Does Online Voting Change the Outcome? Evidence from a Multi-mode Public Policy Referendum

Abstract

Do online and offline voters differ in terms of what they vote for? The growth of Internet voting in recent years has opened up new channels of participation. Whether or not political outcomes change as a consequence of these new voting channels is an open question. Here we analyze all the votes cast both offline (n=5.7 million) and online (n=1.3 million) and compare the actual vote choices in a public policy referendum, the world's largest participatory budgeting process, in Rio Grande do Sul in June 2014. In addition to examining aggregate outcomes, we also conduct two exit polls to better understand the demographic profiles of online and offline voters. We find that vote choices of online and offline voters are no different, even though our data suggest important demographic differences between the two groups of voters.

Classification (JEL): P16, D72, H41, and H7.

Keywords: Internet, Digital Divide, Participation, Voting, and Participatory Budgeting.

Introduction

Online voting – as well as other forms of convenience voting – is promoted as a voting reform with the potential to attract different types of voters who might not have voted in the absence of this voting channel. Reformers argue that expanding online voting can improve the quality and legitimacy of democratic outcomes (Magleby 1987; Rosenstone and Hansen 1993).

In this paper, we examine the policy choices of online and offline voters. To motivate this analysis, we begin by examining the demographic profiles of online and offline voters to understand why their policy choices might differ. This article focuses on Rio Grande do Sul's June 2014 non-electoral[1] participatory budgeting process: the world's largest in terms of participation and geographic coverage. Despite finding substantial demographic differences across online and offline voters, we find a strong relationship between online and offline support for each budget proposition.

We begin by presenting the extant theory on why demographics can predict who votes online, and on how these demographics often correlate with different political preferences and, consequently, vote choices. We then briefly describe the participatory budget and Internet voting processes in Brazil before moving onto the analysis of the participatory budget vote in 2014. We conclude with a discussion of possible explanations for the high correspondence in budget voting observed between online and offline voters in Brazil and under which conditions we may expect to find similar results.

[1] A participatory budgeting vote is non-electoral in the sense that no individuals are elected as public officials. Instead, these votes set public policy around a portion of the budget. Readers more familiar with the American political system may view a participatory budget vote as more akin to a ballot referendum as opposed to a candidate election.

Extant Theory

There are two key strands in the voting literature that we seek to connect in this paper. The first discusses whether convenience voting, and in particular Internet voting (hereafter i-voting), alters the demographic profile of participants in a vote. The second explores whether political outcomes would change under alternative voting modes.

We assume in this discussion that political preferences can have a causal impact on an individual's voting behavior but do not assume this relationship is necessarily one-to-one. However, we do assume that differences in political preferences are one way in which two populations could end up voting differently.

The first substantial convenience voting reform to be adopted was postal voting (Moreton Jr 1985; Kousser and Mullin 2007; Stein and Vonnahme 2011; Mann and Mayhew 2012) and it has seen a series of iterations that have followed the evolution of information and communication technologies (Trechsel et al. 2007; Alvarez, Hall, and Trechsel 2009; Bochsler 2010; Carter and Bélanger 2012). The promise of convenience voting grows from a rational choice calculation of voter turnout that considers both the costs and benefits of voting (Downs 1957; Riker and Ordeshook 1968; Aldrich 1993). By making voting more convenient, the cost of voting is lower while all other factors are held constant (e.g., the benefits). This calculus predicts increased turnout as the cost of voting falls. As Internet access has increased around the world, i-voting has been highlighted as potentially increasing turnout by reducing the costs of voting (Alvarez and Hall 2004; Trechsel et al. 2007; Carter and Bélanger 2012).

While there are substantial theoretical reasons to believe that Internet voting and other forms of convenience voting could increase turnout, the empirical findings are mixed. The mobilizing effect of i-voting is elusive, with a mix of minor and null results (Vassil and Weber

2011; Pammett and Goodman 2013).[2] By contrast, field experiments consistently a mobilizing effect from postal voting reforms (Mann 2011; Mann and Mayhew 2012; Mann and Kalla 2013; Mann and Mayhew N.D.).

A second question, beyond the effect of whether convenience voting changes individual-level voting behavior, is whether electoral outcomes are affected by the modes of voting available to citizens. The effect of voting reforms on policy outcomes has been widely studied within the US context. In a study of the 1994, 1996, and 1998 U.S. Senate races, Citrin, Schickler, and Sides (2003) find that, because most elections are not close contests, few election outcomes would have switched under a counterfactual of full voter turnout. Conversely, Hajnal and Trounstine (2005) find that minority candidates regularly fail to win municipal elections due to low turnout. Thus, voting reforms could have substantial policy implications in hundreds of municipalities across the United States. Here we seek to study whether the expansion of online voting brings in voters who vote for policies that would receive less support without online voting.

In this paper, we examine the effects of i-voting in a non-electoral process, a Brazilian participatory budget vote. Numerous political theorists suggest participatory democracy has the potential to increase participation in civil society, enhance trust in democratic processes, and improve deliberative outcomes (e.g., Pateman 1970; Barber 1984; Couto and Guthrie 1999). Yet, Irvin and Stansbury (2004) suggest that if certain types of people with distinct preferences are systematically unable to participate in participatory decision-making processes, then these processes may be less inclusive and effective thank traditional policy-making approaches that rely on elected representatives (also see Lijphart 1997).

In the Brazilian context, we would expect to see substantial differences in who has access to and chooses to use Internet voting, given that Internet access is strongly correlated with in-

[2] While in the majority of cases i-voting is offered in conjunction with traditional forms of voting, in a limited number of cases Internet voting is the only channel of participation available. See, for instance, Peixoto (2009).

come and education (Hilbert 2010). Since substantial research has shown that political preferences and voting behavior differ across income and education levels (Page, Bartels, and Seawright 2013; Page and Seawright 2014; Gilens 2012; Gillon, Ladd, and Meredith 2014; Baker 2003), we would expect to observe differences in vote choices across online and offline voters in our study of the 2014 participatory budget vote. These differences in vote choice should also be reflected in the aggregate vote choice among the online and offline voting populations. Research from a similar participatory budget vote in 2012 found younger, male, wealthier, and better educated individuals were substantially more likely to report being online-only voters, who would not have voted had Internet voting not existed (Spada et al. 2016).

In the following sections, we provide a more detailed overview of the participatory budget process in Brazil and the use of i-voting. We then describe our three sources of data, an offline exit poll, an online exit poll, and the official results of the budget vote. We then move onto our primary investigation: whether the vote choices of online voters are substantially different than those of offline voters.

Participatory Budgets and I-Voting in Rio Grande do Sul

The Brazilian Federal Constitution of 1988 created an enabling environment for democratic innovations. For instance, the constitution mandated the introduction of public policy management councils, thematic councils, and management councils (Coelho 2004; Moreira and Escorel 2009), and also introduced an array of facultative participatory institutions, such as referenda and ballot initiatives. Furthermore, by incorporating the principle of direct participation in public administration, the constitution – along with subsequent national legislation[3]

[3] For instance, Federal Law 101/2000 makes specific provisions for transparency and public participation in budgeting processes.

- enabled the emergence of municipal participatory budgeting, the most studied of Brazilian participatory institutions (Wampler 2007; Avritzer 2009; Baiocchi et al. 2011). From an international standpoint, Participatory Budgeting (hereafter PB) is also one of the most replicated participatory institutions in recent history: since its introduction in the municipality of Porto Alegre in 1989, PB is estimated to have spread to over 2,500 cities worldwide (Sintomer et al. 2013; Wampler and Hartz-Karp 2012). Recent research has suggested that PB processes lead to a number of positive outcomes, such as reduction in government misspending, tax evasion, and infant mortality (Touchton and Wampler 2013; Gonçalves 2014; Zamboni 2007; Beuermann and Amelina 2014).

Participatory budgeting is a process in which citizens can make decisions over part of the governmental budget, typically through an annual cycle of decentralized public meetings. At such gatherings citizens and public officials deliberate and vote on projects and priorities to be included in the upcoming year's budget (Goldfrank and Schneider 2006; Baiocchi and Ganuza 2014). The PB process consists of three core stages: deliberation, voting, and monitoring. In this study, we focus exclusively on the voting stage. The first attempts to combine online and offline participation in the budgeting process took place in the late 1990's and early 2000's in the Brazilian municipalities of Porto Alegre and Ipatinga, respectively. In these cases, citizens could use the Internet to submit proposals to the PB process, which were then submitted for consideration in face-to-face neighborhood meetings. I-voting was introduced for Rio Grande do Sul's PB in 2004. Since then, a number of municipalities in Brazil have adopted i-voting in their PB processes. This paper focuses on the current version of participatory budgeting in Rio Grande do Sul, of which Porto Alegre is the capital city. The first attempt to scale PB from the municipal to the state level, Rio Grande do Sul's PB is also the world's largest in terms of participation and geographic coverage.

While the diffusion of PB in Brazil and beyond has led to significant adaptation (Wampler and Hartz-Karp 2012; Sintomer et al. 2013; Röcke 2014), Rio Grande do Sul's PB process contains six major traits that are common to all PB cases identified around the world. As singled-out by Sintomer et al. (2012), these traits are: i) participation of non-elected citizens in the allocation of public resources, ii) focus on financial and budgetary resources, iii) involvement of government authorities with power over resources, iv) periodically repeated (mostly annually), v) inclusion of a stage of public deliberations in specific meetings/forums, and vi) presence of some degree of accountability, with the conveners providing information about the execution of selected priorities.

The 2014 Rio Grande do Sul ballot allows voters to participate in the PB process in two ways.[4] First, citizens can select up to four regional projects out of a list of 10-20 projects. Second, citizens can select up to two regional priorities from four or five policy areas. The options on the ballot are chosen through a series of state, regional and municipal meetings involving organized civil society, regular citizens and representatives of the state government.[5] Both choice sets vary across regions (administrative units called Coredes). Citizens have the option of voting either online or in-person. The ballots are identical whether a voter participates online or offline. The offline voting process is organized by coordinators, paid for by the state, and by representatives that are selected through municipal assemblies. The representatives do not receive compensation. On average there are three to five polling officials at each location. Overall turnout in the 2014 PB vote was 15.2 percent, as shown in Table 1.

[4] For a thorough description of the PB process in Rio Grande do Sul state, see Spada et al. 2016.
[5] For an example of a ballot, see appendix.

Table 1. Voters in the PB Process, by Type.

	No. of citizens
Population	11,164,043[6]
Voting age population	8,645,435[7]
Total voters	1,315,593 (15.2% of population)
Online voters	255,751 (19.3% of voters, 2.9% of population)
Offline voters	1,059,842 (80.7% of voters, 12.3% of population)

* *Notes:* Data from (Haikin, Sjoberg, and Mellon 2017).

The state government and civil society organizations, along with individuals that support a particular type of project proposal, are largely responsible for mobilizing citizens to participate in the voting process. The state government advertises the PB via a variety of channels, including radio adverts, social and printed media campaigns (e.g., posters on buses), and direct email and SMS to people that have voted in the past (Peixoto, Mellon, and Sjoberg 2016). Furthermore, the in-person offline vote is organized in areas with high levels of pedestrian traffic – shopping centers, health centers – with poll workers proactively approaching passers-by and encouraging them to vote (Haikin, Sjoberg, and Mellon 2017). Despite these efforts, however, the vote itself remains a relatively low-salience event: in a mobile phone survey, 78 percent of non-voters reported they did not know about the PB (Haikin, Sjoberg, and Mellon 2017).

[6] This is the 2013 estimate taken from the IBGE website. The latest official figures are from the 2010 census when the population was listed as 10,693,929.
[7] This estimate is made by calculating the percentage of citizens 16 or over in the 2010 census and using the same ratio for the 2013 population estimates.

Methodology & Data

The first question is whether online and offline voters differ demographically. To compare these groups, we conducted two exit polls with voters: i) an online exit poll throughout the four days of online voting[8] and, ii) an offline exit poll of voters in Porto Alegre, the state capital of Rio Grande do Sul on the only day of offline voting.[9]

The offline exit poll was conducted using 50 interviewers, each of whom conducted interviews at a single polling location.[10] 1,924 Porto Alegre offline voters participated in the in-person exit poll (with a response rate of 95.5 percent). Polling stations were selected by first listing all census enumeration areas within greater Porto Alegre, then sampling 50 enumeration areas without replacement, with a probability proportional to the population of the enumeration area. For each area, if there was exactly one polling station in the area, an enumerator would choose that polling station. If there was more than one polling station, one station was randomly selected. If there were no polling stations, the enumerator would go to the polling station closest to the centroid of the assigned area.[11] Respondents were then selected at the polling station by the interviewer choosing the second person they saw finish voting. This procedure was repeated each time the interviewer completed an interview. This procedure was adopted to reduce interviewer's tendencies to pick individuals who appeared more likely to accept being interviewed (Brick and Tucker 2007).

For the online exit poll, all 253,529 voters who participated in the online PB vote were invited to complete a survey immediately after they voted. The online exit poll was conducted in conjunction with the state information technology company (PROCERGS) responsible for implementing the online voting platform. A total of 33,758 online voters agreed to take the

[8] Online voters were invited to take part in the survey at the end of the voting, taking place between June 2nd and 5th 2014.

[9] June 5th 2014.

[10] The offline exit poll was conducted by NRM Estatica.

[11] In practice, the offline vote was not well organized and some interviewers had to go to nearby locations when it turned out that the polling stations they were originally sent to were not open.

online exit poll, yielding an overall response rate of 13.3 percent. Because the offline exit poll was only conducted in Porto Alegre, we subset the online exit poll to those voters with IP addresses located in Porto Alegre to allow comparison, yielding 4,947 online exit poll respondents.

Modelling strategy for demographics

To compare these data within a logistic regression model, we combine the online exit poll and offline exit poll and weight them to reflect the proportion of the population that voted according to each of these methods.[12] The weight for each respondent is as follows:

$$\frac{votes_{online} \times respondents_{total}}{votes_{total} \times \ respondents_{online}}$$

These weights account for the oversampling of online voters at the state level and do not adjust for demographic factors (since the only data on the demographic composition of voters comes from these surveys). We then use logistic regression to determine which demographic variables predict mode of voting at the individual level, as follows:

$$logit(vote_{online}) = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n$$

where $X_1 .. X_n$ are various individual level attributes and $vote_{online}$ is a dummy variable reflecting whether the respondent voted online or offline. We include gender, age, education level, income level and frequency of Internet usage as predictors in the model.

[12] While the direction of coefficients would still be correct when using the unweighted data, the magnitude would not be.

Modelling strategy for vote choice

The second question in our study is whether vote choices differ between online and offline voters. Here we use official vote results for both online and offline voting to compare the choices of voters using each mode. We have ballot box-level data in the offline vote and individual level results data in the online vote (without individual identifiers) for the whole State (and not only the capital region, as with the survey data). Because this analysis relies on the official vote counts provided by the government, there is less scope for measurement error or reporting biases here than in most of the literature that relies on self-reported vote choices (e.g., Wright 1990; Wright 1993). Results from the online and offline votes can be aggregated up to the same level to make a direct comparison of what online and offline voters vote for in the same area.

There are 28 different voting regions (Coredes) within Rio Grande Do Sul, each of which has a separate ballot with different measures. Results are tabulated at the Corede level, with online and offline votes combined to decide the winning proposals. In essence, the PB voting process is actually 28 separate participatory budgeting votes. We aggregate the results to the Corede level in order to compare the online and offline results for each ballot measure.[13]

The vote totals for each Corede were then converted into an online and offline vote share at the Corede level. Because each voter receives more than one vote, this figure refers to the proportion of votes cast and not the proportion of voters who cast a vote for a proposed project.

Although the ballots vary across different Coredes, each proposed project was coded into one of 16 official categories by the administration (these categories were also visible to voters) that allows some comparison of ballot measures across Coredes. The categories are: Preventing violence on transportation; Culture and digital inclusion; Economic development;

[13] We had to exclude one Corede from the analysis given that the results coding was inconsistent between the online and offline vote, see the Appendix for details.

Rural development; Social development and eradication of poverty; Basic education, professional and technical; Higher education; Sport, leisure and tourism; Housing, urban development and sanitation; Infrastructure and logistics; Irrigation; Environment and water resources; Local and regional planning; Health; Public security and civil defense, and Citizenship, justice, human rights and policies for women.

In addition to these categories, we manually coded each proposed project according to their redistributive potential. Proposals such as job creation, low-income housing and direct transfers were coded as redistributive, whereas police equipment, hospitals and roads were coded as non-redistributive. While all projects have some distributional consequences, we coded based on whether redistribution appeared to be a primary goal of a proposed project. In total, 44 proposed projects out of a total of 440 were clearly redistributive, while 13 were unclear.

The simplest way to compare online and offline voting would simply be to look at the proportion of voters voting for projects in each category online and offline. However, this could introduce bias into the comparison given that different numbers of items fall into each category across different regions and online voting is more common in some areas than others.

To avoid this bias, we use an n=440 dataset of vote totals for each proposed project in each Corede, i.e., one observation is a vote share that a particular project received in a particular Corede (the project options differ across Coredes). We then run an OLS regression as follows:

$$voteshare_{online} = \beta_0 + \beta_1 voteshare_{offline} + \beta_2 X_2 + \cdots + \beta_n X_n,$$

where X_2 to X_n are dummy variables for the category of the project e.g., health, security, rural development etc. The category dummies capture how much online and offline votes differ

by looking at online vote share conditional on offline vote share.[14] The key independent variable is defined as the proportion of all offline votes the project received.

Analysis

Figure 1 shows the difference in demographic attributes between online and offline voters. There are clear demographic differences between online and offline voters. The demographic predictors fit closely with the existing literature on the digital divide (Gerlach and Gasser 2009) as well as the results of previous research on online only voters in previous PB votes (Vassil and Weber 2011). These differences are also clear when we consider the marginal effects of demographics in a logistic regression model in Figure 2 (for the underlying regression see Table 3 in the appendix). In both the descriptive analysis and the regression model, respondents who are male, university educated, less than 30 years old, or who use the Internet daily are more likely to vote online.

The substantively largest effects are clearly education and Internet usage. Respondents with an undergraduate degree are 20 percentage points more likely to vote online than respondents with no formal education. The effect is even larger for respondents with postgraduate degrees, who are 39 percentage points more likely to vote online. Internet usage also has a strong effect: respondents who use the Internet weekly are 22 percentage points more likely to vote online, and respondents who use the Internet daily are more likely still, with a 29 percentage point increase in online voting compared to people who do not use the Internet.

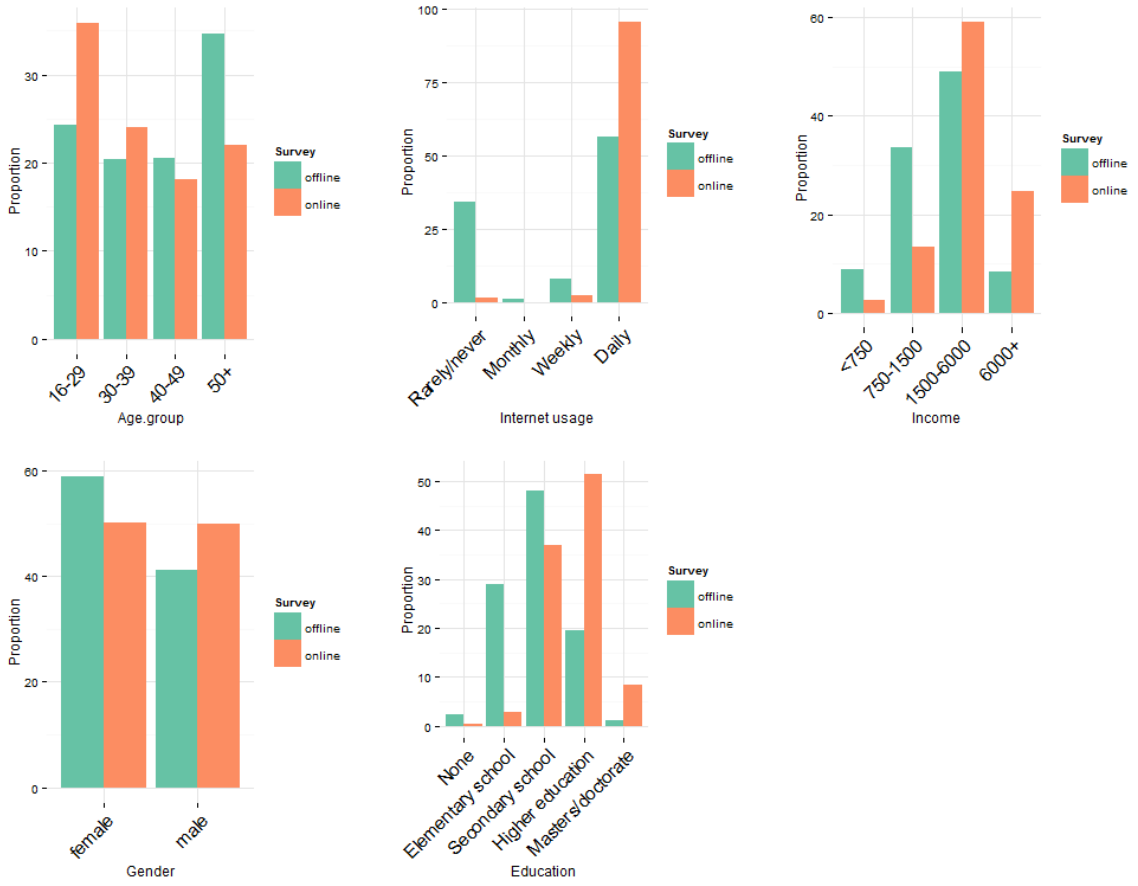
In the descriptive analysis, there is a substantial income gap between online and offline voters. However, this gap is not statistically significant after controlling for the other demo-

[14] We do not cluster the standard errors within Coredes in the models we present. Because the total vote share within a Corede is bounded at 100%, an increase in votes for one project will decrease the share for other projects. Consequently, there is actually a negative correlation between project vote shares within a Corede and the clustered standard errors shrink compared to the raw standard errors. The substantive conclusions are unaffected by clustering the standard errors.

graphic factors. With the exception of younger people, the overrepresented groups online are also generally more privileged groups within society.[15] Given that online voting, in practice, gives greater representation to privileged groups than offline voting, it is plausible that the policy choices in the online and offline vote would also differ (Page, Bartels, and Seawright 2013; Page and Seawright 2014; Gilens 2012; Gillon, Ladd, and Meredith 2014; Baker 2003).

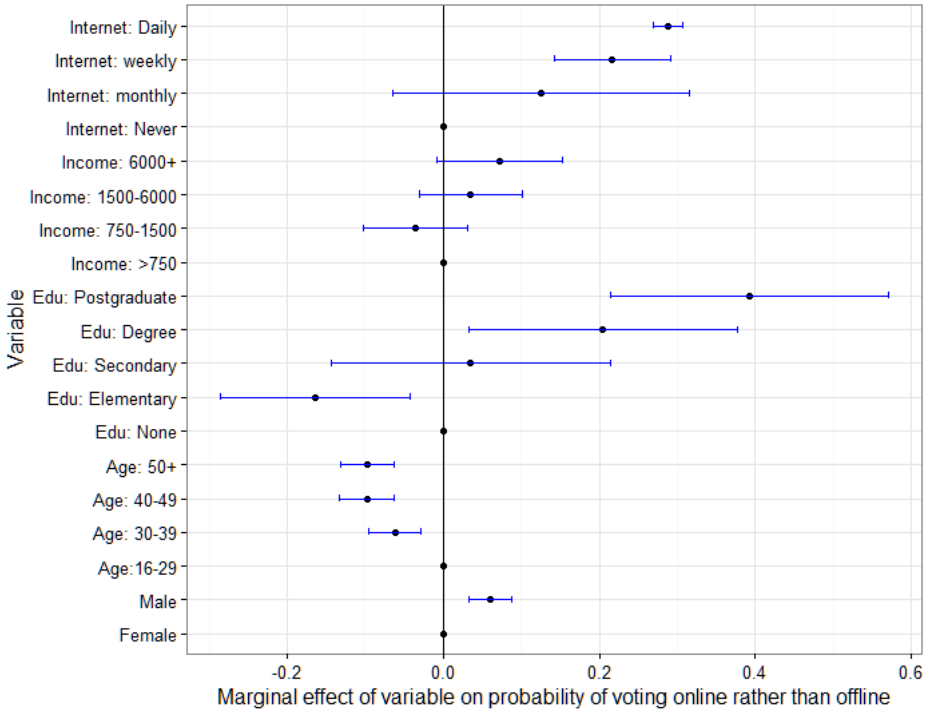
[15] Given the different survey designs for the offline and online exit polls, we also consider whether the different response rates and modes for the surveys might explain the differences we see. Using a separate interactive voice response survey conducted on Election Day, we show that the same patterns of demographic differences hold between online and offline voters when they are surveyed using the same method. These results are shown in the appendix.

Figure 1. Demographic Differences Between Online and Offline Exit Poll Respondents.



* *Notes:* The unit of analysis is the individual survey respondent.

Figure 2. Marginal Effects of Voting Online Versus Offline Based on Combined Data From Online and Offline Exit Polls.



** Notes:* The unit of analysis is the individual survey respondent. Logistic regression with online voting as dependent variable. 95% confidence intervals shown.

In the online exit poll, we also asked whether individuals who voted online would not have voted had online voting not existed. Only 31.3 percent of online voters reported that they would have voted anyway, while an overwhelming majority (68.7 percent) said they would not have voted without the ability to vote online. Similarly in the offline exit poll, we asked offline voters the main reason they chose to vote in person rather than online. In response to this question, 77.6 percent of offline voters stated they did not know Internet voting was an option, suggesting that many of them would not have voted in the absence of the online option. While there is always the possibility of misreporting in any survey responses, we expect voters would tend to over-report their willingness to participate rather than under-report, a behavior that has been observed in many other contexts (Karp and Brockington 2005). This

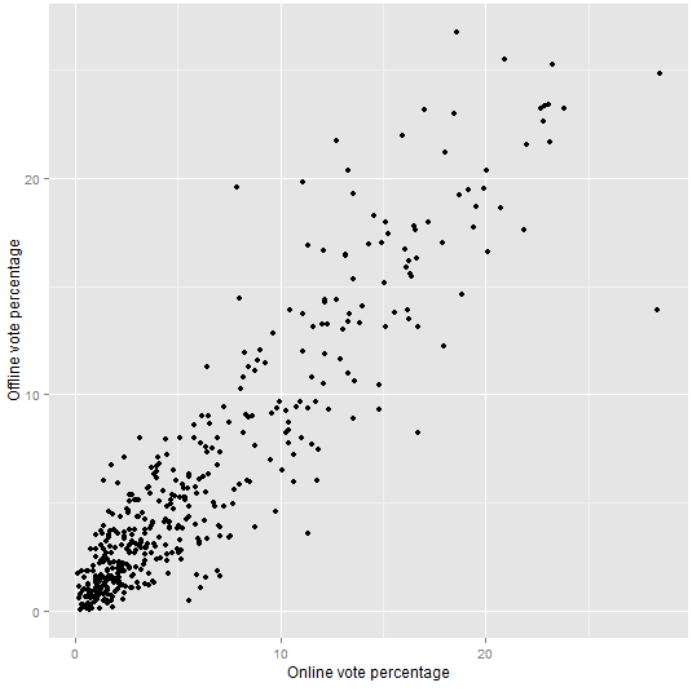
finding increases our confidence that online voters reflect an entirely different demographic profile than offline voters.

Policy voting online and offline

Given the strong evidence of demographic differences between online and offline voters, we now turn to whether these differences are reflected in vote choices between online and offline voters. Because this data reflects actual votes and not just recalled or self-reported choices, we are less concerned with non-random measurement error that can be a threat in survey research. The unit of analysis here is a particular project proposal in a particular Corede.

Figure 3 shows a scatter plot of the percentage of voters in each Corede who supported each project proposal online and offline. For instance, one point on the plot would be the proportion of online voters in Corede 1 who supported a proposal to build a new hospital against the proportion of offline voters in Corede 1 who supported that proposal. The bivariate relationship is very strong (R^2=0.84). Unlike the demographic differences, the overall picture is clearly one of similarity rather than differences.

Figure 3. Online Vote Share For Each Proposition in a Corede Against the Offline Vote Share in the Same Corede. (N=440)



** Notes:* The unit of analysis is a proposition within a Coredes.

Table 2 shows the regression estimates of online vote choices (while controlling for the offline vote share). Model 1 includes the estimates of online vote for different categories of project proposals. Online voters vote for basic education and health, even after accounting for offline vote share. Nevertheless, the overall results suggest more similarities than differences between online and offline vote choice.

Given that the demographic results suggest online voters are more likely to be from privileged demographic groups, we test whether online voters are less supportive of redistributive policies on the PB ballot. In order to test this hypothesis, Model 2 adds an additional parameter, capturing whether a project proposal is redistributive. Although the effect is in the expected direction (negative), it is not significant and the magnitude is trivial. The two catego-

ries that are significant in Model 1 become insignificant, suggesting these effects are not highly robust either.

Table 2. Regression Estimates of Online Vote Share, Controlling for Offline Vote Share, (N= 440).

	Model 1			Model 2		
	Estimate	Std. Error		Estimate	Std. Error	
(Intercept)	0.40	0.36		0.47	0.38	
Offline vote share	0.86	0.02	***	0.87	0.02	***
Categories						
Preventing violence on transportation	0.31	1.38		0.23	1.37	
Culture and digital inclusion	-0.63	0.67		-0.71	0.68	
Economic development	-0.17	0.54		-0.18	0.56	
Rural development	0.67	0.47		0.40	0.52	
Social development and eradication of poverty	0.87	0.75		0.88	0.79	
Basic education, professional and technical	1.05	0.51	*	0.98	0.53	
Higher education	0.41	0.66		0.23	0.68	
Sport, leisure and tourism	0.24	0.49		0.23	0.50	
Housing, urban development and sanitation	0.04	0.53		0.08	0.66	
Infrastructure and logistics	1.42	2.33		1.34	2.32	
Irrigation	0.57	0.73		0.31	0.86	
Environment and water resources	0.36	0.73		0.27	0.78	
Local and regional planning	-0.11	1.67		-0.38	2.32	
Health	1.02	0.47	*	0.80	0.48	
Public security and civil defence	0.38	0.51		0.30	0.53	
Redistributive				-0.14	0.54	
N						
Adjusted R-Squared		0.84			0.85	

** Note*: The unit of analysis is a proposition within a Coredes. Omitted category: Citizenship, Justice , Human Rights and Policies for Women. Signif. codes: *** 0.001, ** 0.01, *, 0.05, and '.' 0.1. '

These analyses suggest that, despite the different demographic profiles of voters who choose to vote online or offline, the two groups broadly make similar vote choices in the Rio Grande do Sul PB vote. The raw bivariate relationship between online and offline vote share as plotted in Figure 3 is strong and robust to models in which we control for the different categories of project proposals and whether they are redistributive or not. Regardless of the particular model specification, we find the strongest predictor of online vote share is offline vote share, suggesting online and offline voters have similar voting behavior.

Conclusions

Consistent with similar results from Brazil in 2012 (Spada et al. 2016) and Estonia (Alvarez, Hall, and Trechsel 2009), we find evidence that i-voting increases turnout across the electorate. Our online exit poll suggests a large majority of online voters would not have voted if the online voting mode had not existed. However, we find that people who choose to vote online have systematically different demographic profiles than people who choose to vote offline: in addition to having greater Internet access, online voters are more likely to be male, university educated, high earning, and under 30 years old. Thus, the introduction of i-voting is likely to have a significant effect on the overall demographic makeup of voters, particularly in low-income countries where higher education and income can often be correlated with lower voter turnout (Pande 2011).

While offline voters and potential non-voters, i.e. online voters who would not have voted without online voting, have different demographic profiles, at least on the budget issues at stake, they clearly vote very similarly. This means that even if the number of i-voters increased, assuming the profile of online voters stayed the same, this would not greatly alter the outcomes of the process. Thus, many of the concerns raised by Irvin and Stansbury (2004) and others surrounding participatory decision-making do not seem to apply in this instance. Yet it is likely premature to generalize from this finding to other i-voting settings without further research.

There are a number of possible explanations for the seemingly contradictory finding that demographics change while voting remains the same. The first of these is that the PB ballots are not heavily ideological, so demographic differences do not translate into differences in voting behavior. There is some evidence for and against this claim. On the one hand, only ten percent of the ballot measures were clearly redistributive in their impact and most proposals funded public goods such as police or hospitals. On the other hand, even in the cases where

measures were redistributive, we do not find systematic differences between the online and offline vote. This finding would seem to contradict a large existing literature on voter preferences for redistributive policies and demographic groups.

A second possible explanation is that participatory budgeting voters face relatively difficult voting decisions. Unlike candidate elections, voters do not have the heuristic of party labels (e.g., Lenz 2012) to guide their vote choice. Instead they must directly assess the value of different projects, to which they generally will not have been exposed previously. The low information, low turnout (turnout was only 15.2 percent overall) environment of the participatory budgeting vote further compounds the cognitive difficulty of the ballot. Even among those who did vote, few seemed to have heard much about the process. The most common comment at the end of the online poll was that the process did not seem to have been well publicized. This means that voters were unlikely to have been exposed to much information about the proposals or to elite cues (Lupia 1994) about how to consider the proposals, prior to voting. Another line of evidence supporting the low information theory is that additional analysis shows strong ballot ordering effects and text length effects for online and offline voters showed (voters prefer items earlier on the ballot or that include more text).[16]

A third possible explanation is that the deliberative first stage of the participatory budgeting process tends to create sets of projects that represent preferences that are more evenly distributed across demographic groups, leading to proposals that do not easily divide along ideological lines. By restricting the choice set, there may be less room for demographic differences to play a role in vote choice.

The fourth possible explanation is that participatory budgeting voters are more similar on other attributes that override their demographic differences. For instance, online and offline voters could both have strong pro-social preferences that predict their vote choice and their

[16] Please refer to the appendix.

decision to take part in a low salience vote. There is relatively little evidence for this claim, given that online and offline voters differ on most attributes, but it is at least a possibility. Furthermore, the PB process is unique in that prior to voting, offline participation occurs to determine which project proposals should be placed on the ballot. These earlier discussions could increase the likelihood of consensus within communities prior to the vote taking place, because the budget proposals that are voted on already reflect some degree of compromise and agreement. Overall, the low information explanation looks the most plausible and has the most corroborating evidence. However, further research will be needed to analyze the reasons for this trend more carefully.

Finally, we might consider the possibility that voters are choosing largely altruistically rather than in a self-interested manner and that their views of the general good are similar enough that they do not generate large differences in voting behavior.

To what extent can we expect to generalize the results from this study? While claims on that subject require caution, a few considerations are worth making. As noted earlier, Rio Grande do Sul's PB guards all the key defining characteristics of the other 2,500 cases of PB identified around the world. Considering these traits of institutional design – e.g. deliberation preceding decision-making – are the ones playing a definitive role in the outcomes of the PB process, one should expect these findings more likely to be observed in other PB cases as well. Yet, this remains essentially an open empirical question. The same is true, if not more so, for other processes that involve public participation. On the one hand, the demographic differences observed here are similar to those seen in other situations where there is a digital divide (Vassil and Weber 2011; Pammett and Goodman 2013). On the other hand, the low information and high complexity environment of the participatory budgeting vote is an extreme case. In an online vote for a candidate in typical elections, where voters receive more information prior to the poll and there are clearer partisan and elite cues, it is plausible that more

differences would emerge between online and offline voters. Future research should focus on finding other cases where votes were conducted in a parallel fashion across online and offline modes, to see whether these findings are generalizable.

Regardless of the reason for the lack of difference, this study provides evidence that, while i-voting in participatory budgeting brings different participants to the process, it does not fundamentally alter its outcomes. These findings should temper the concerns of cyber-pessimists that the introduction of ICT in participatory budgeting processes may alter its re-distributive logic. Furthermore, if i-voting does not alter PB outcomes, there are still benefits that may be associated with increased turnout and diversity of participants. The first refers to the sustainability of the process. One may argue that, all other things equal, participatory processes are less likely to be terminated or when they engender sustained participation. In a similar vein, it may well be that the higher the numbers of participants, the more likely government officials are to comply with the decisions made by the public in such processes. Finally, considering intrinsic benefits that stem from public participation (e.g., increased efficacy, knowledge of public issues), one could argue that increased turnout per se is a desirable goal. Bearing all these considerations in mind, our findings suggest that i-voting is neither a threat, nor a panacea to participatory budgeting processes. Similarly, i-voting is not a substitute for offline voting. In order to promote inclusive democracy, all reforms that promote more convenient and less costly voting should be considered, while at the same time addressing the digital divide that may prevent the poor and less educated from taking advantage of less costly forms of voting.

Appendix A: Regression Model Prediction of online voting

*Table 3. Logistic Regression Predictors of Voting Online as Opposed to Offline From Post-Vote Survey of Voters (*N= 6,780*).*

	Estimate	Std. Error	
(Intercept)	-4.11	0.53	***
Male	0.34	0.08	***
Age group			
30-39	-0.36	0.10	***
40-49	-0.58	0.11	***
50+	-0.57	0.11	***
Education			
Elementary school	-1.09	0.53	*
Secondary school	0.20	0.52	
Higher	1.15	0.53	*
Masters/doctorate	2.06	0.57	***
Income			
750-1500	-0.20	0.20	
1500-6000	0.20	0.19	
6000+	0.39	0.22	.
Internet usage			
Monthly	0.66	0.49	
Weekly	1.14	0.20	***
Daily	2.62	0.15	***
Null deviance		6,895	
Residual Deviance		5,337	
AIC		1,934	
n		6,780	

** Notes:* Unit of analysis is the individual survey respondent. Omitted categories: female, 16-29, no education, less than R$ 750, less than monthly, rarely/never use Internet. Signif. codes: *** 0.001, ** 0.01, *, 0.05, and '.' 0.1.

Appendix B: IVR Survey

The demographic differences between online and offline voters in the participatory budgeting vote are analyzed using separate exit polls of the two votes. However, this does raise the question of whether two relatively different survey modes might be driving the results rather than actual differences in the online and offline electorate. In particular the face-to-face exit poll had a response rate of 95.5 percent, while the online exit poll had a response rate of 13.3 percent.

To assess this possibility, we make use of a separate random digit dial Interactive Voice Response (IVR) poll of Rio Grande do Sul conducted on Election Day with the firm Voto Mobile. This covered both voters and non-voters, with a survey start rate of 5.4 percent (total completion rate 2.1 percent). In total, 1,363 non-voters, 557 offline voters and 163 online voters started the survey. The results in Table 4 show the demographic variables for online and offline voters as well as non-voters. The results consistently show the same pattern of differences between online and offline voters, with online voters being younger, male, better educated, heavier Internet users and higher income, corroborating our exit poll findings. We are therefore confident that the differences observed in the exit polls are not driven by different survey modes or response rates across those modes. While the IVR survey is not a high quality sample in itself, the correspondence between its results and those of the two exit polls shows that the differences are robust to the sampling procedure used.

Table 4. Demographic Differences Across Voting Modes Based on Separate IVR Survey.

	Non-voter	Offline	Online
Age(n=1,444)			
16-29	32.9	24.9	28.3
30-39	26.7	25.7	34.9
40-49	20.4	25.1	15.1
50+	20	24.3	21.7

Gender (n=1,533)			
Female	49.9	55.5	46.5
Male	50.1	44.5	53.5
Education (n=1,477)			
None	6.6	8.9	5.4
Elementary school	33.5	37.8	25
Secondary School	42.3	39.3	44.6
Degree	14.8	12.4	23.2
Masters/doctorate	2.8	1.5	1.8
Internet usage (n=1,715)			
Rarely/never	31.4	34.4	12.7
Monthly	5.7	7.6	8.7
Weekly	13.2	15	11.9
Daily	49.7	43.1	66.7
Income (n=1,418)			
<750	21.8	26	15.5
750-1500	45.5	48.5	39.1
1500-6000	26.4	23.3	37.3
6000+	6.3	2.1	8.2

* *Notes:* The unit of analysis is the individual survey respondent. Data is from a separate random digit dial Interactive Voice Response (IVR) poll.

Appendix C: Ballot Example – Corede 'Central'

Popular Participation and Citizen - State Budget 2015 CENTRAL REGION

Budget Priorities Vote

FIELD 1. Vote for up to 04 (four) demands, 01 (one) in each area			
Areas			**Demands**
CULTURE AND DIGITAL INCLUSION	1	()	Support for cultural events
	2	()	Construction, renovation and modernization of cultural spaces
RURAL DEVELOPMENT	3	()	Support for networks of farming cooperatives
	4	()	Strengthening of local and regional supply chains for small farms and cooperatives. Actions: • Support small farmers program "Sabor Gaucho," • Support fruit farming • Support development of agro-ecological systems • Support development of Gaucho dairy and livestock • Development of fisheries and aquaculture
HEALTH	5	()	Strengthening of health system infrastructure in Rio Grande do Sul
PUBLIC SAFETY AND CIVIL DEFENCE	6	()	Fire prevention and fire fighting, Conduct search and rescue, and civil defense activities
	7	()	Support for police and crime prevention and Suppression (Civil Police)
	8	()	Support police functions and preservation of public order (Military Police)
SPORTS, RECREATION AND TOURISM	9	()	Promote health, recreation and leisure
	10	()	Carry out competitions and events that promote sports and social inclusion
	11	()	Tourist infrastructure and equipment (Tourist signs)
BASIC EDUCATION, VOCATIONAL AND TECHNICAL	12	()	Technological modernization
	13	()	Equipment / basic furniture to improve schools, regional coordination centers, and the Secretariat of Education
FIELD 2. Vote for up to two (02) Regional Priorities			
INFRASTRUCTURE AND LOGISTICS	21	()	Improvement of regional roads infrastructure. Municipal access to State / Federal roads, Maintenance of State roads, and build a bridge over the Vacacai River, between the Municipalities of Formigueiro and Restinga Seca.
PUBLIC SAFETY	22	()	Regional fire department restructuring
HEALTH	23	()	Equipment for State hospital in Santa Maria municipality
INFRASTRUCTURE AND LOGISTICS	24	()	Construction of Rio Soturno Dam

Appendix D: Corede Ballot Problems

The ballot for Corede 28 (Celeiro) does not include an option 16. It goes directly from 15 (Programa modernização e desenvolvimento da educação superior pública) to 17 (Transportes multimodais).

This does not line up in the data for the offline vote. In the online data, option 17 includes 2389 cases where the title is "Qualificação, recuperação e ampliação da infraestrutura física e pedagógica e viabilização da modernização tecnológica das escolas estaduais" (listed as 18 on the ballot) and 146 cases of "Transportes multimodais" (listed as 17 on the ballot). In the offline data, all the option 17 cases are "Educação Básica, Profissional e Técnica - Qualificação, recuperação e ampliação da infraestrutura física e pedagógica e viabilização da modernização tecnológica das escolas estaduais" (listed as 16 on the ballot).

By contrast, the options all match up outside of this particular case. It is unclear what the cause of this is. One possibility is that the ballot was initially misprinted and then corrected partway through the process. Rather than try and infer what happened in this case, we have simply excluded Corede 28 from the analysis entirely.

Appendix E: Order and Text Length Effects

We also ran models that included two voter heuristics. First, we included a term capturing the number of characters used to describe each project proposal. The proposed heuristic is that longer proposals are better. We see a significant result, with every 100 characters predicting an additional 1 percentage point of vote share. We also included a measure of where the measure appeared on the ballot. Higher values indicate that it appeared nearer the top of the ballot. We see a significant effect of earlier placement of proposals, with a 0.08 percentage point decrease in vote share for every position down the ballot. This means that moving a ballot item from first position to twentieth would reduce its share of the vote by 1.5 percentage points. These results indicate that voters are likely satisficing in their voting behavior in at least some cases.

Table 5. OLS Regression Predictors of Online Vote Share, Including Heuristics. (N=440)

	Model 3		
	Estimate	Std. Error	
(Intercept)	-0.72	0.49	
Offline vote share	0.84	0.02	***
Categories			
Preventing violence on transportation	0.53	1.36	
Culture and digital inclusion	-0.95	0.70	
Economic development	-0.47	0.56	
Rural development	0.19	0.52	
Social development and eradication of poverty	1.08	0.78	
Basic education, professional and technical	1.41	0.55	*
Higher education	0.52	0.68	
Sport, leisure and tourism	0.35	0.50	
Housing, urban development and sanitation	0.42	0.65	
Infrastructure and logistics	1.98	2.30	
Irrigation	0.06	0.85	

Environment and water resources	0.26	0.77
Local and regional planning	-0.30	2.29
Health	0.76	0.48
Public security and civil defense	0.41	0.53
Redistributive	-0.12	0.53
Proposal length	0.01	0.00 *
Early on ballot	0.08	0.03 **
Adjusted R-squared		0.85

** Notes:* The unit of analysis is a proposition within a Coredes. Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1. Omitted category: Citizenship , Justice , Human Rights and Policies for Women.

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