Identifying how Internet Availability Shapes the Impact of Online Voter Registration on Political Participation

Unequal participation and unequal internet access are both structural inequalities across the American states, factors that keep certain demographic groups in a continued marginalized status. According to the Current Population Survey (2015), nearly 20% of American households do not have access to the internet. Not having internet access hampers the ability to vote, as individuals without such are less motivated and less able to acquire information on how and for whom to vote. The demographic groups who are least likely to have internet access – African Americans and Hispanics, low income, low education, and rural – are also less likely to vote. A key question is whether government policies that make internet access more widespread also increase the likelihood that individuals from these groups will become voters. To answer this question, this paper assesses whether online voter registration, a law whose effect is strongly structured by broadband or high-speed internet access, has a more positive impact on voter registration and turnout in areas with on average more internet access. To evaluate this hypothesis, this study utilizes 2014 and 2016 Current Population Survey data on individuals from across the American states. This is combined with state-level broadband availability data aggregated from the census block level from the Federal Communications Commission Varying internet access by state and using online voter registration policies as a treatment variable, this study determines whether state internet availability structures the impact of this law on political participation. Ultimately, the results of this study reveal the degree to which the impact of online voter registration policies is contingent on the availability in the American states.

Introduction

The internet has been a fixture of American elections since the late-1990s and early-2000s, when during his presidential administration Clinton involved federal government in widening internet deployment to a broader segment of the American populace, and John McCain demonstrated that a web presence is an important component of any viable political candidate's campaign (Solop 2004). High speed internet access is connected to many aspects of daily life, encompassing medical care, employment, and educational goals, among others (Bauerly 2018; Martin 2019; Horrigan 2010). Recent American presidents, including Obama and Trump, have recognized this need and have pushed for policies that narrow the digital divide, expanding internet availability to broader segments of the American populace. In the U.S. Appeals Court case *United States Telecom Association v. Federal Communications Commission* (2016), the court decided that broadband access – high-speed internet – was not a luxury but an essential utility for the average American citizen (Kang 2016). (Bauerly 2018).

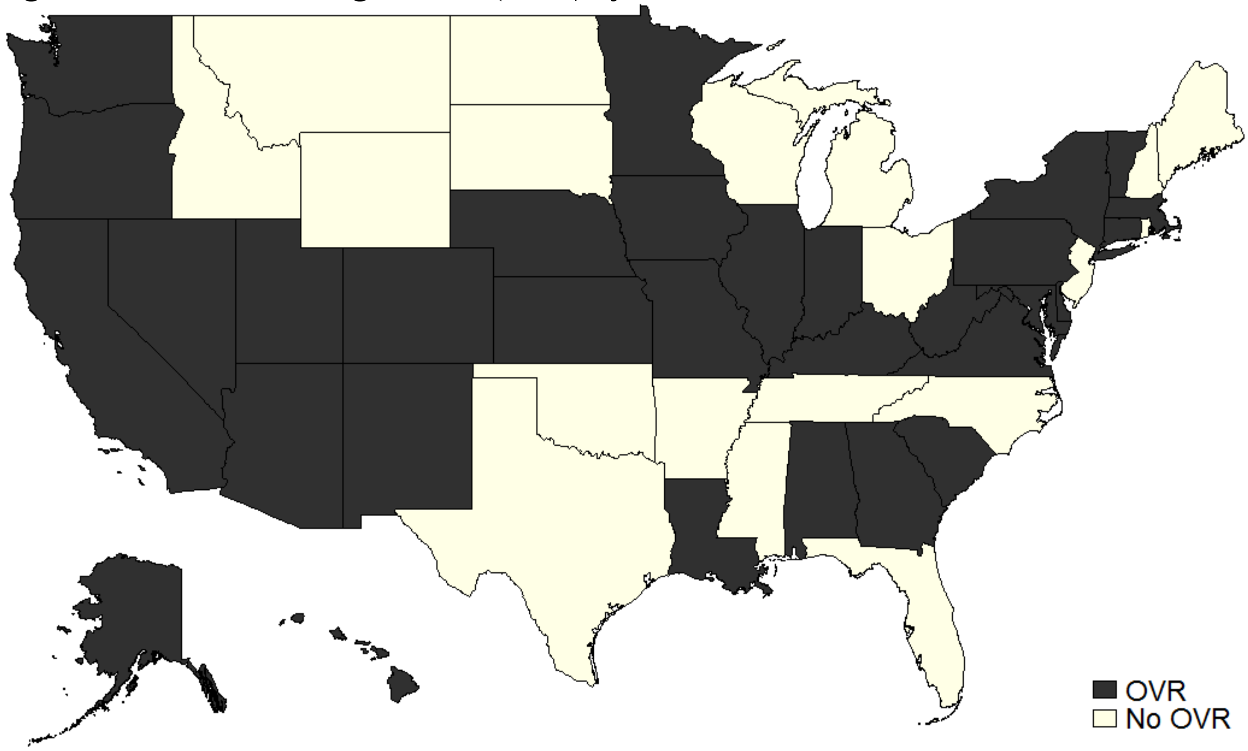
In the realm of political participation, Alvarez and Hall (2004) and Mossberger, Tolbert, and Stansbury (2003) argue that internet registration or voting can add convenience to the ballot casting process for both citizens and election administrators. A key argument in the convenience voting law literature is that reforms that make registration and voting easier will increase political participation (Gronke et al. 2008). Going back to the Founding Era of American government, political elites in both the Federalist and Jeffersonian Republican parties identified voting as an essential right that allowed individuals to communicate their interests and needs to government leaders, thereby maximizing the representational quality of government **(**Gillman, Graber, and Whittington 2017**)**. In this context, having access to broadband internet and the possibility of registering to vote online could also be understood as a utility – not a luxury – for the American citizen. This study tests the proposition that the combination of greater (rather than less) broadband access makes the use of online voter registration (OVR) more convenient, thereby increasing citizen voter registration and turnout rates.

This study makes several contributions to the study of election reform laws. First, the research evaluates the impact of OVR on both registration and voter turnout outcomes at the individual-level across the American states in the 2014 midterm and the 2016 presidential elections. Second, the works develops and tests a unique argument that the impact of OVR is shaped by the level of broadband access in a state. This hypothesis is partly tested using a unique dataset from the Federal Communications Commission that identifies what percentage of county and state census blocks have fixed broadband service. The intuition is that individuals will be more likely to use OVR in states that have more widely available broadband service. Third, the outcomes of this study are able to show what groups are more or less benefited by OVR. Overall, this study demonstrates that the combination of a highly accessible state broadband network and internet voter registration can improve political participation.

Online Voter Registration (OVR)

OVR represents part of the new wave of election reform. Instead of having citizens submit and election administrators process paper forms, the transaction takes place electronically. After election transmission of forms takes place, election officials confirm the authenticity of citizens' information, and then enter the registration information into a state's voter files. Except for being entirely an electronic process, the procedures followed are identical to offline voter registration. But OVR offers advantages to both citizens and election administrators. Although no state has adopted internet voting for general elections due to security concerns **(**Alvarez and Hall 2004; Buchstein 2004; Hasen 2012**)**, Arizona became the first state to adopt OVR in 2002; today, in 2019, 37 states have this option available to citizens for registration. As of 2016, the states with OVR are depicted in Figure 1.

Figure 1: Online Voter Registration (OVR) by State in 2016



Note: Data from National Conference of State Legislatures (2019)

In many ways, OVR was an outgrowth of the 2000 presidential election and the Help American Vote Act of 2002, as well as the greater computerization of American society and government in the 1990s and 2000s. From 1995 to 2003, nearly 77 million voter registration records were processed, and 4 million of these were duplicates. A majority of these registration records were interjurisdictional, involving moves across states, while a non-trivial number of these records were intrajurisdictional, involving moves within states or counties. To ease the handling of registration records, and to minimize the possibility of human error in processing them, the Federal Election Commission has recommended and the U.S. Congress mandated in the Help American Vote Act that states move toward digital registration databases. Thus, OVR was born out of need to improve the accuracy of state voter registration records, and to make the keeping of such records more convenient for both local and state election administrators (Done

2003).

What have been the effects of OVR? Alvarez and Hall (2004) point out that online participation – which they define as either OVR or internet voting – will both be an added convenience for voters as well as election administrators. They evaluate pilot trials of internet participation in Alaska, Arizona, and Uniformed and Overseas Citizens voting (all in 2000). While they emphasize that none of these pilots constituted a scientific experiment, thus rendering statistical inferences unwieldy and unreliable, they also note that the benefits and costs associated with internet participation are similar to other reform laws such as all-mail or absentee voting. With the caveat that states need to make sure that internet participation systems are secure from hacking, Alvarez and Hall (2004) endorse internet participation as a promising reform for the American states.

For election administrators, internet political participation reduces local and state costs related to election office staffing, and funds needed to process paper-based registration forms and voting ballots (Smith and Clark 2005). For individuals, Mossberger, Tolbert, and Stansbury (2003, 93-94) emphasize the online voter offers convenience, with the possibility of enhancing political participation. Although they do not directly test the impact of OVR on voter registration and turnout, they use a nationally representative telephone survey from 2001 to measure support of the law; from this data they forecast the likely effects of OVR. They find that educated, young, and Democratic individuals are more likely to support this reform, with the expectation being that OVR will register and make more of these individual eligible to cast ballots. Ponoroff and Weiser (2010) also find that young individuals between the ages of 18-34, as well as racial and ethnic minorities, are more likely to view OVR with favorable attitudes; they also predict that OVR will have positive effects on registration and participation, particularly among these groups.

As for actual results, examining internet voting in Estonia, Alvarez, Hall, and Trechsel (2009) find that in a 2006 nationwide election approximately 86% of internet voters cast ballots online because it was convenient. McDonald (2008) also finds that computerized state election systems that enable portable registration – meaning allowing citizens who move within states to transfer their registration records – boosts turnout among movers by 2.4%. In the 2000 Arizona Democratic primary election, Solon (2004) finds that better educated and younger voters were more likely to be internet voters. Gibson, Ward, and Lusoli (2002) also find that internet voting increased primary ballot casting in the 2000 Arizona Democratic primary election. Done (2003) shows that the availability of internet voting in this same election combined with campaign outreach information on polling locations and voting methods contributed to higher participation from non-polling location. Goodman and Stokes (2018), using panel data to evaluate the impact of internet voting in Ontario, Canada, find that this mode of voting can increase turnout by 3.5%. This studies show that internet participation can enhance civic engagement.

However, Bimber (1999), employing 1998 American National Election Study data, finds that internet voting has no impact on voter participation. . In Arizona Democratic primary elections, Alvarez and Nagler (2002) also find that internet voting was associated with a decline in nonwhite voter turnout from 1998 to 2000 in every Arizona county. Bennion and Nickerson (2011; also see Nickerson 2007) find that voter registration recruitment through email does not by itself increase voter registration; only when such emails are accompanied by further text reminders does internet mobilization have a positive impact on registration. Additionally, in a field experiment among more than 61,000 registered Maine voters in 2010 General Election, Mann and Genevieve (2015) find that Maine’s new online mail ballot request system only had a modest effect on requesting a mail ballot, and no significant impact on increasing overall voter turnout. These two studies suggest that making online registration available by itself might not increase registration or turnout. Other voter cost-savings mechanisms – such as higher broadband access – may be needed to entice individual to use OVR. These latter studies suggest that the effects of OVR could be similar to some research on convenience voting laws which have shown these laws to have a minimal impact on voter turnout, and, if they do have an effect, tend to exacerbate existing demographic biases in the American electorate (Berinsky 2005; Fortier 2006; Gronke et al. 2008; Karp and Banducci 2001; Neely and Richardson 2001; Stein 1998).

Still, Provost and Schaffner (2008) evaluate the impact of internet voting on turnout in the 2004 Michigan Democratic primary. They find that internet voting is not more biased than other modes of voting, and that younger voters are more likely to choose to cast their ballots online. Awad and Leiss (2011) also find that government officials are more supportive of online registration or voting when such reforms offer at least as much security as older forms of remote registration and voting, such as absentee or mail voting (also see Alvarez and Hall 2004). One central objective of this study is to determine whether or not OVR has a significant impact on registration and turnout.

Federal Communications Commission Broadband Availability Data

A unique contribution of this research is to use comprehensive broadband access data from the Federal Communications Commission (FCC) to see whether the accessibility of high-speed internet in a state enhances any effect OVR has on political participation. Specially, internet access data is from the FCC's Form 477; the form requires internet service providers (ISPs) to provide data on each type of internet service they make available by technology and speed for each census block. For this study, FCC data on fixed internet connections by U.S.

Census tracts is used to construct an internet access variable. Fixed internet connects include census blocks that have broadband access through cable, DSL, or fiber-optic connections. According to Martin (2019), these fixed categories are "more likely than the alternatives such as satellite or terrestrial fixed wireless services to meet the FCC's benchmark for a high-speed broadband connection necessary for ordinary internet use." Hence, in this study, a state's percentage of census blocks with fixed internet connections is used as the key internet access variable that is predicted to structure the impact of OVR on voter registration and turnout.

The FCC defines basic fixed broadband service as being marked by a minimum download speed of 25 megabits per second, and a minimum upload speed of 3 megabits per second. Regarding OVR, both these measures of bandwidth are critical. Individuals need adequately fast download speeds to acquire and fill out online registration forms, and need similarly fast upload speeds to submit such documentation. Having fast download and upload speeds – what the FCC considers to be a basic fixed broadband connection – makes undertaking online tasks more convenient to individuals, and makes it more likely that they will transfer from doing tasks such as paying bills offline to doing so online. Analogously, individuals in OVR states will be more likely to take advantage of the convenience of OVR when the necessary digital infrastructure exists.

The FCC creates, implements, and monitors broadband deployments policies. These responsibilities are linked to Section 706 of the Telecommunications Act of 1996. Under Section 706, the FCC is required to report annually to Congress on the progress of internet deployment in the United States; the agency must ascertain not only whether deployment exists in a certain area, but also that efforts are being made to ensure that the expansion of internet services to uncovered areas is occurring in a "reasonable and timely fashion." If in the annual reports the

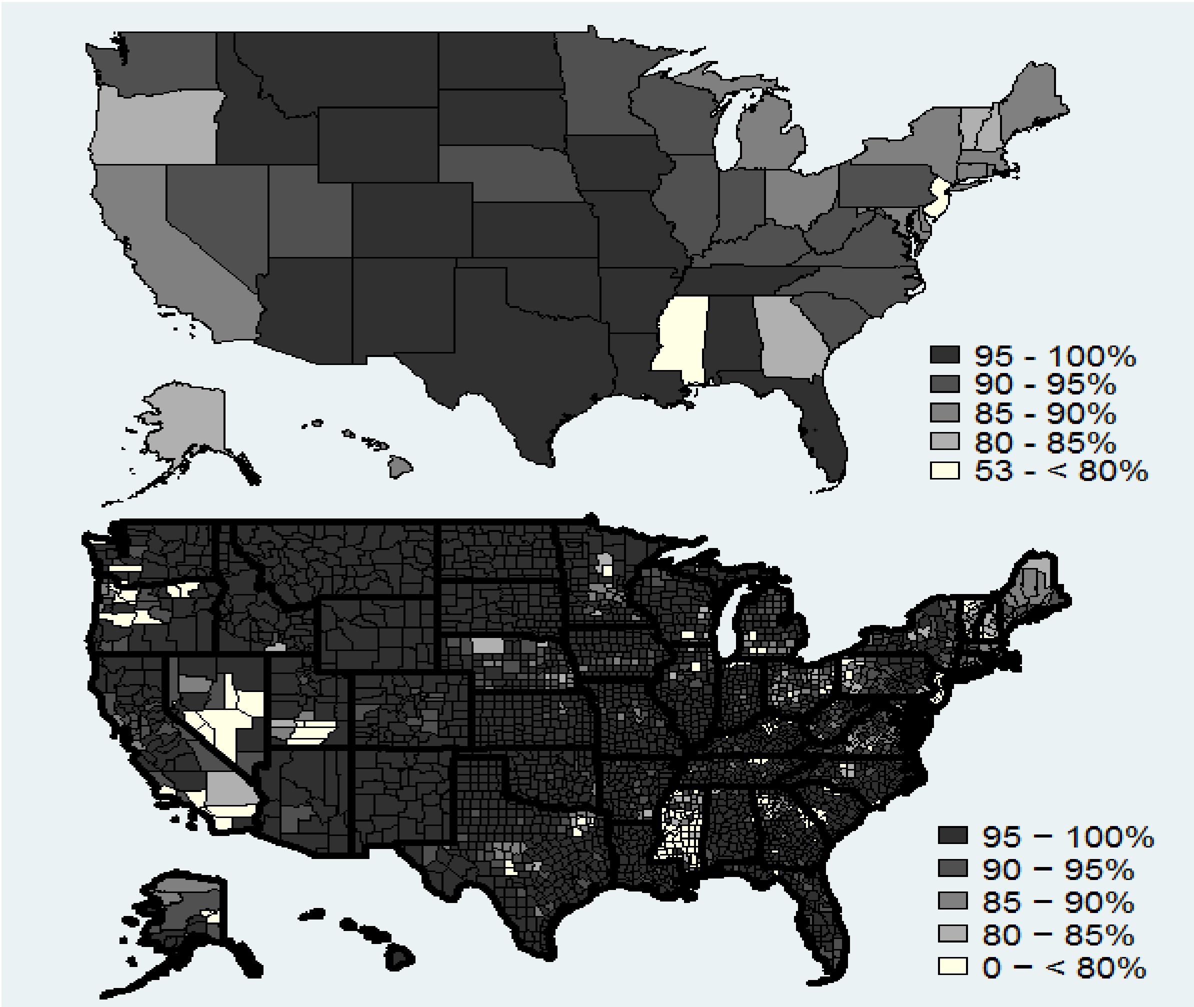
FCC determines that deployment does not exist in a given area, or if the reasonable and timely fashion standard is not being met, Congress mandates that the FCC “take immediate action to accelerate the deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecommunications market.” Thus, Congress and the FCC endorse pro-marker broadband deployment policies to expand access.

Within the FCC’s “2019 Broadband Deployment Report,” the agency cites closing the digital divide as a cardinal policy objective. To advance this objective, the FCC emphasizes the removal of “barriers to infrastructure investment and by promoting competition in the telecommunications market.” The FCC’s 2010 National Broadband Plan outlines steps for the government to take to improve the national broadband environment. One cited key method is by reducing infrastructural costs. To do so, the federal and state governments focus on improving the deployment of broadband infrastructure to extend to high cost areas, such as rural or less densely population areas where the cost to connect customers is greater than in more densely populated areas (Martin 2019). The plan calls for increases ISP competition to “maximize consumer welfare, innovation, and investment” (FCC 2010c**).** Government agencies are also instructed to facilitate “network upgrades and competitive entry” for ISPs; this can include opening up the broadband spectrum to new ISPs, helping to finance new infrastructure developments, and expanding existing broadband infrastructure (FCC 2010c).

The 2019 FCC report notes that state and local internet policies play key roles in broadband deployment. The Telecommunications Act of 1996 also gives states authority to implement polices to consistent with promoting wider internet deployment. For example, states and municipalities vary in the laws that stipulate whether broadband technology can be attached to pre-existing towers and structures; the sitting fees ISPs and municipal governments must expend to establish private or public internet service; the average length of the review process before deployment expansions can occur; and zoning requirements that either promote, delay, or prevent deployment. The FCC (2019b) report states "that a state or local legal requirement constitutes an effective prohibition" on wider internet deployment "if it materially limits or inhibits the ability of any competitor or potential competitor to compete in a fair and balanced legal and regulatory environment." Hypothetically, more state and local laws that impose fewer constraints on internet deployment would be expected to be associated with higher levels of infrastructural broadband availability in a state.

To measure the progress of broadband deployment, the FCC requires each Internet Service Provider (ISP) to report if they provide broadband service to a census block. From this data, the FCC is able to identify areas of the county that are still experiencing an infrastructural digital divide, meaning that areas have neither fixed (DSL, cable, or fiber-optic) nor non-fixed (satellite or wireless) internet service. To measure the progress of FCC (2019a) internet deployment policies, the 2019 report shows that the percentage of Americans with fixed broadband access increased from 83.6% in 2013 to 93.5% in 2017. As of 2016, Figure 2 shows how states and counties vary in terms of the percentage of census blocks that have fixed broadband service.

Figure 2: Percentage of States and Counties with Fixed Broadband Access in 2016



Note: Data from Federal Communications Commission. 2019a

Having broadband access is critically important to internet dependent policies such as OVR. Tolbert and McNeal, using National Election Study data from 1996 and 2000 as well as two-stage least squares to control for internet self-selection effects, find that internet access increases the probability of voting by 12%, and the use of online election information increased the probability of voting by 7.5%.

Internet Availability and Digital Divide

Broadly, the digital divide refers to disparities in access to or use of the Internet (Martin 2019; Mossberger, Tolbert, and Stansbury 2003; Norris 2001). According to the Pew Research

Center (2019; see Ropek 2019), more young (nearly 100%) than older people (between 75 to 85%) use the internet. Higher income (98%) and education individuals (98%), compared to individuals lowest on these scales (82% and 71%), are more likely to use the internet. However, there is currently approximately equal use among men and women (both 90%), as well as non-Hispanic whites, African Americans, and Hispanics (each approximately 75%). Tolbert and Mossberger (2018) point out that rural counties tend to lag behind urban and suburban counties in terms of internet and broadband deployment; according to Pew, there is an urban/suburban versus rural divide, with those in the former categories (approximately 90%) more likely than those in the latter (85%) to employ the internet. Mossberger, Tolbert, and Franko (2012) also find that areas of greater poverty are less likely to have access to broadband.

In the event that internet voting became a statewide or nationwide policy, McNeal and Tolbert (2004) argue that the digital divide could lead such a reform to biasedly benefit individuals from demographic groups more likely to register or vote. Regarding OVR, both Alvarez and Hall (2004) as well Mossberger, Tolbert, and Stansbury (2003) point out that a risk of the law is that it will maintain or exacerbate existing inequalities in political participation, biases that are already identified in some research regarding absentee, early, and mail voting (Berkinsky 2005). These biases take the form of home owners, older, higher socio-economic, and non-Hispanic individuals becoming more likely to register and vote because individuals in these groups are not only more likely to possess access the internet, but also to have higher likelihoods of registering and voting compared to their demographic counterparts. To evaluate whether infrastructural access to internet resources the percent of state census blocks is correlated with individual home ownership, age, income, education, and racial classifications in Table 1 If infrastructural access to the internet has the potential to exacerbate biases in participation, a key prerequisite would be for broadband services to be unequally available across these demographic classifications.

Is there an Infrastructural Digital Divide (2014-2016)?

	Percent of State Census Blocks with Fixed Broadband Access	Home Ownership	Age	Income	Education	Non-Hispanic White
Percent of State Census Blocks with Fixed Broadband Access	1.00					
Home Ownership	0.01***	1.00				
Age	-0.01**	0.24***	1.00			
Income	-0.07***	-0.07***	0.35***	1.00		
Education	-0.04***	0.11***	-0.03***	0.37***	1.00	
Non-Hispanic White	0.06***	0.18***	0.14***	0.14***	0.12***	1.00

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Individual-level variables that are positively and significantly correlated to having infrastructural access to broadband include being a home owner and being white. These findings reflect past digital divide research that shows that individuals within these groups are more likely to have internet access (Martin 2019).The variables that are negatively correlated include age, income, and education. These latter findings likely partly reflect the outcome of government policies intended to expand broadband deployment; they likely also partly reflect the demand for wider internet deployment among demographic groups who need access to the internet for various life purposes such as education, health care, and employ opportunities. Overall, these correlational patterns suggest that broadband access is broadly accessible, and is not exclusively available to individuals from historically better situated demographic groups.

Testable Implications of OVR in Relation to Broadband Availability

From this overview of the OVR, election reform, and digital divide literature, several research hypotheses are generated. These include the following: (1) states with OVR will have individuals who are more likely to register online; (2) individuals who register to vote online will be more likely to vote; (3) states with a higher level of broadband deployment will have individuals who are more likely to use OVR; (4) OVR states with higher broadband deployment will have more positive and significant participatory outcomes linked to the internet registration law; and (5) benefits associated with OVR will not be uniquely beneficial to demographic groups that are historically more likely to register and vote, but will help historically underrepresented groups become registered and vote at higher rates.

Voter Registration Models

This study examines the direct impact of OVR on an individual's propensity to register to vote, and any spillover impact of the law on this individual's propensity to vote. This first results section examines the impact of OVR on individual-level registration in every state except North Dakota in 2014 and 2016. Individual-level registration and demographic data comes from the Current Population Survey's (CPS) Voting and Registration Supplement. The total sample includes 161,277 individuals, with 82,393 for the 2014 midterm election, and 78,884 for the 2016 presidential election. Although the Cooperative Congressional Elections Study (CCES) was considered as a data source, and models were robustness checked with this other dataset, the CPS was selected as the preferable dataset because (1) the CPS is not an internet-based survey like the

CCES that may bias model results due to self-selection effects; and (2) the CPS includes registration and voting questions that allows this study to more precisely identify the impacts of OVR on registration and turnout. Specially regarding this second point, the CPS includes a question in 2014 and 2016 asking what method individuals used to register, a question that is not available on the CCES.

For the registration models, multinomial logistic regression models are employed. These models are useful for choice models that have a multiple category dependent variable. In this case, there are five categories to the dependent variable: (1) not registering; (2) registering at a government office or polling place; (3) registering at a satellite location; (4) registering by mail; and (5) registering online. The first category is the baseline category, so all results in these models are interpreted as relative to an individual's likelihood of not registering.

The key independent variables are OVR and State Internet Availability. The former variable is binary, with one indicating a state has the law, zero not; the latter variable is a continuous percentage variable, representing the percentage of state census blocks with fixed broadband service. For both the midterm and presidential elections, three models are executed. The first only include OVR to identify baseline reform law effects; the second includes a State Internet Availability variable to see if this variable has an independent effect on registration; and the third includes an OVR x State Internet Availability variable to see if variation in high-speed internet infrastructure across states unique shapes the impact of OVR.

Several control variables are also included in the models to mitigate the possibility of confounding factors masking the true relationship between these key variables and registration. State election reform laws early voting, absentee or mail voting, and same day registration (SDR) are incorporated because these are convenience voting laws that may also entice individuals to register or vote (National Conference of State Legislatures 2018a; 2018b). Age, education, income, home ownership, gender, and race/ethnicity (white, African American, Hispanic, Asian) are additional covariates in the models. These control variables are conventional in most statistical analyses on voter registration and turnout (Leighley and Nagler 2013; Wolfinger and Rosenstone 1980).

What is the Impact of OVR and State Internet Availability on Voter Registration?

2014 Midterm Election

For midterm elections, residing in a state with OVR results in an individual being significantly more likely to register online, compared to not registering. Converting logistic results to predicted probabilities, an individual in an OVR state is approximately 2% more likely to register. In this midterm election, a state's broadband available has no direct or interactive effect on an individual's likelihood of becoming registered. The control variables indicate that younger, more educated, higher income, and non-Hispanic white (relative to Hispanics and Asians) individuals were more likely to become registered online.

As for the other registration methods, residing in an OVR state makes one less likely to register at a polling place or government office. SDR was significantly related to polling place or government office registration, but negatively related to mail registration. Older, more educated, higher income, and home owning individuals were more likely to register at polling places or government offices, to use satellite registration, or mail registration. Regarding racial or ethnic groups, African Americans were more likely to take advantage of satellite or mail registration. Hispanics, on the other hand, were less likely to use polling place or government office registration; Asians were also significantly less likely to use any of the modes of registration. Females, compared to males, were significantly more likely to use any of these modes of registration.

2016 Presidential Election

What about the impact of OVR and broadband availability in the 2016 presidential election? These multinomial logistic results consistently show that OVR significantly increased one's likelihood of online registration. The percentage of state census blocks covered by fixed broadband service – the State Internet Availability variable – also has a significant and positive impact on online registration. Regarding substantive effects, as displayed in Figure 3**,** OVR increased one's probability of registering by approximately 6%. Ranging the State Internet Availability variable from lowest to highest values indicates that individuals in states with the most extensive broadband deployment have individuals who are approximately 2.5% more likely to register online. The control variables further show that higher incomes and education, as well as being non-Hispanic white and female, are positively and significantly related to internet registration. Conversely, living in an SDR state and being a home owner are significantly and negatively related to this type of registration.

Regarding the other registration options, SDR is positively and significantly related to polling place and government office registration, but negatively and significantly related to mail registration. Older Americans are more likely to use every other type of registration except OVR. More education and higher income are also more likely to engage in every other mode of registration. Being a home owner is also positively and significantly related to polling place and government office as well as satellite registration. Considering racial and ethnic groups, African Americans are more likely to use satellite registration. Hispanics and Asians, on the other hand, are less likely to use polling place/government office, satellite, or mail registration. Females are more likely, across the board, to use every type of registration method.

Voter Turnout Models

To evaluate whether individuals who register to vote via OVR are more likely to vote, the results in this section measure the voter turnout behaviors of the subsamples of individuals who registered online in the 2014 and 2016 elections. In the CPS, there were 1,405 such individuals in the 2014 election, and 3,633 in the 2016 election. These are subsamples of individuals registered via OVR; this allows for more precise estimation of the impact of OVR on voter turnout. Logistic regression models with state-level clustered errors are used to measure this behavior. The dependent variable is a binary voter turnout outcome, with one signifying having voted, and zero not so. The key independent variable is OVR; the same independent variables from the registration models are also employed here. Additionally, to make sure the dataset is reflective of the eligible voting population, all respondents were poststratified using validated voting weights (see Hur and Achen 2013; McDonald 2016).

2014 Midterm Election

Table 2 evaluates the impact of OVR and other covariates on individual-level ballot casting in the 2014 election. State Internet Availability was not included because internet voting does not exist, and internet availability is not theorized to directly facilitate one's likelihood of voting. In the results, OVR has no significant spillover effect on individual-level voting in 2014. The only election reform law that has an effect is no-excuse absentee or mail voting, which have a positive and significant effect. Converting this logistic result to predicted probabilities, with all other variables held at mean values, residing in an absentee/mail voting state makes OVR registrants approximately 11% more likely to cast a ballot.

Voter Turnout Models

Table 2: Likelihood of Voting among Individuals Registered with OVR in 2014 in American States

OVR	0.10
	(0.145)
Early Voting	-0.13
	(0.235)
Absentee/Mail Voting	0.45**
	(0.184)
SDR	0.24
	(0.196)
Age	0.04***
	(0.006)
Education	0.23***
	(0.047)
Income	0.06***
	(0.015)
Own Home	0.06
	(0.140)
African American	0.43
	(0.273)
Hispanic	-0.37**
	(0.156)
Asian	0.18
	(0.304)
Female	0.21*
	(0.125)
Constant	-3.46***
	(0.401)
N	1,405
Pseudo R^2	0.095

The estimates are logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As for the other covariates, older, more educated, higher income, non-Hispanic white (relative to Hispanics), and female OVR registrants are more likely than their counterparts to cast ballots.

2016 Presidential Election

Table 3 evaluates the impact of OVR and other covariates on individual-level ballot casting in the 2016 election. OVR also has no direct spillover effect on turnout among OVR registrants in the 2016 election. Again, only absentee/mail voting has a positive and significant impact on turnout among the other election reform law covariates. Converting this logistic result to a predicted probability, residing in an absentee/mail voting state makes OVR registrants approximately 3% more likely to vote.

Table 3: Likelihood of Voting among Individuals Registered with OVR in 2016 in American States

OVR	0.19
	(0.121)
Early Voting	-0.23
	(0.165)
Absentee/Mail Voting	0.24**
	(0.111)
SDR	-0.10
	(0.130)
Age	0.01**
	(0.006)
Education	0.25***
	(0.048)
Income	0.07***
	(0.017)
Own Home	0.12
	(0.128)
African American	0.41
	(0.272)
Hispanic	-0.14
	(0.153)
Asian	0.15
	(0.282)
Female	0.34**
	(0.145)
Constant	-0.56
	(0.378)
N	3633
Pseudo R^2	0.054

The estimates are logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As for the other covariates, older, more educated, higher income, and female OVR registrants are significantly more likely to cast ballots in the 2016 election.

Conclusion

In conclusion, this study has shown that OVR can boost registration and voter turnout in both midterm and presidential elections. The extent of state's deployment of broadband also has a direct, if not interactive, impact in incentivizing individuals to take advantage of online registration. However, while OVR increases voter registration among the young, individuals who are higher income, more educated, and non-Hispanic white are more likely to become registrants due to the law. Furthermore, older, higher income, and more educated, and non-Hispanic white online registrants are more likely to vote. While OVR may boost registration and turnout probabilities at the individual-level, this latter evidence suggests that individuals among demographic groups historically more likely to register and vote are also more likely to benefit from OVR.

There are limitations to this study. First, the FCC data only notes whether broadband is available in a county tract, not the type, number, or percentage of individuals in these areas that have access to such services. Pairing the FCC data with detailed and comprehensive county or lower level data on who has access would lead to a more fine-grained assessment of the impact of the infrastructural availability of broadband on various digital policy outcomes, such as OVR. A return of the CPS question asking which respondents have home internet access would also enable future studies to more precisely estimate how this infrastructural availability shapes individual-level outcomes with less concern regarding the ecological fallacy.

Also left unanswered in this study is whether closing other digital divides – such as the skills gap, or the relevance gap – also structure the impact of OVR on political participation (Mossberger, Tolbert, and Franko 2012). According to Horrigan (2010), 22% of individuals on an FCC survey did not use broadband because of their lack of familiarity with the technology or privacy concerns. On the same FCC survey, nearly 20% of respondents said that broadband wasn't relevant to their daily lives. Hypothetically, federal and state policies that enhance digital literacy could close these divides, potentially enhancing the impact of OVR on voter registration and – by reducing the costs of this first act – ballot casting.

Future research could also look at the impact of non-fixed internet infrastructure, such as satellite or mobile phone internet, on structuring the impact of OVR. When including satellite infrastructural connections to measure broadband deployment, FCC (2019a) data shows that nearly every U.S. Census block has broadband access (Martin 2019). Additionally, according to Anderson (2019), as of 2019 81% of American adults own a smartphone, and 37% of Americans now go online almost exclusively via a smartphone. Given these recent developments, evaluating the impact of mobile internet connections on OVR is a timely endeavor.

Overall, there are several main takeaways from this study. First, OVR can improve voter registration and turnout. Second, a state's broadband infrastructure is integral to this process. Finally, local, state, and federal governments need to continue advancing in terms of broadband deployment and OVR adoption to greater political participation – a central utility, not luxury, in the daily lives of every citizen – in the American states.

Appendix

Appendix Table A1: Likelihood of Registering by Various Means relative to Not Registering in 2014

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-0.50**	0.07	0.12	0.35**
	(0.234)	(0.133)	(0.153)	(0.158)
Early Voting	-0.41	0.10	0.13	-0.33
	(0.318)	(0.127)	(0.235)	(0.382)
Absentee/Mail Voting	-0.07	-0.07	0.02	0.47
	(0.286)	(0.136)	(0.232)	(0.366)
SDR	1.03***	-0.11	-0.35*	-0.41
	(0.259)	(0.230)	(0.180)	(0.295)
Age	0.04***	0.01***	0.03***	-0.01***
	(0.001)	(0.001)	(0.002)	(0.003)
Education	0.25***	0.29***	0.35***	0.54***
	(0.015)	(0.012)	(0.020)	(0.025)
Income	0.02**	0.03***	0.05***	0.08***
	(0.007)	(0.007)	(0.008)	(0.014)
Own Home	0.78***	0.33***	0.30***	-0.01
	(0.048)	(0.035)	(0.055)	(0.085)
African American	0.10	0.33***	0.22***	-0.22
	(0.125)	(0.048)	(0.072)	(0.154)
Hispanic	-0.73***	-0.15	0.11	-0.31***
	(0.121)	(0.092)	(0.105)	(0.100)
Asian	-1.72***	-0.99***	-0.32***	-1.02***
	(0.125)	(0.082)	(0.088)	(0.292)
Female	0.14***	0.15***	0.12***	0.05
	(0.012)	(0.013)	(0.022)	(0.049)
Constant	-3.48***	-2.17***	-4.32***	-4.67***
	(0.267)	(0.169)	(0.204)	(0.223)
N	82393	82393	82393	82393
pseudo R^2	0.077	0.077	0.077	0.077

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table A2: Likelihood of Registering by Various Means relative to Not Registering in 2014, varying State Internet Infrastructure Availability

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-0.50^{**}	0.09	0.11	0.38^{**}
	(0.232)	(0.129)	(0.148)	(0.156)
State Internet	-0.24	0.75	-0.52	1.73
Availability	(0.630)	(0.469)	(0.464)	(1.134)
Early Voting	-0.41	0.11	0.13	-0.27
	(0.320)	(0.123)	(0.247)	(0.323)
Absentee/Mail	-0.07	-0.05	0.00	0.48
Voting	(0.286)	(0.139)	(0.240)	(0.315)
SDR	1.03^{***}	-0.12	-0.34^{*}	-0.43
	(0.259)	(0.227)	(0.180)	(0.292)
Age	0.04^{***}	0.01^{***}	0.03^{***}	-0.01^{***}
	(0.001)	(0.001)	(0.002)	(0.003)
Education	0.25^{***}	0.29^{***}	0.35^{***}	0.54^{***}
	(0.015)	(0.012)	(0.020)	(0.025)
Income	0.02^{**}	0.03^{***}	0.05^{***}	0.08^{***}
	(0.007)	(0.006)	(0.008)	(0.015)
Own Home	0.78^{***}	0.32^{***}	0.31^{***}	-0.02
	(0.046)	(0.033)	(0.056)	(0.086)
African	0.09	0.34^{***}	0.21^{***}	-0.20
American	(0.124)	(0.048)	(0.072)	(0.156)
Hispanic	-0.73^{***}	-0.14	0.11	-0.29^{***}
	(0.120)	(0.093)	(0.105)	(0.093)
Asian	-1.73^{***}	-0.97^{***}	-0.34^{***}	-0.98^{***}
	(0.126)	(0.080)	(0.087)	(0.296)
Female	0.14^{***}	0.15^{***}	0.12^{***}	0.05
	(0.012)	(0.013)	(0.022)	(0.049)
Constant	-3.26^{***}	-2.89^{***}	-3.83^{***}	-6.31^{***}
	(0.625)	(0.457)	(0.409)	(1.068)
N	82393	82393	82393	82393
Pseudo R^2	0.077	0.077	0.077	0.077

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table A3: Likelihood of Registering by Various Means relative to Not Registering in 2014, varying State Internet Infrastructure Availability x Online Voter Registration

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-2.66	-1.91	1.44	-1.71
	(2.407)	(1.178)	(1.524)	(1.826)
State Internet	-0.79	0.14	-0.22	0.94
Availability	(0.568)	(0.310)	(0.384)	(0.588)
	(0.568)	(0.310)	(0.384)	(0.588)
OVR x	2.43	2.25*	-1.52	2.35
Internet Availability	(2.708)	(1.302)	(1.704)	(2.094)
Early Voting	-0.36	0.16	0.08	-0.20
	(0.327)	(0.118)	(0.251)	(0.312)
Absentee/Mail	-0.11	-0.08	0.02	0.44
Voting	(0.297)	(0.135)	(0.252)	(0.291)
SDR	1.07***	-0.09	-0.36*	-0.40
	(0.268)	(0.221)	(0.186)	(0.284)
Age	0.04***	0.01***	0.03***	-0.01***
	(0.001)	(0.001)	(0.002)	(0.003)
Education	0.25***	0.29***	0.35***	0.54***
	(0.015)	(0.012)	(0.020)	(0.025)
Income	0.02**	0.03***	0.05***	0.08***
	(0.007)	(0.006)	(0.008)	(0.014)
Own Home	0.77***	0.32***	0.31***	-0.03
	(0.042)	(0.030)	(0.061)	(0.086)
African	0.10	0.35***	0.21***	-0.20
American	(0.125)	(0.049)	(0.073)	(0.160)
Hispanic	-0.72***	-0.13	0.10	-0.28***
	(0.125)	(0.094)	(0.110)	(0.089)
Asian	-1.71***	-0.95***	-0.35***	-0.96***
	(0.128)	(0.073)	(0.097)	(0.295)
Female	0.14***	0.15***	0.12***	0.05
	(0.012)	(0.013)	(0.022)	(0.049)
Constant	-2.78***	-2.36***	-4.06***	-5.64***
	(0.550)	(0.291)	(0.377)	(0.567)
N	82393	82393	82393	82393
pseudo R^2	0.078	0.078	0.078	0.078

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table A4: Likelihood of Registering by Various Means relative to Not Registering in 2016

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-0.46*	-0.00	-0.01	0.84***
	(0.259)	(0.133)	(0.219)	(0.172)
Early Voting	-0.45	0.02	0.23	0.03
	(0.363)	(0.129)	(0.265)	(0.227)
Absentee/Mail Voting	-0.10	-0.03	-0.01	0.20
	(0.288)	(0.122)	(0.274)	(0.209)
SDR	0.87***	0.01	-0.54***	-0.18
	(0.247)	(0.149)	(0.163)	(0.143)
Age	0.03***	0.01***	0.02***	-0.02***
	(0.002)	(0.001)	(0.002)	(0.002)
Education	0.29***	0.34***	0.36***	0.47***
	(0.013)	(0.013)	(0.020)	(0.017)
Income	0.02**	0.04***	0.07***	0.09***
	(0.007)	(0.003)	(0.007)	(0.010)
Own Home	0.62***	0.18***	0.09	-0.18**
	(0.050)	(0.028)	(0.062)	(0.088)
African American	-0.02	0.30***	0.15	-0.37***
	(0.141)	(0.077)	(0.122)	(0.125)
Hispanic	-0.74***	-0.26***	-0.06	-0.28**
	(0.110)	(0.062)	(0.080)	(0.131)
Asian	-1.58***	-0.83***	-0.53***	-0.74***
	(0.137)	(0.091)	(0.141)	(0.124)
Female	0.11***	0.15***	0.15***	0.10***
	(0.021)	(0.020)	(0.026)	(0.032)
Constant	-2.97***	-1.79***	-3.86***	-3.58***
	(0.341)	(0.165)	(0.236)	(0.223)
N	78884	78884	78884	78884
Pseudo R^2	0.073	0.073	0.073	0.073

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table A5: Likelihood of Registering by Various Means relative to Not Registering in 2016, varying State Internet Infrastructure Availability

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-0.45*	0.00	-0.01	0.84***
	(0.258)	(0.132)	(0.214)	(0.162)
State Internet	-0.02	0.73*	-0.89**	1.32*
Availability	(0.967)	(0.379)	(0.452)	(0.761)
Early Voting	-0.45	0.01	0.25	0.04
	(0.364)	(0.127)	(0.276)	(0.211)
Absentee/Mail	-0.09	0.01	-0.07	0.25
Voting	(0.293)	(0.127)	(0.278)	(0.188)
SDR	0.87***	-0.02	-0.49***	-0.24*
	(0.243)	(0.150)	(0.163)	(0.142)
Age	0.03***	0.01***	0.02***	-0.02***
	(0.002)	(0.001)	(0.002)	(0.002)
Education	0.29***	0.34***	0.36***	0.47***
	(0.013)	(0.013)	(0.020)	(0.017)
Income	0.02**	0.05***	0.07***	0.09***
	(0.007)	(0.003)	(0.007)	(0.010)
Own Home	0.62***	0.17***	0.09	-0.18**
	(0.049)	(0.028)	(0.062)	(0.086)
African	-0.02	0.31***	0.14	-0.35***
American	(0.138)	(0.079)	(0.123)	(0.128)
	(0.138)	(0.079)	(0.123)	(0.128)
Hispanic	-0.74***	-0.26***	-0.06	-0.27**
	(0.110)	(0.062)	(0.081)	(0.126)
Asian	-1.58***	-0.82***	-0.54***	-0.72***
	(0.134)	(0.090)	(0.144)	(0.122)
Female	0.11***	0.15***	0.15***	0.10***
	(0.021)	(0.020)	(0.026)	(0.032)
Constant	-2.95***	-2.47***	-3.03***	-4.83***
	(0.966)	(0.343)	(0.393)	(0.772)
N	78884	78884	78884	78884
Pseudo R^2	0.074	0.074	0.074	0.074

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table A6: Likelihood of Registering by Various Means relative to Not Registering in 2016, varying State Internet Infrastructure Availability x Online Voter Registration

	Polling Place/Govt. Office Registration	Satellite Registration	Mail Registration	Online Voter Registration
OVR	-3.99	-1.30	1.44	1.12
	(3.143)	(1.388)	(1.981)	(1.513)
State Internet	-0.69	0.43	-0.76	1.60*
Availability	(1.156)	(0.440)	(0.511)	(0.834)
OVR x	3.90	1.45	-1.64	-0.31
Internet Availability	(3.435)	(1.488)	(2.176)	(1.683)
Early Voting	-0.37	0.04	0.21	0.03
	(0.348)	(0.115)	(0.264)	(0.215)
Absentee/Mail	-0.12	0.01	-0.08	0.25
Voting	(0.280)	(0.124)	(0.277)	(0.186)
SDR	0.82***	-0.05	-0.45***	-0.23*
	(0.232)	(0.153)	(0.152)	(0.140)
Age	0.03***	0.01***	0.02***	-0.02***
	(0.002)	(0.001)	(0.002)	(0.002)
Education	0.29***	0.34***	0.36***	0.47***
	(0.013)	(0.013)	(0.020)	(0.017)
Income	0.02**	0.05***	0.07***	0.09***
	(0.007)	(0.003)	(0.007)	(0.010)
Own Home	0.61***	0.17***	0.10	-0.18**
	(0.044)	(0.026)	(0.066)	(0.085)
African	-0.01	0.32***	0.13	-0.36***
American	(0.136)	(0.078)	(0.125)	(0.129)
Hispanic	-0.72***	-0.25***	-0.07	-0.27**
	(0.119)	(0.063)	(0.088)	(0.128)
Asian	-1.54***	-0.80***	-0.56***	-0.72***
	(0.128)	(0.094)	(0.141)	(0.117)
Female	0.11***	0.15***	0.15***	0.10***
	(0.021)	(0.020)	(0.026)	(0.032)
Constant	-2.41**	-2.24***	-3.08***	-5.08***
	(1.109)	(0.425)	(0.457)	(0.818)
N	78884	78884	78884	78884
Pseudo R^2	0.075	0.075	0.075	0.075

The estimates are multinomial logistic regression coefficients. Standard errors are clustered by state in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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