making. As aforementioned, this could be due to cognitive bias wherein administrators favour the electoral systems that they have experience with. Another explanation for the continued receptiveness to the voting mode, however, could simply be that time eases negative experiences and memories. Some municipal administrators communicated that while there was “no way” local

elected officials would have agreed to online voting after the 2018 election, sometime in the four years since then they “seemed to forget about the incident.” Had we surveyed municipal officials immediately following the 2018 election, perceived effects of the 2018 technical incident may have been stronger.

Finally, it is possible that there is, to some extent, a culture of complacency among municipal officials regarding technical issues. Research examining voters’ satisfaction with, and attitudes towards, online voting before and after the 2018 technical incident points to concerns regarding the culture of risk acceptance among Canadian voters [60]. Since administrators often take their cues from voters (focus group members and open-ended survey comments admit to doing so) it is possible that the 2018 technical incident was not perceived as a greater threat because of local bureaucrats’ greater acceptance of technical risk. Such feelings were emphasized in survey comments and the focus group discussion, capturing a perspective that technical issues are bound to happen and that municipalities are accepting of the associated risks. Such patterns have also been observed among the Canadian public, with the public being open to the risk exposure associated with online activities and less reactive to data breaches or security issues that transpire in day-to-day life. While the implementation of technology certainly brings with it the possibility for problems, a key question is whether elections – as a core institution of democracy – should be held to higher standards than other online activities, such as online banking. This culture of complacency could explain why local administrators in Canada seem to have greater risk tolerance than officials in other countries where online voting programs have been halted or canceled.¹¹

Given the persistence of the COVID-19 pandemic and the increasing frequency with which technical incidents occur as elections technologies are more widely adopted, our results offer insights for scholars and policymakers, notably that some exogenous shocks may not impact the delivery of elections as much as one might expect, and that despite certain shocks, elections tend to remain relatively stable. Our study also provides avenues for future research, including about the ways that exogenous shocks may impact decisions to adopt or not-adopt voting technologies at other levels of government. Cross-comparative research may also be conducted on the likelihood of online voting adoption in places that have experienced exogenous shocks versus those that have not, and how different shocks have varied implications on voting and other electoral systems. A third area that merits further exploration is the impact of exogenous shocks on public perception of voting technologies and/or willingness to accept policy changes affecting the administration of elections. Policymakers may likewise use this research to better understand the role of exogenous shocks on the policymaking process, and the ways that policy windows create crucial opportunities and support calls for the advancement of electoral reform that may otherwise proceed slowly, if at all.

¹¹ Interestingly, our data suggest that using online voting even once, in 2018, is sufficient to minimize the negative effect of the 2018 technical incident upon the likelihood of adopting online voting in 2018. We ran an alternate specification of the ‘Technical incident’ model from Table 3, including another dummy variable that indicates experience with online voting previous to 2018 (results not shown but available from the authors). This variable was statistically insignificant. In other words, this ‘culture of complacency’ may require just one election cycle to take hold.

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