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When Women Run, Voters Will Follow (Sometimes): Examining the Mobilizing Effect of Female Candidates in the 2014 and 2018 Midterm Elections

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Abstract
In this paper, we examine whether women candidates are more likely to spur turnout in election years when gender-related issues are central to the national debate. We argue that having women on the ballot in a gendered electoral environment mobilizes specific groups of voters. Utilizing voter files in Pennsylvania and Washington for 2014 and the more gender focused 2018 election, we evaluate this potential mobilizing effect in both primary and general midterm elections. Our results show that both female and male voters were more likely to turn out in the 2018 midterm elections when a woman was on the ballot for the U.S. House of Representatives. In Pennsylvania, which tracks registrants' party affiliation, Democrats, members of third parties, and independents were particularly impacted by the presence of a female candidate. Moreover, in both states, a woman on the ballot was especially important for young people, a group that is traditionally less engaged. Utilizing a difference-in-difference approach, we confirm these results are not due to the endogenous selection of where women choose to run. These findings demonstrate that the mobilizing effect of women candidates is dependent on political context.

Keywords Female candidates · Gendered electoral context · Midterm elections · Mobilization · Voter turnout · Young voters · Voter files

Introduction

The 2018 midterm elections saw a record number of women candidates throw their hat into the electoral ring. The unusual size of the candidate pool (225 women running as candidates of a major party), the diversity of the field on the dimensions of

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race, age, and occupation, and their distinctive Democratic lean is well documented (CAWP, 2018a) and has been the topic of much political discussion.[1] Equally newsworthy was that the 2018 election motivated voters to turn out in unusually high numbers. In 2018, 53.4% of the voting-eligible population cast a ballot (Misra, 2019)—the highest midterm turnout since 1914 (United States Election Project). While the wave of female candidates and record-breaking voter turnout made headlines independent of one another, there is reason to believe the two are connected.

In this paper, we examine the relationship between female candidates, electoral environment, and voter turnout. We evaluate whether the presence of a female candidate on the ballot in a gendered political environment increases turnout among particular groups in the electorate. We examine this mobilizing effect in two different political contexts—2014, an election when gender issues were not central, and 2018, an election when gender-related issues were a prominent focus of the national debate. We find that both male and female voters were more likely to turn out in 2018 when a woman was on the ballot. By contrast, in 2014, the presence of a female candidate had no consistent impact—indicating candidate gender only mobilized voters in an electoral context focused on gender-related issues. Additionally, the effect of female candidates was particularly important for young people, an oft-unengaged population.

Our approach to examining the effect of gender on turnout is novel in several ways. First, unlike most previous studies, we look at turnout in both primary and general races—those with female candidates and those with only men on the ballot. Second, our case selection of Pennsylvania and Washington allows us to evaluate the impact of female candidacy across a variety of salient electoral contexts including open (Washington) vs. closed (Pennsylvania) primaries, a state with a history of high female representation (Washington) and one without (Pennsylvania), as well as a broad spectrum of district demographics and ideological leanings within a state. Furthermore, the focus on the same two states in 2014 and 2018 allows us to contrast a political context in which gender was highly salient (2018) to one in which gender was less salient (2014). Finally, we utilize verified voter files rather than relying on survey data. This data choice ensures that our findings reflect the actual voting behavior of those registered, rather than a small subset of the population who respond to surveys.

Voter files are official, administrative records. This makes them invaluable for assessing voter turnout, a phenomenon in which small changes are substantively consequential in determining who is elected to positions of authority in our government. In the expansive get-out-the-vote (GOTV) literature, nearly all empirical studies utilize voter files over survey data to study the effects of policy reforms or experimental interventions to encourage turnout (e.g. Bryant et al., 2020). The typical error in surveys is often too large to detect small changes in turnout, particularly at state and local levels, and survey biases from non-response and sampling can result in inaccurate estimates of the behavior of the population under study. Similarly, sources such as the CCES, which include validated vote, often have high levels

[1] For example, see FiveThirtyEight special on "When Women Run" (January 2020).

of missing data. These biases can mask the true relationship of candidate gender and participation.[2]

While we are unable to definitively isolate candidate gender as a primary motivation to vote, we conduct additional analyses to examine alternative explanations of increased voter turnout that further strengthen the validity of our results. First, descriptive statistics show that districts where women ran (and won) vary across demographic and electoral characteristics. This suggests that the candidacy and election of women was not driven by similar district-specific factors. Second, to further demonstrate that the observed turnout effect is due to candidate gender in 2018, and not unobserved differences in the districts where women opted to run, we conduct a difference-in-difference analysis on turnout in Washington.[3] This analysis provides additional evidence that in 2018, voters were mobilized by female candidates, and not by factors endogenous to the districts themselves, nor the overall boost in turnout from 2014 to 2018. This paper contributes to research on voter participation by adding to work that posits the importance of context and system cues as mobilizing factors. Furthermore, it leverages the use of voter files to capture small, but substantively consequential, changes in voter turnout that are missed by relying on survey data.

2014 and 2018: A Contrast of Electoral Contexts

Midterm elections are a referendum on the president in which voters express frustrations by punishing the president's party. In the post-World War II period, the president's party has lost an average of 25 House seats in midterm elections. In 2014, Democrats lost 21 seats. In 2018, Republicans lost 40 seats. However, the president's party's loss of seats is where similarities between these elections end. The 2018 election was distinctive from 2014 in two major ways: the significant increase in voter turnout and the extent to which gender and gender-related issues fueled opposition to the president.

In 2018, there was a surge in women running for office. That year, a record 529 women filed to run for a congressional seat, and 255 women won their party's nomination (CAWP, 2018b).[4] The majority of women running and winning were Democrats. Nationwide, 44% of the non-incumbent Democratic women won their primaries, compared to 21% of Democratic men (Zhou, 2018). All but one of the thirty-five new women elected to the House were Democrats (CAWP, 2019).

Women who ran in 2018 did not shy away from their gender as a selling point, often emphasizing the need for more women in Congress. In campaigns and

[2] Additional details are available in Supplementary Appendix E.

[3] Difference-in-difference was not performed for Pennsylvania because court ordered redistricting changed the district lines between 2014 and 2018.

[4] A total of 176 women were candidates for Congress in 2014, compared to 257 women in 2018 (CAWP, 2018c). The 2018 election resembles the 1992 election, dubbed the "Year of the Woman" for the surge in women candidates, particularly Democratic women, and focus on gender-related issues.

advertisements, they spoke about their concerns as women, mothers, and daughters; they highlighted their experience with sexual harassment and gender discrimination. They emphasized the importance of health care and preserving the protections of Obamacare (Cramer, 2018). Thus, voters in 2018 were presented with a record number of primarily Democratic women candidates who made gender-related issues a focus of their campaigns. Perhaps most importantly, beyond the candidates and their policies, issues related to gender permeated the political landscape. Voters were primed to think about gender by the Women's Marches that formed after President Trump's inauguration, by the #MeToo movement that highlighted issues of sexual assault and harassment, and by Dr. Christine Blasey Ford's accusations of sexual assault at the confirmation hearings of Supreme Court nominee Brett Kavanaugh (Hemmer, 2017; Klein, 2018). Furthermore, registered voters in 2018 ranked gender as a top issue, with 74% citing "the way women are treated in U.S. society" as extremely or very important in their vote for Congress that year (Newport, 2018).

Theory and Hypotheses

Given the strongly gendered political context of 2018, should we expect the increased presence of female candidates to affect voter turnout? If so, will the impact on turnout vary across groups of voters? While analyses of the previously most gendered U.S. election, 1992, found that the presence of women candidates did impact vote choice (particularly among women voters) (Dolan, 1998; Paolino, 1995), research on subsequent elections have found mixed results for the mobilizing effect of female candidates on voter turnout. Using survey data, Dolan (2006) finds that from 1990 to 2004, the presence of women candidates in competitive Senate races increased turnout among women but not men. Yet Broockman (2014) reports that neither the presence of a woman in a competitive race, nor being represented by a female state legislator affects voter turnout among women in state legislative elections. Lawless (2004) similarly finds no impact on turnout among women voters who are represented by a woman in Congress. However, more recently, using validated voter data from CCES for the 2006–2014 elections, Wolak (2019) shows that both men and women exhibit higher turnout rates when there are more women on the ballot (p.17–8) and that female representation increases political knowledge among both men and women. She suggests that female candidates may provide information cues or offer cross-cutting appeal to all voters.

There is reason to believe that women candidates can have a mobilizing effect on various groups of voters, under certain circumstances: a gendered electoral context. Traditionally, theories of political participation have focused largely on individual factors to help explain varying levels of voting (and broader civic engagement) among different groups. However, research has also shown that beyond dispositional determinants, the environment in which elections take place also matters for political engagement. As Rosenstone and Hansen (1993) note, individuals are moved to political action by changing political circumstances. The circumstances or context of an election may be especially important to voters who traditionally face other barriers to participation (Atkeson, 2003; Bobo & Gilliam, 1990). The value of electoral

context can be understood by contextual cue theory (Bobo & Gilliam, 1990; Hansen, 1997; Rosenstone & Hansen, 1993). This theory emphasizes the importance of environment or context in shaping political attitudes and behaviors. Atkeson (2003) expands on contextual cue theory by positing that it is both the quality of candidates (i.e., having a reasonable chance of being elected) and contextual factors that likely influence the level of citizen mobilization. Akenson states that, overall, it is likely a combination of factors such as information about candidates, the competitiveness of a contest, and a focus on specific issues that are catalysts for greater turnout in elections. While Atkeson (2003) focuses specifically on how contextual factors mobilize women citizens to vote, we build upon contextual cue theory and posit that a gendered electoral environment, in combination with the presence of competitive female candidates will increase voter turnout across various groups of voters.

As previously noted, the literature is mixed on whether women candidates increase voter turnout at all, and if so, whether it is simply among women citizens or for both men and women. We argue that women candidates running in a gendered electoral context will mobilize both men and women voters. Some previous research has suggested the possibility of this effect. First, it is well established that politics is defined by conflict and that battles over varying topics and agendas determine political outcomes (Mansbridge, 1980). However, men and women do not react to conflict equally; men are more likely to embrace political conflict, while women tend to find political conflict distasteful (Atkeson & Rapoport, 2003). Leveraging this gendered political conflict gap, Wolak (2020) shows that men are more likely to participate in politics when the political environment is conflictual. As Wolak (2020: 14) notes, "… men's greater enthusiasm for conflict increases their participation, relative to women." The increase in women candidates in a gendered electoral environment provides such a context.

Furthermore, research on political ambition and the electoral experience of female candidates suggests that women candidates need to be more qualified and work harder to achieve the same electoral results as men (Bauer, 2020; Fulton, 2012). Moreover, political psychology research demonstrates that voters prefer candidates with masculine traits and policy expertise (Bauer, 2020; Holman et al., 2016; Schneider & Bos, 2014). As a result, women must spend more time establishing their competence. The increased efforts that female candidates must engage in and the additional electoral hurdles they must overcome likely draw greater attention to their candidacy. In an electoral environment where gender issues are more salient and there are more female candidates, this increased attention and effort may encourage turnout among both male and female voters.

It is important to note, though that the increased saliency of gendered issues and mobilization due to women's candidacies does not necessarily mean this universally leads to support for those candidates. Voters rarely agree about the importance of gender issues or inequality, and in a heightened context, this could produce a backlash, as some voters are motivated to vote against female candidates in response to a conflictual and conspicuous gendered political environment.

We further expect that women candidates in a gendered environment will also mobilize young voters, a group that is traditionally less engaged than other groups in the electorate. Compared to research on the general electorate, and on evaluations of

differences between male and female voters, less work has examined whether young people are mobilized by the candidacy of women. There is reason to expect that this is the case, particularly in a gendered electoral environment. Young people consistently vote at lower rates than older adults (File, 2014; Fry, 2018). In midterm elections, where overall turnout is lower than in presidential years, young people have been even less likely to show up at the polls (Wattenberg, 2015). However, 2018 saw a dramatic increase in youth turnout—an estimated 31% of those ages 18–29 voted (compared to just 20% in the 2014 midterms)—the largest percentage point increase for any age group and the highest level of voter participation among young adults in the past quarter century (CIRCLE, 2018). We argue that this is due, at least in part, to the unique characteristics of current young generations.

The current cohort of young adults, largely consisting of the Millennial Generation,[5] differs from older generations in several ways. As Rouse and Ross (2018, p. 201) explain, the Millennial Generation persona points to several "unique experiences shared by this age cohort." First, Millennials are the most educated adult cohort in American history—an important component of high socioeconomic status and liberal policy inclinations (Hainmeuller & Hiscos, 2010). Second, not only are Millennials more liberal than previous generations, they are staying consistently liberal as they age (Pew Research Center, 2018). Third, Millennials are the most diverse generation in American history. Highly educated, liberal, and diverse cohorts mean that young adults prioritize policies related to gender equity, social justice, and tolerance (Rouse & Ross, 2018).[6] These issues comprised a large part of the electoral context in 2018 and provided a catalyst for young people to become more politically active when presented with candidates who embody such priorities.

Furthermore, a candidate's personal characteristics and narrative may be more impactful for young voters who have not yet developed the habit of party loyalty. In 2018, female candidates' emphasis on personal experiences as a catalyst for tackling sexism and misogyny (Newburger, 2018) may have spurred youth participation. Supporting this idea of the importance of a candidate's background to young voters, Wolbrecht and Campbell (2017) find that a role model effect is strongest for young women (age 18–29) who are exposed to female, non-incumbent women in competitive races. In fact, Medenica and Fowler (2020) find that young people were more likely to vote for diverse female candidates in the 2018 midterm elections, noting that it was the first year many young voters were able to cast a ballot for women, and in particular, women of color.

In addition to mobilizing young people, the presence of female candidates may increase turnout among Democrats more than Republicans. Partisanship is the most important determinant of vote choice and the vast majority of women in Congress are Democrats. This was particularly true in 2018 when the majority of

[5] Millennials are those born between 1980 and 1996. Generation Z encompasses those born between 1997 and 2012. Only a small portion of Generation Z (those born 1997–2000) were eligible to vote in 2018.

[6] A perspective also seen in the smaller group of adults that are part of Generation Z (Parker et al., 2019).

women running and winning competitive seats—the type of races most likely to mobilize voters—were Democrats. Women's groups and activists are key components of the Democratic Party coalition and Democrats value electing women candidates (Crowder-Meyer & Cooperman, 2018; Grossman & Hopkins, 2016; Thomsen & Swers, 2017). Indeed, in contemporary politics, the type of districts most likely to elect female candidates, districts with more educated and racially and ethnically diverse voters, are also the districts that favor Democrats (Palmer & Simon, 2008). Moreover, some research suggests that the impact of female candidates on voter turnout only applies to Democrats. Because women are presumed to be more liberal than their male counterparts and more committed to gender-related issues, the presence of Democratic women on the ballot imparts a more liberal cue that lowers the cost of voting for Democratic partisans (Fulton & Dhima, 2020; Ondercin & Fulton, 2019). Reingold and Harrell (2010) find this effect particularly strong for Democratic women. However, as we discuss later in the paper, female candidacy prompted greater turnout in 2018 beyond the impact of district competitiveness, suggesting that female candidacy alone can be a driver of participation.

In sum, prior research presents mixed findings on whether female candidates increase political engagement among particular groups of voters. Building upon the contextual cue theory and expectations about the mobilizing effect of female candidates, we expect the impact of candidate gender is conditional on the extent to which gender related issues are emphasized in the political context. We argue that when gender-related concerns are prominent electoral issues, as they were in the 2018 elections, voters will be primed to think about these issues and the importance of electing women candidates as change agents, resulting in increased turnout in races with women on the ballot. This may be particularly important for young voters who may require a combination of factors to be mobilized and for Democrats who are more likely to value candidate diversity and to prioritize gender-related issues. In less gender-salient elections, as was the case in 2014, the effect of women candidates on turnout will be less potent, because citizens will not be primed to think about gender-related issues as important considerations or to identify women candidates with political change. We present the following hypotheses:

The effect of female candidates should be more impactful in contexts where gender and issues that disproportionately affect women and their place in society are a focus of electoral debate.

H_1 The effect of female candidates on voter turnout will vary by year. Citizens will be more likely to vote when women are on the ballot and the electoral context is focused on gender-related concerns.

As previously noted, the literature on whether female candidates increase voter turnout is mixed. Some work finds no mobilizing effect at all, while other research shows a mobilizing effect only among women, or among both women and men. However, we argue that in a gendered environment, men and women alike will

respond to female candidates. Voters will turn out to vote for (or against) a female candidate as a response to the attention given to gender issues in the political environment at large.

H_2 Female candidates in a gendered electoral context will boost turnout among both men and women.

We also expect female candidates will impact partisans differently with Democrats most likely to be mobilized by female candidates. More women run for office as Democrats than Republicans, and Democratic voters and activists are more likely than Republicans to prioritize gendered issues. In 2018 for instance, 87% of Democratic voters prioritized the treatment of women in U.S. society relative to just 57% of Republican voters (Newport, 2018).

H_3 Democrats are more likely than non-Democrats to vote when women are on the ballot in gendered electoral contexts.

Finally, a gendered electoral context likely emphasizes issues important to young people and provides meaningful cues for mobilizing this group to vote. Since women candidates are more likely to support such policies and are perceived as more liberal, they are likely to mobilize young people (Pew Research Center, 2018; Rouse & Ross, 2018).

H_4 Young people are more likely to vote when women are on the ballot in gendered electoral contexts relative to when only men appear on the ballot.

Data and Methods

To better understand how voters respond to candidate gender in particular electoral contexts, we turn to an analysis of state voter files. Much of the existing research on the mobilizing effect of female candidates relies on survey data. Sometimes this data is verified using voter files, but this validation is only done on the subset of the eligible population that responds to surveys and may not accurately reflect the actual turnout or outcome of elections due to response bias and inefficiencies. The widely publicized inaccuracies of state-level polling in the past two presidential elections demonstrate the value of utilizing official administrative records over survey data when possible.[7] In this paper, we utilize actual voter file (VF) data from Pennsylvania and Washington,[8] combined with county-level partisanship and congressional

[7] For an assessment of state polling accuracy see Guskin and Santamariña (2020). For additional details on differences between survey and voter file data as well as an analysis showing how survey data yields inaccurate estimates in this context, see online Appendix E.

[8] The voter files contain key attributes of individual registrants including vote history, gender, age, and (for Pennsylvania) party registration.

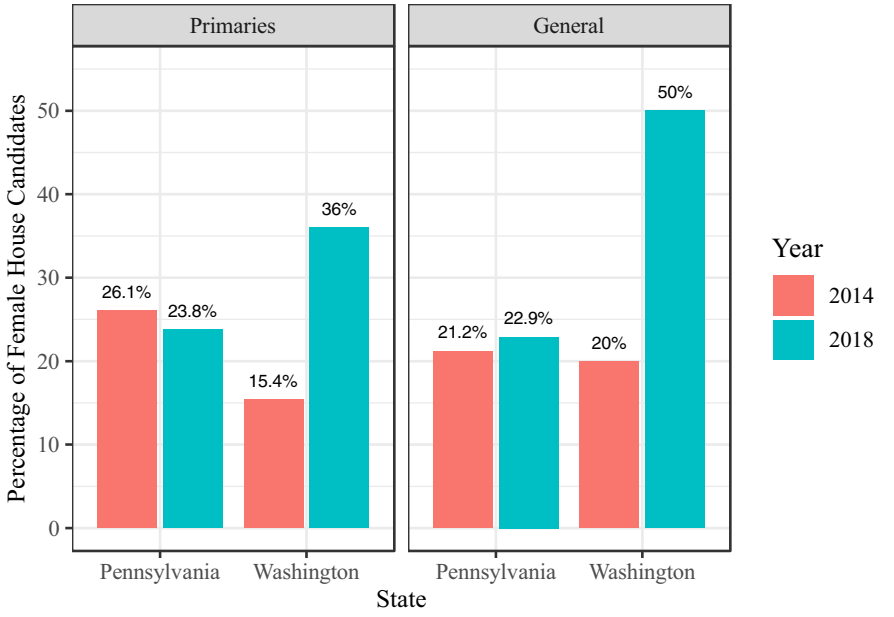

Fig. 1 Percentage of female candidates, 2014 and 2018

district candidate information, to determine if female candidates influenced turnout across electoral contexts.[9] Contrasting 2014 and 2018 in the same states allows us to test the effect of female candidates in different political contexts across general and primary elections.

Four female candidates ran for the U.S. House in the 2014 Washington general election, three of whom were elected. In Pennsylvania, seven women ran in the 2014 general, but none were successful. However, in both states in 2018, 50% of women running won—five out of ten female candidates in the Washington general; four of Pennsylvania's eight female candidates were successful. Figure 1 breaks down the percentage of female primary and general election candidates in both years. Figure 2 compares the number of winning candidates who ran for office, as a percentage of their gender. In Pennsylvania, the percentage of female candidates is similar in both years. However, in 2014, not a single woman who won in the Pennsylvania primaries prevailed in the general. In contrast, 2018 female candidate success in the

[9] Due to the maintenance of VFs as snapshots in time, we use separate VFs for the 2018 and 2014 models. 2018 models use a January 31, 2019 version of the Washington VF and a February 18, 2019 Pennsylvania VF. 2014 models use a December 2014 Washington VF and a February 6, 2017 export of the Pennsylvania VF. Ideally, we would have preferred a 2014 version of the Pennsylvania VF, unfortunately the state does not maintain old versions and the 2017 version was the oldest the authors had in their possession. Luckily, the 2017 version had voter history for the past 40 elections and district designations prior to the 2018 court ordered redistricting that altered district lines.

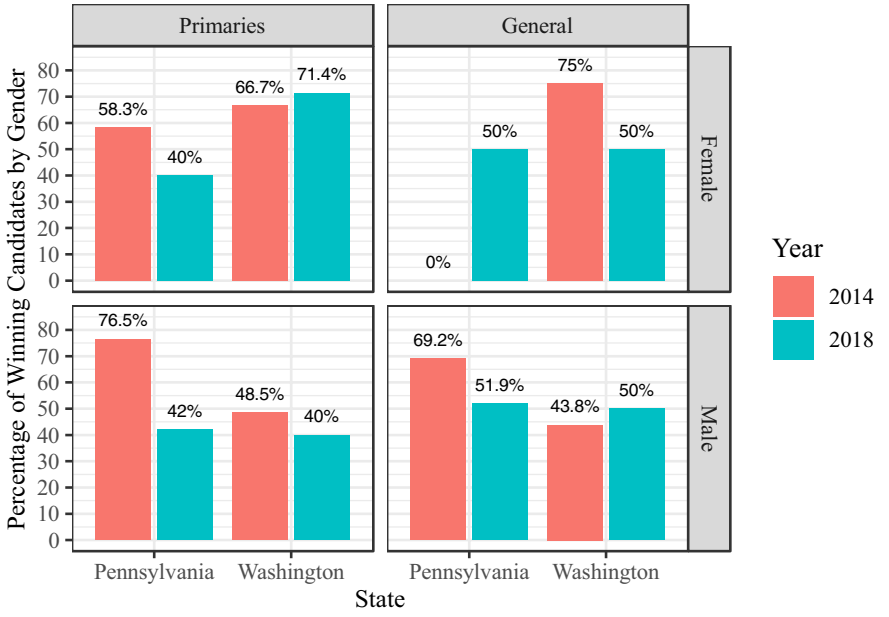

Fig. 2 Percentage of winning candidates by gender, 2014 and 2018

Pennsylvania general closely matched male success. Likewise, in Washington, more female candidates ran and won their primaries in 2018 than did so in 2014.

We chose Pennsylvania and Washington for both practical and theoretical reasons. Practically, state voter files are often difficult and costly to obtain. Furthermore, the format in which the files are provided (from state board of elections) require significant cleaning, formatting, and organizing. While there are inherent limitations in only analyzing a few states, theoretically these two states provide meaningful variation across political, economic, and geographic characteristics, thereby strengthening the generalizability of our findings. First, Pennsylvania utilizes a closed primary where only partisans can participate, while Washington has an open primary where anyone can vote. Additionally, Pennsylvania featured a more competitive electoral environment in 2018 with six open congressional seats, whereas Washington only had one. Pennsylvania also had more visible statewide elections to draw people to the polls, including a somewhat competitive Senate race and the governor's re-election bid. Washington only had one, non-competitive, statewide race to re-elect an incumbent senator. The two states also had substantially different 2016 results—Pennsylvania was narrowly decided for Trump (0.7 percentage points), while Washington supported Clinton by a 12.5-point margin. The two states also have markedly different profiles in terms of major industries, median household income, and racial diversity within the states (see Supplemental Appendix A for a specific breakdown of these measures). Lastly, these states have considerably different histories of female representation, with Washington ranking near the top and Pennsylvania near the bottom in terms of female representation. State variation along with variation

Table 1 Descriptive statistics for districts with female candidates in 2018

	Pennsylvania				Washington			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Turnout rate	0.485	0.061	0.368	0.583	0.513	0.063	0.4	0.584
White pop	570,000	116,000	242,730	657,365	565,000	75,695	367,222	638,152
Black pop	79,356	98,467	11,851	407,657	29,181	27,006	9,261	97,348
Hispanic pop	59,623	52,170	9,612	142,642	104,734	84,389	49,583	292,354
Median income	61,997	13,282	42,568	88,168	75,638	14,896	56,330	100,810
Bachelor's degree	105,082	28,378	64,366	145,207	126,498	50,141	66,961	219,587
Age 20 to 34	139,000	24,475	114,877	219,867	163,000	31,865	132,657	239,583
Age 35 to 54	175,000	10,045	153,725	190,926	194,000	19,911	166,533	219,899
Age 55 to 74	173,000	13,839	140,517	191,953	167,000	16,500	145,712	198,466
Age 75 and up	56,734	6,571	39,490	63,500	45,321	5,733	36,288	54,904
Density Code	1.944	1.626	0	5	1.7	1.10	1	4
Trump 2016 Vote Share	0.492	0.168	0.344	0.698	0.392	0.136	0.122	0.579

in districts where women ran in 2018 should assuage concerns that our results are a byproduct of state or district-specific factors. Observing a boost in turnout in both these states would demonstrate our argument holds for dissimilar states with divergent histories with respect to female representation.

Our main predictor of interest is whether a female candidate appeared on the ballot for the U.S. House of Representatives. We selected U.S. House races because they provide adequate within-state variation for modeling purposes. We expect a weaker effect for female candidacy in the 2014 midterm elections, relative to the gendered electoral context in 2018.

In addition to our primary variable of interest—whether a female candidate appeared on the ballot in the registrant's congressional district—we controlled for registrant's age, gender, registered party (when available), prior vote history (operationalized as voting in the past presidential election), and a measure of county-level partisanship defined as the proportion of the county voting for the incumbent president in the past election. Models also included interactive terms between female candidate, and variables capturing the registrant's age, gender, and party when applicable. These interactive terms allow us to investigate heterogeneous effects by registrant subgroup. We also control for total money raised by candidates in the district. This measure captures the overall competitiveness of the district, as well as the quality of the candidates, as both greater district competitiveness and those with higher quality candidates may generate more money. Accounting for candidate competitiveness confirms that the turnout effects observed for female candidacy are not exclusively a result of female candidates opting to run in districts that are more competitive. Full details on model specification and coding are in Supplemental Appendix B.

Given differences in electoral laws, culture, and turnout rates across states (Hanmer, 2009), as well as differences in data quality and record keeping, we conduct

Table 2 Descriptive statistics for districts without female candidates in 2018

	Pennsylvania				Washington			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Turnout rate	0.473	0.065	0.368	0.580	0.500	0.043	0.468	0.549
White pop	552,482	138,583	242,730	657,365	569,903	24,031	544,535	592,326
Black pop	92,090	118,408	14,903	407,657	32,099	15,169	23,020	49,610
Hispanic pop	50,673	51,498	13,090	190,084	64,722	19,988	49,583	87,379
Median income	57,765	12,041	42,568	88,168	292,552	388,794	66,793	741,490
Bachelor's degree	93,278	26,231	62,650	134,447	106,414	13,571	91,873	118,743
Age 20 to 34	142,796	30,204	118,452	219,867	164,484	16,885	144,989	174,489
Age 35 to 54	173,393	10,071	153,725	186,814	182,912	6,635	175,345	187,733
Age 55 to 74	172,472	15,821	140,517	188,540	176,836	21,842	154,788	198,466
Age 75 and up	56,149	7,432	39,490	63,500	49,845	4,870	45,190	54,904
Density Code	2.7	1.68	1	6	2.3	1.15	1	4
Trump 2016 Vote Share	0.481	0.192	0.07	0.712	0.361	0.062	0.290	0.399

Density code uses CityLab's Congressional Density Index, which we coded: 0 = pure rural; 1 = rural-suburban; 2 = sparse-suburban; 3 = dense-suburban; 4 = urban-suburban; 5 = pure-urban

separate analyses for Pennsylvania and Washington and separate models for each election. Because our analysis focuses on differences between types of districts (those with female candidates and those without) within a given state and for a particular year, differences such as the overall boost in turnout in 2018 or statewide races such as Senate or Governor are held constant in our analyses.

To counter competing explanations, we conduct several additional analyses. First, we demonstrate that the districts that both did and did not include women candidates are diverse across a number of characteristics. As shown in Tables 1 and 2, district characteristics such as minority population, median income, population density, and Trump vote share in 2016 vary across the two states and across districts with and without women candidates. This suggests that women ran and won in diverse electoral environments and that the candidacy and election of women in 2018 was not driven by homogeneous district-specific factors.

Next, we conduct a difference-in-difference analysis for Washington to address concerns that the districts where female candidates chose to run may not have been randomly distributed. Women may have run in districts where they expected unusually high turnout for reasons unrelated to candidate gender. A difference-in-difference analysis is not performed for Pennsylvania because the court-ordered redistricting prior to the 2018 midterm violates the model's composition assumption (Besley & Case, 2000). The difference-in-difference method has been used to estimate the effects of policy changes and candidate emergence when there is concern over endogenous selection as the model eliminates bias introduced by unobserved differences (e.g. Enos, 2016; Hanmer, 2009). The model compares districts that changed from having exclusively male candidates in 2014 to at least one female candidate in 2018 (treatment districts) with districts where only male candidates ran in both years. The technique provides an estimate for female candidacy in 2018 that

eliminates the average difference in the probability of voting between the two types of districts and the mean change in the probability of voting between 2014 and 2018. In short, this serves as a check to ensure that the 2018 turnout boost in districts with female candidates is not spurious. As we will show, the difference-in-difference results corroborate our main findings.[10]

Results

To gauge whether the effect of female candidacy in 2018 was unique, we run comparable logistic regression models predicting 2014 and 2018 turnout in Pennsylvania and Washington on the respective VFs. We regress a binary variable capturing voting on an indicator variable coded 1 if at least one House candidate in the registrant's district is female, 0 otherwise. To assess conditional effects by registrant subgroup, we include an indicator variable for female registrant, a series of indicator variables capturing the registrant's generation, interactive terms between female candidate and female registrant, and interactive terms between female candidate and each of the generation variables. Pennsylvania models also include indicator variables for registrant party and interactive terms between female candidate and registrant party. Party registration is not tracked in Washington. We also include an indicator for whether the registrant voted in the past presidential election and a variable capturing county level partisanship: the percentage of the county that voted for the incumbent president. Finally, we include the total money raised by the candidate as a measure of candidate competitiveness to ensure the results do not merely reflect differences in candidate quality associated with candidate gender.

Regression tables and full model specifications are in Supplemental Appendix C**.** Given the complexity of interpreting logistic regression coefficients, we present discrete differences in the predicted probability of voting between having a female candidate on the ballot versus having exclusively male candidates, overall and among subgroups of voters.[11] Predicted probabilities are computed by holding all covariates at their observed values (Hanmer & Kalkan, 2013) with 95% confidence intervals calculated using simulation. To evaluate conditional hypotheses, we compute discrete differences by subsetting the data by the specific subgroup, setting candidate gender on the interactions and constituent terms accordingly, and evaluating the effect separately for each subgroup. This ensures that the results reflect the true effect of candidate gender rather than both the effect of candidate gender and the effect of altering characteristics of registrants in the electorate.

[10] Data and replication codes for all analyses are available at the Political Behavior Dataverse page: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/GCZG82.

[11] This is done by computing the predicted probability of voting when female candidate = 1 minus the probability of voting when female candidate = 0 with all constituent interaction terms set accordingly. See Brambor et al. (2006).

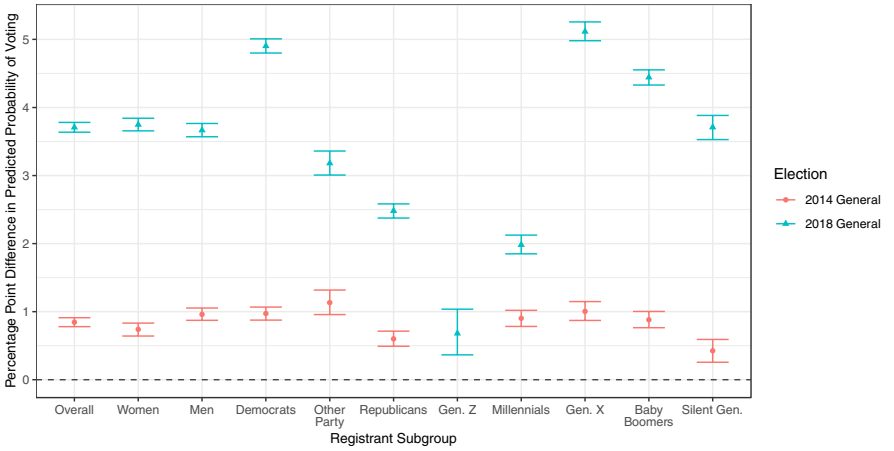

Fig. 3 Effect of female candidates on voting in Pennsylvania's general elections. *Notes:* Estimates calculated using separate models for each election. Error bars are 95% confidence intervals calculated using simulation holding covariates at their observed values. Gen. Z was not eligible to vote in the 2014 general election

General Election Turnout

Figure 3 shows the effect of female candidates on turnout in Pennsylvania overall and by registrant subgroup in the 2014 and 2018 general elections. The 2014 general featured a total of seven female candidates (six Democrats, one Republican) and the 2018 general featured eight female candidates (seven Democrat, one Republican). The partisan balance provides a good test of our theory that female candidates spur greater turnout in contexts where gender is salient compared to when gender is not at the forefront of voter's minds. While female candidates boosted turnout relative to exclusively male House races in both elections, the effect was larger in 2018: the overall increase in 2014 was eight-tenths of a percentage point, relative to the nearly four percentage point boost in 2018. Differences by registrant subgroup were also consistently larger in 2018.

In the 2018 Pennsylvania general, the overall, average probability of voting with a female candidate on the ballot is 62.1%, whereas it is only 58.4% with exclusively male candidates. This 3.7 percentage point difference in turnout is statistically significant and substantively consequential. Several of the exclusively male House races in Pennsylvania could have been flipped by a turnout boost of just shy of 3 percentage points depending on how those additional registrants had voted. For instance, Scott Wallace's electoral fortunes in his failed bid for the U.S. House in Pennsylvania's First district were determined by a mere 2.5% points difference in votes between him and his successful Republican opponent Brian Fitzpatrick.

Effects among male and female registrants were statistically indistinguishable. Consistent with prior research, the effect was greatest among Democrats, who turned out an additional 4.9 points when female candidates appeared on the ballot. Registrants from other parties were empowered to vote for female candidates as well, with turnout increasing by 3.2 points. The partisans impacted the least were

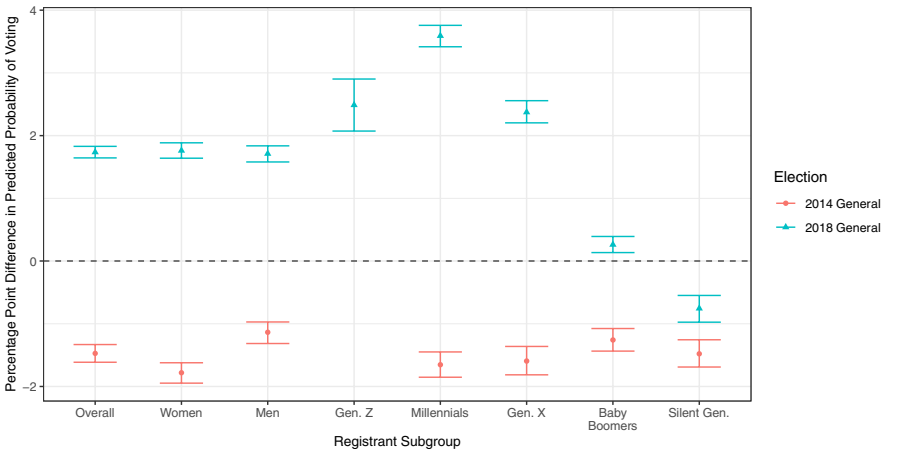

Fig. 4 Effect of female candidate on voting in Washington's general elections. *Notes:* Estimates calculated using separate models for each election. Error bars are 95% confidence intervals calculated using simulation holding covariates at their observed values. Gen. Z was not eligible to vote in the 2014 general election

Republicans, who saw an average 2.5-point boost in districts with female candidates. Indeed, Fulton and Dhima (2020) find that female Democratic candidates (compared to male Democrats) perform worse in districts with more male Republicans and male independent voters. They suggest this is because these voters are more likely to oppose Democratic women's perceived emphasis on gender equality issues. In 2014, the boost across parties was roughly the same, with only about four-tenths point difference between party identifiers.

In 2018, female candidacies had the greatest effect among members of Generation X, boosting turnout by about 5.1 percentage points. Baby Boomers presented with a female candidate were similarly spurred to greater participation, with members of this group turning out approximately 4.4 points more. Female candidates boosted turnout among the youngest cohort, Generation Z, by about 0.7 percentage point. In 2014, variation by registrant generation was minimal.

Figure 4 displays the effect of female candidates in Washington's 2014 and 2018 general elections. The average probability of voting in Washington's 2018 general with a female candidate on the ballot is 66.3%, whereas it is only 64.6% with exclusively male candidates. This approximately 1.7-percentage point boost in turnout is consistent with the effect found in Pennsylvania. These states have considerably different histories with female candidates, with Washington ranking as near the top, while Pennsylvania ranks near the bottom in terms of female representation. Despite this, we observe remarkably similar effects for female candidacy in 2018, suggesting that despite the states' histories, voters did not respond to female candidates differently in these states. Washington's 2018 boost was greatest among young voters, with Millennials' turnout increasing by about 3.6 percentage points. This effect was significantly greater than among Generation Z and Generation X, which itself was quite large at approximately 2.5 and 2.4 points respectively.

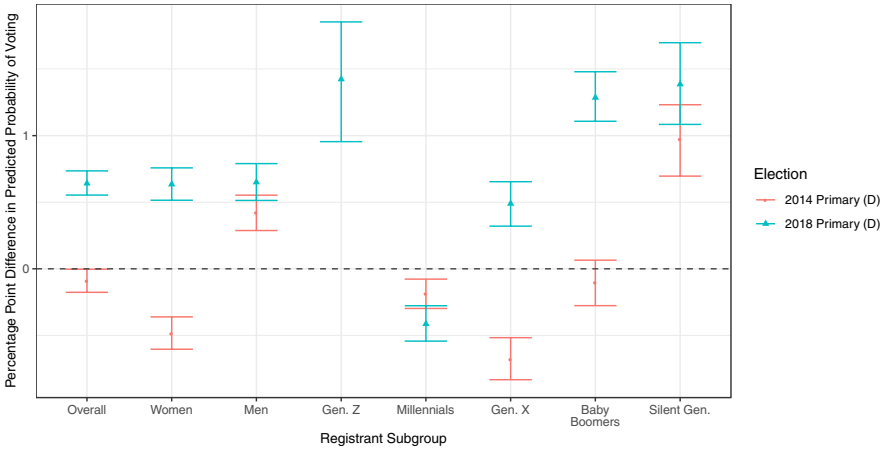

Fig. 5 Effect of female candidate on voting in Pennsylvania's democratic primary elections. *Notes:* Estimates calculated using separate models for each election. Error bars are 95% confidence intervals calculated using simulation holding covariates at their observed values. Models only include registered Democrats. Gen. Z was not eligible to vote in the 2014 primary election

Contrary to the effect in Pennsylvania, female candidates in Washington reduced turnout in the 2014 general by approximately 1.5 points. This depressing effect likely stems from the fact that three out of the four female House candidates in 2014 were Republicans. Therefore, the finding more accurately captures the effect of *Republican* women, rather than any woman on the ballot. Unfortunately, the sole female Democratic candidate provides insufficient variation to parse out the effect of gender and party individually for this contest. However, as a robustness check we ran an identical model that excludes the lone district with a Democratic woman and indeed found the turnout depressing effect strengthened (see Supplemental Appendix C).

Keeping in mind that the 2014 results are generally the effect of Republican female candidates, we consider conditional effects by gender and generation. Women were about 1.8 points less likely to vote when presented with a female candidate, whereas male turnout was suppressed slightly less, about 1.1 point. Across ages, female candidates depressed turnout with relatively consistent effects by generation.

Primary Election Turnout

Having established that female candidates on the ballot increased turnout in the 2018 Pennsylvania general more than in 2014, we next turn to whether there was a similar effect in the state's primary elections. Ideally, we would have liked to examine the impact of women in the primaries among all of Pennsylvania's registrants, however

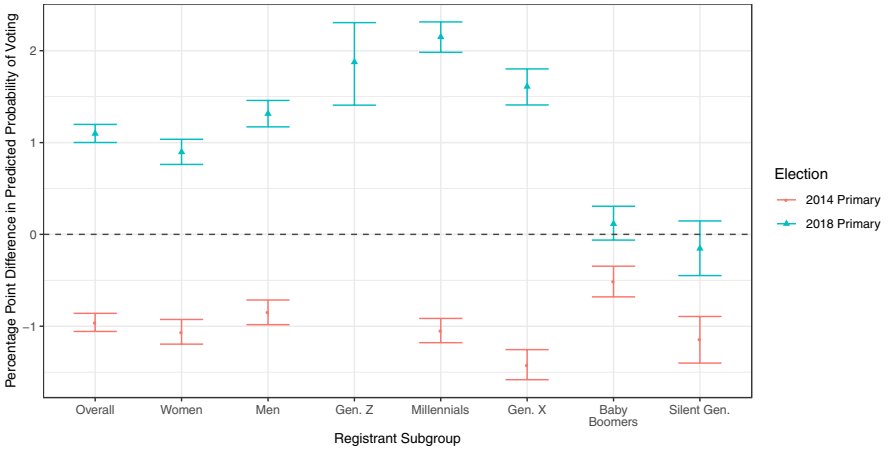

Fig. 6 Effect of female candidate on voting in Washington's primary elections. *Notes:* Estimates calculated using separate models for each election. Error bars are 95% confidence intervals calculated using simulation holding covariates at their observed values. Gen. Z was not eligible to vote in the 2014 primary election

closed primary rules and a single female Republican in 2018 made such an analysis impossible. Fortunately, adequate variation in the gender of Democratic House candidates permitted an examination of how candidate gender influenced Democratic primary turnout.[12]

To determine the impact of female House candidates on primary turnout among Democrats, we first subset our data to include only those Pennsylvanians who were registered Democrats, and therefore would have been eligible to vote in the closed primary. Next, we run logistic regressions predicting voting in the respective year primary.

As shown in Fig. 5, female candidates were associated with a small, yet significant boost in 2018 Democratic primary turnout of just over six-tenths of a percentage point. In 2014, female candidates exerted a small, negative effect (less than a tenth of a percentage point). Once again, we also evaluate whether female candidacy had heterogeneous effects by registrant gender and generation. Effects in 2018 were largest among the Silent Generation, Baby Boomers, and Generation Z at approximately 1.5 points. Inconsistent with expectations, Millennial turnout appeared to decrease by about half a point in response to female primary candidates in both years. This may be due to the closed primary system and Millennials, while more likely to support Democrats, are less likely to register with a party (Rouse & Ross, 2018). We find homogeneous effects by gender, with the effect among female and male registrants nearly identical in 2018.

[12] While we include every House primary, regardless of whether there is a female on the ballot, in the case of the 2014 Democratic primary, we exclude districts 15 and 18 because no candidates ran for their party's nomination in those districts. In these excluded districts, no House candidate, male or female, would have impacted turnout.

However, the effect in 2014 differed by gender, with male turnout increasing by about half a point and female turnout decreasing by a similar amount. Turnout similarly decreased among Millennials and Generation X yet increased by about a point among the oldest registrants. Consistent with expectations, these effects are smaller than in 2018.

Although we found that female candidates increased turnout in Pennsylvania's 2018 Democratic primary, Washington's primary presents a more difficult test because we cannot control for individual party, and therefore must pool the effect of female candidacy on registrants of all parties. Since Republican women only ran in two of the eight congressional districts with female candidates in 2018, our estimates comprise the effect of predominately Democratic female candidates on both Democratic and Republican registrants. With the caveat that our findings likely *underestimate* the effect, we now turn to the results of Washington's primary elections, shown in Fig. 6.

Overall, female primary candidates boosted turnout in 2018 by a little over a percentage point. Contrary to expectations, female candidates in this election increased male turnout slightly more than female turnout (1.3 and 0.9 points respectively). This effect, although statistically significant ($p < 0.05$), is small and inconsistent with the effects observed in Pennsylvania's primary and both states' general elections. Consistent with our theory, the effect of female candidates in 2018 was greatest among younger voters: about two points among Millennials and Generation Z.

Figure 6 also shows the effects on 2014 primary turnout. As with Washington's 2014 general, only a single female Democrat ran in the 2014 primary. Therefore, the female candidacy effect in this election captures mainly the effect of Republican and third-party women. Female candidates depressed overall turnout in this election by about one point. Relative to the 2018 primary, the magnitude of the effect was higher in 2018 and effects by generation were higher as well, consistent with expectations.

Difference-in-Difference Analysis

Credibly claiming that female candidates boosted turnout requires temporal sequence—women appearing on the ballot must precede the increase in turnout, *and* the relationship is nonspurious. The prior analysis demonstrated that female candidates boosted turnout even after accounting for registrant age, gender, prior voting, and, in Pennsylvania, party. The following difference-in-difference analysis in Washington serves as an additional robustness check to ensure these empirical results are not spurious.

This analysis tests whether the probability of voting differs in districts that went from male-only candidates in 2014 to having at least one female candidate in 2018 (treatment group), compared with districts in which only male candidates appeared on the ballot in both years (control group). The model eliminates the differences between the two types of districts (districts where women ran in 2018 and districts where they did not) as well as the overall boost in turnout in 2018 relative to 2014. This assumes that regardless of whether a female was on the ballot in 2018, the

Table 3 Difference-in-difference, Washington 2014 and 2018 general elections

	Dependent variable
	Voted
Effect of 2018 Female Candidates	0.0252*** (0.0007)
Year 2018	0.1407*** (0.0006)
Treatment District	− 0.0019** (0.0006)
Prior voting	0.3965*** (0.0005)
Female	− 0.0036*** (0.0004)
Generation Z	− 0.1333*** (0.0015)
Millennials	− 0.2107*** (0.0006)
Generation X	− 0.1257*** (0.0006)
Silent generation	0.0570*** (0.0006)
Constant	0.3330*** (0.0007)
Observations	5,119,932
R^2	0.2343
F statistic	99,999.00*** (df = 9; 3,120,551)

*p < 0.05 **p < 0.01 ***p < 0.001. Results from ordinary least squares regression, robust standard errors clustered by state voter ID in parentheses. Treatment districts are the 4th, 7th, 8th, and 9th. Control districts are the 2nd and 6th. Effect of 2018 Female Candidates = Year 2018 × Treatment District. Baseline age category: Baby Boomers

increase in turnout from 2014 to 2018 would have been the same, in otherwise identical districts. This technique yields an estimate for female candidacy in 2018 that eliminates characteristics of the districts which may also increase turnout such as level of education, income, or partisanship of district registrants. Additional details and full model specifications are found in Supplementary Appendix D.

To reflect the fact that we have more information regarding individuals who appear in both the 2014 and 2018 voter files, standard errors are clustered by individual using the state's unique voter identification number. For ease of interpretation, we present the results using OLS regression. Estimates using logistic regression are similar and available upon request. As shown in Table 3, the model estimates that female candidates in 2018 boosted turnout by roughly 2.5 percentage points ($p < 0.001$). This significant boost is net of the overarching boost in turnout in 2018, the mean difference in the probability of voting between these districts, and the effects of individual level controls. This effect is nearly identical to the effects estimated using our main model (which estimated a roughly 2.2-point effect for Washington) and demonstrates that our results are not being driven by missing district specific factors.

Conclusion

The main headlines of the 2018 elections were two-fold: the record number of women who ran for office and unusually high voter turnout. However, discussion of these characteristics has mostly occurred independently of one another. In this paper, we argue that female candidates have the potential to increase turnout when gender-related issues are an important focus of debate and women are viewed as change agents. To test this, we analyze verified voter files in two states, Pennsylvania and Washington, in the 2014 and 2018 elections—a year with low and a year with high gender salience, respectively.

Our results show that in both states, the presence of a female candidate increased turnout in 2018, even after controlling for age, prior vote history, gender, and party. Consistent with expectations, we find that female candidates boost turnout among both women and men. And in an era where partisanship often subsumes other electoral factors, we find that a woman on the ballot has an independent effect on turnout. As expected, some voters are more influenced to vote when there are women candidates in the race, with Democrats much more likely to do so. This aligns with previous research demonstrating that Democratic voters value diversity in representation more than Republicans (Crowder-Meyer & Cooperman, 2018; Grossman & Hopkins, 2016; Ondercin & Fulton, 2019). Our results also show that independents, third-party, and Republican registrants responded to the presence of a female candidate by turning out in greater numbers than when only men appeared on the ballot. The increased turnout among Republicans may be a result of a "backlash effect." Republicans, perceiving female candidates to be more liberal, including those from their own party (Thomsen, 2015), are counter-mobilized to mitigate increases in turnout among other groups. This explanation is strengthened by additional analysis (presented in Supplementary Appendix, Figure C.1) which show that in the Pennsylvania 2018 general election, the effect of female Democratic candidates alone boosted turnout among Republicans significantly more than estimates for all female candidates (which includes a single district with a female Republican candidate).

Finally, we find some support for the expected effect of female candidates on youth turnout. The diversity of both Millennials and Generation Z, their liberal inclinations, and a preference for policies related to gender equity, social justice, and tolerance are likely important motivations for voting in a gendered context midterm election. Our results indicate that a woman on the ballot satiates some of these political desires. In the primary elections in 2018, female candidates boosted Democratic Generation Z turnout in Pennsylvania and Generation Z and Millennial turnout in Washington. In both states in the 2018 general, female candidates increased Millennial turnout. Female candidates also slightly boosted Generation Z turnout in Pennsylvania's 2018 general election. While the results are not consistent across both young generations and in both states, the trends are indicative of an effect that is supported by previous examination of the 2018 midterm elections (e.g. Medenica & Fowler, 2020).

Our findings are especially innovative because we utilize actual voter files for our analyses, which in total amounts to the official records of over 12.2 million

registrants in the 2018 election and 11.2 million in the 2014 election. Utilizing official records avoids the possibility that our results are confounded by survey respondents over-reporting of voting or due to response bias altering the composition of survey samples, thereby increasing the reliability of our findings. Indeed, as we show in our Supplementary Appendix E, the estimates obtained using survey data are biased and inefficient relative to the true behavior of this electorate. Moreover, our findings concerning the impact of female candidates are relatively consistent across two states with varying political, social, and economic characteristics (both statewide and in districts where women ran for Congress).

Overall, this paper makes an important contribution to the literature on candidate gender, voter participation, and representation. Our results demonstrate the potential effect of female candidates for increasing turnout. However, this impact is conditional; the prominence of gender issues is an important part of the narrative and speaks to the necessity of accounting for political context when analyzing elections. Furthermore, our findings suggest that female candidates running in a gendered political environment motivate turnout among both men and women and amid groups traditionally less likely to participate in elections. While our analyses cannot speak to individual motivations, it is likely that communication styles, greater campaigning efforts, policy positions, and a desire for descriptive representation played important roles in voting decisions.

Future work should address limitations and examine several questions that we were unable to fully test in this paper. First, greater generalizability is constrained by our data. While we believe the two states selected are representative of broad demographic trends and differences around the country, extensions of this research should include additional state voter files across more years. Second, our data did not permit us to confidently address whether and how there may be a differentiating effect of Democratic and Republican female candidates in a gendered electoral context. This limitation is in part because fewer Republican women run for congressional seats. Furthermore, as we note above, even Republican female candidates are perceived to be more liberal, relative to their male Republican counterparts. Therefore, teasing out any effects of female candidate partisanship in a particular context may require alternate data and additional methods such as experimental surveys. Third, follow up work should expand on the relationship between female candidates and less electorally engaged populations. While our use of state qualified voter files adds depth and reliability to our findings, motivations behind mobilization is an area ripe for research. Rep. Kim Schrier noted on the campaign trail that when women run, voters look to them to "fill this missing voice" in Congress (Brunner, 2018). It remains to be seen whether women will continue to be perceived as change agents who spur greater turnout and whether this perception is conditional on electoral circumstances. Tracking this phenomenon is a fruitful area to better understand democratic participation.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11109-021-09767-x.

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