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Serving Democracy: Evidence of Voting Resource Disparity in Florida

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Abstract. Florida, an important state in presidential elections in the United States, has received considerable media coverage in recent years for long lines to vote. Do some segments of the population receive a disproportionate share of the resources to serve the voting process, which could encourage some or dissuade others from voting? We conduct the first empirical panel data study to examine whether minority and Democrat voters in Florida experience lower poll worker staffing, which could lengthen the time to vote. We do not find evidence of a disparity directly due to race. Instead, we observe a political party effect—all else equal, a 1% increase in the percentage of voters registered as Democrat in a county increases the number of registered voters per poll worker by 3.5%. This effect appears to be meaningful—using a voting queue simulation, a 5% increase in voters registered as Democrat in a county could increase the average wait time to vote from 40 minutes (the approximate average wait time to vote in Florida in 2012 and the highest average wait time across all states in that election per the Cooperative Congressional Election Study) to about 115 minutes.

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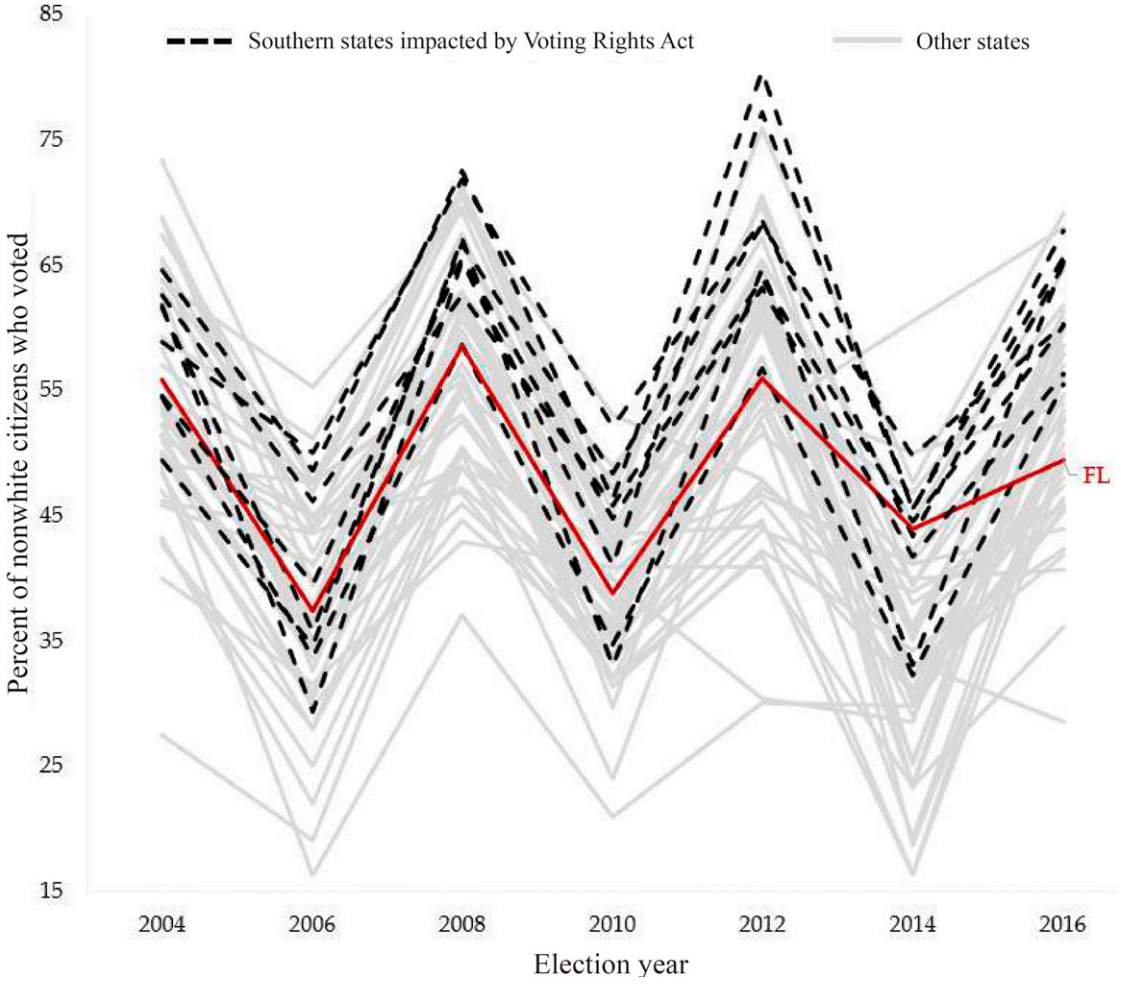
Keywords: voting • queue • lines • waiting • politics • resource allocation

1. Introduction

Given the importance of voting in a democracy, a considerable amount of attention and study has been applied to how the design of the voting process can influence elections: for example, gerrymandering of district boundaries (Abramowitz 1983, Cain 1985, Friedman and Holden 2009, Chen and Cottrell 2016) and voter suppression through voter identification laws or the service provided by local election officials (Hood and Bullock 2012, Bentele and O'Brien 2013, White et al. 2015, Hajnal et al. 2017, Stein et al. 2019). Our study investigates the allocation of voting resources, in particular the number of poll workers. All else being equal, the more registered voters there are per poll worker, the more time voters will experience in the voting process (waiting in queue, checking in, and casting a ballot) (Stein et al. 2019). Long wait times to vote are not ubiquitous in the United States, but, depending on the election and location, some voters do experience wait times of 30 minutes or more (Ansolabehere and Shaw 2016), the standard set by a Presidential Commission (Bauer and Ginsberg 2014). Long waits have been shown to influence choice in nonvoting situations, such as blood donation (Gillespie and Hillyer 2002), waiting in a call center queue (Mandelbaum and Zeltyn 2013), and grocery shopping (Lu et al. 2013), among others. In the context of voting, theory (Riker and Ordeshook 1968) and empirical evidence (Alvarez et al. 2008, Cottrell et al. 2021, Stein et al. 2019) suggest that long wait times also have the potential to dissuade voters in current and future elections by raising the actual or perceived cost to vote. This raises the possibility that one political party could gain an advantage over another if the allocation of resources creates systematic differences in the time to vote.

In our study, we aim to identify whether there is any disparity in poll worker staffing levels within counties in Florida with respect to race and political party. We focus on Florida for several reasons: (i) it is viewed as an important state in presidential elections; (ii) it experienced well-publicized long polling queues in the 2012 election (e.g., Famighetti et al. 2014); (iii) it has a checkered past on voting discrimination issues (e.g., Childress 2014, Klas 2016, Wood 2016, Hawkins 2018); (iv) unlike most other states, Florida provides county-level data that include racial and political party affiliation; and

Figure 1. (Color online) Percent of Nonwhite Citizens Who Voted by State



Notes. Data taken from U.S. Census Bureau reports on the voting and registration for states by race. Other southern states also impacted by the Voting Rights Act (AL, GA, LA, MS, NC, SC, TX, VA) are highlighted.

(v) Florida has lagged behind many of its peer states in terms of minority voter turnout (Figure 1) and registration (see Figure EC.1).

We study election and demographic data from 2004 to 2016 across all 67 counties in Florida. Our empirical strategy is to identify the effect of political party and race within Florida counties across time so as to control for unobserved heterogeneity across counties. To summarize our results, we find no evidence of a disparity in poll worker staffing directly due to race. However, we do find that as the percentage of Democrat party voters increases in a county, the number of registered voters per poll worker also increases, that is, there are fewer resources per voter. Our estimates indicate a large and meaningful effect size. Thus, changes in the composition of political party affiliation of voters across time can lead to larger disparities in wait times to vote.

2. The Voting Process

In Florida, general elections for public offices occur every two years with presidential and midterm elections alternating. A supervisor of elections conducts county elections, but a board of county commissioners typically will determine county budgets for an election. All voters in a county registered at least 29 days before an election are allowed to cast a ballot in an election. On an early voting day (a practice that was mandated in Florida from 2004) or Election Day, a registered voter who has not voted via an absentee (or "mail-in") ballot may go to an early voting site (for early voting) or their assigned polling place in their precinct (on Election Day) to vote. Based on information from the Florida Division of Elections, the in-person voting process in Florida includes two primary steps: check-in and voting.

At the check-in step, poll workers ensure voters are registered to vote using a photo identification with a

signature (a practice used in Florida from 1998). If a voter is deemed eligible to vote at the polling place, the voter proceeds to the voting stage. Otherwise, a provisional ballot may be issued and counted later if voter eligibility is verified. Voting can be done via an electronic or a paper ballot. To exit the voting process, a voter submits the electronic ballot on a voting machine or processes a paper ballot through an optical scanner.

Queues form at either stage of the voting process whenever the arrival rate of voters exceeds the rate of service. A number of factors contribute to the queue lengths, such as the overall level of service capacity, the variability of demand throughout the day, the complexity of the ballot, and the skill of the poll workers. Although poll workers may be primarily responsible for check-in, they may also play an important role in voting (e.g., via distributing ballots, assisting voters with questions on how to use voting equipment, etc.). Hence, the number of poll workers is a key factor to determine the service experience in elections (Stein et al. 2019).

Equity in the voting process has received considerable attention. Some states (but not Florida) have laws to ensure there is equality among precincts with respect to voting resources. For example, South Carolina requires (but does not strictly enforce) that precincts not exceed 250 registered voters per voting machine and 500 registered voters per three poll workers for general elections (Famighetti et al. 2014). Several studies focus on analytical methods to assign voting resources with some form of equity across voters as part of the objective (Allen and Bernshteyn 2006, Yang et al. 2009, Olabisi and Chukwunoso 2012, Yang et al. 2013).

There are a number of empirical studies on equality in the voting process (Mebane 2005, Highton 2006, Brady and McNulty (2011), Stewart 2012, Clinton et al. 2021, Shepherd et al. 2021). With respect to Florida, a cross-sectional study of the 2012 general election finds that minorities faced longer wait times and racial disparities existed in the distribution of voting resources across precincts (Famighetti et al. 2014). Cross-sectional studies are unable to control for unobserved differences across precincts that could influence voter waiting times that are not directly related to race or party affiliation (but may be correlated with race or party). The limited number of panel data studies on voter-reported wait times are unable to control for both race and party affiliation (Pettigrew 2017). Without data on party affiliation, it is not possible to distinguish between a direct racial bias and one that is due to a group's leaning toward an opposition party. For example, nonwhite voters tend to vote Democrat in the United States (Pew Research Center 2016). Thus, a bias against Democratic voters would affect nonwhite voters as well as educated young white voters (who lean toward the Democratic party, according to Pew Research Center (2015)), whereas a direct racial bias would affect only the former.

3. Data and Estimation

The data in our study are from all 67 counties in Florida and span the biannual elections from 2004 to 2016. The data are collected from five sources: (1) Election Administration and Voting Survey (EAVS) conducted every two years by the U.S. Election Assistance Commission and collected, typically at the county level, from the 50 states, the District of Columbia, and the U.S. territories; (2) the Florida Division of Elections publishes voter registration statistics for each of its counties in every election; (3) the U.S. Census Bureau data on annual demographic information on counties; (4) the Verified Voting Foundation data on voting equipment used across counties; and (5) the Federal Reserve Bank of St. Louis data on county-level housing prices. (See Section EC.3 for more information on the origin of the data.)

Our goal is to estimate the causal relationship between both political affiliation and race of voters and the staffing level of poll workers in a county relative to the number of registered voters. Our empirical strategy exploits variation across time within a county in the percentage of registered Democratic voters and white voters, thereby controlling for unobservable, time-invariant characteristics of each county:

$$\begin{aligned} Voters/PollWkr_{i,t} &= \beta_1 PctDemocrat_{i,t} + \beta_2 PctWhite_{i,t} \\ &\quad + \mathbf{Y}_{i,t-j}\vec{\gamma} + \mathbf{F}_{i,t-j}\vec{\delta} + \mathbf{X}_{i,t}\vec{\psi} + e_t + c_i + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where

$$\mathbf{Y}_{i,t-j} = Voters/PollWkr_{i,t-1} + Voters/PollWkr_{i,t-2}, \tag{2}$$

$$\begin{aligned} \mathbf{F}_{i,t-j} &= AbsenteeBallots_{i,t-1} + AbsenteeBallots_{i,t-2} \\ &\quad + EarlyBallots_{i,t-1} + EarlyBallots_{i,t-2} \\ &\quad + ElectionDayBallots_{i,t-1} + ElectionDayBallots_{i,t-2} \\ &\quad + ProvisionalBallots_{i,t-1} + ProvisionalBallots_{i,t-2}, \end{aligned} \tag{3}$$

$$\begin{aligned} \mathbf{X}_{i,t} &= PollDiff_{i,t} + PersonPerSqMile_{i,t} + HousePrice_{i,t} \\ &\quad + MedInc_{i,t} + UseDRE_{i,t} \\ &\quad + Pct65Plus_{i,t}. \end{aligned} \tag{4}$$

The proposed regression model is specified in Equation (1). In any service system, a key metric is generally demand relative to capacity, thus the dependent

variable of interest is $Voters/PollWkr_{i,t}$, which is the log of the total number of active registered voters per poll worker (across both early voting and Election Day) for county i in election year t. According to the 2016 Florida Statute 98.065 (registration list maintenance programs), inactive (as opposed to active) registered voters are those "who have been sent an address confirmation final notice and who have not returned the postage prepaid, preaddressed return form within 30 days or for which the final notice has been returned as undeliverable."

The main regressors of interest are $PctDemocrat_{i,t}$ and $PctWhite_{i,t}$. The regressor $PctDemocrat_{i,t}$ is the percentage of active registered voters who identified as Democrat for county i in election year t. In Florida, voters have an incentive to keep their political party affiliation up-to-date because only members of a party can vote in the party's primary. Over the time of our study, Florida consistently had a higher number of counties vote Republican in the presidential or gubernatorial elections. The regressor $PctWhite_{i,t}$ is the percentage of active registered voters for county i who identified as white in the election year t.

Both $PctDemocrat_{i,t}$ and $PctWhite_{i,t}$ act as controls for each other because (as discussed) nonwhite voters tend to vote Democrat in the United States, but some white voters (younger and more educated) do as well. If some counties become relatively more Democratic while also decreasing their relative percentage of nonwhite voters, then including only one variable may not be able to identify the effects of interest. During the time period in our sample, $PctWhite_{i,t}$ is decreasing on average, while $Voters/PollWkr_{i,t}$ is on average increasing (see Table 1). Florida also had a negative trend for $PctDemocrat_{i,t}$ (see Table 1).

Included in Equation (1) are a number of controls, divided into three sets, $\mathbf{Y}_{i,t-j}$, $\mathbf{F}_{i,t-j}$, and $\mathbf{X}_{i,t}$. Table 1 and Table EC.1 provide summary statistics for all variables in Equation (1), including these controls. The staffing level for an election can be expected to depend on the expected demand to vote, which in turn is likely to be related to voter demand in recent elections. Hence, $\mathbf{Y}_{i,t-j}$ within Equation (1) includes the staffing in the two previous elections of the same county, $Voters/PollWkr_{i,t-1}$ and $Voters/PollWkr_{i,t-2}$. We use two lags because midterm and presidential year elections alternate. As a result of the need to use lags as controls and instruments (described later), our study analyzes changes in *Voters/PollWkr* between elections 2008 and 2016.

We include in $\mathbf{F}_{i,t-j}$ proxies for the unobserved, true forecasted voting demand in each county and election across different voting methods in case those methods are related to race or party affiliation. Specifically, we use the lagged turnout from the previous two elections (i.e., $j = 1$ or $j = 2$) across the different voting methods. Again, two lags capture the most recent midterm and presidential elections. The regressor $AbsenteeBallots_{i,t-j}$ is the log of the number of absentee ballots (also known as mail-in ballots) cast per polling place. Absentee ballots should represent a lighter workload per ballot cast for election workers. The regressor $EarlyBallots_{i,t-j}$ is the log of the early voting ballots cast per polling place. Given that early voting occurs over multiple days and that voters physically cast a ballot just as they do during Election Day, we expect an increase in the early ballots cast per polling place to decrease *Voters/PollWkr* because more poll workers are needed over multiple days to service early voters. The regressor $ElectionDayBallots_{i,t-j}$ is the log of the Election Day ballots cast per polling place. We expect

Table 1. Key Variables Reported at the State Level in Florida for General Election Years from 2004–2016

Variable	2004	2006	2008	2010	2012	2014	2016
*Voters/PollWkr**	167.1	199.3	162.5	229.0	229.1	284.8	276.7
PctDemocrat	41.4	40.4	42.0	41.3	40.1	38.8	37.9
PctWhite	72.6	72.0	69.1	68.6	66.5	65.9	64.3
*AbsenteeBallots**	248.9	135.8	347.9	221.7	483.0	386.2	560.9
*EarlyBallots**	262.9	144.1	475.5	189.7	488.9	266.7	786.5
*ElectionDayBallots**	895.5	612.4	685.8	540.5	758.3	577.5	600.3
*ProvisionalBallots**	5.11	2.63	6.37	2.30	8.67	2.57	4.96
PollDiff[†‡]	n.a.[§]	n.a.[§]	3.07	3.21	3.37	3.39	3.77
*PersonPerSqMile**	n.a.[§]	n.a.[§]	350.7	350.6	355.7	363.8	375.7
HousePrice[‡]	n.a.[§]	n.a.[§]	174.3	132.7	119.3	132.2	152.6
*MedInc**	n.a.[§]	n.a.[§]	47,450	47,661	47,309	47,212	48,900
UseDRE[†‡]	n.a.[§]	n.a.[§]	0.94	0.85	0.78	0.70	0.36
Pct65Plus	n.a.[§]	n.a.[§]	16.9	16.9	17.5	18.2	19.1

*Nonlogged values shown.
[†]Values calculated by averaging all imputations. See Section EC.4.
[‡]Straight average taken across all 67 Florida counties.
[§]Data for this variable and election year is not applicable to the study.

increases in Election Day ballots cast per polling place to increase *Voters/PollWkr* because more of the demand for poll workers is concentrated on just one day. The regressor $ProvisionalBallots_{i,t-j}$ is the log of the provisional ballots cast per polling place (with one added if a county reports zero provisional ballots). Although provisional ballots may not represent a large portion of total votes cast (less than 0.5% of total ballots cast from 2008 to 2016 in our sample), they can require a significant amount of work for poll workers (Dixon 2012).

A number of additional controls are included in $\mathbf{X}_{i,t}$. Staffing could depend on the difficulty to recruit poll workers who must be trained in advance of the election (Burden and Milyo 2015). Recruitment difficulty is a concern if this is linked to race or political party. In the EAVS, counties rate poll worker recruitment difficulty on a scale from 1 (very difficult) to 5 (very easy) for each election, which we include as the control $PollDiff_{i,t}$ in Equation (1). For this variable, there are four out of 67 counties missing data for 2014 and 30 out of 67 counties missing data for 2016. We use multiple imputation to account for the missing data values (see Section EC.4). We also include in $\mathbf{X}_{i,t}$ several demographic and economic measures of a county that could be related to vote staffing because race and party affiliation is correlated with where a person lives (Parker et al. 2018). The variability of demand throughout the day may depend on a precinct's degree of urbanization, and that variability may influence staffing. We include in $\mathbf{X}_{i,t}$ the log of the number of people per square mile in a county, $PersonPerSqMile_{i,t}$, to control for changes in urbanization over time within a county. We use the log of median income of a county, $MedInc_{i,t}$, and the All-Transactions House Price Index, $HousePrice_{i,t}$ (normalized at a value of 100 in the year 2000) to control for differences in staffing that could be related to the wealth of a county over time (Spencer and Markovits 2010). To control for changes in voter age within a county, which may influence the time a voter needs to cast a ballot (Glenn and Grimes 1968), we include the U.S. Census estimate of the percentage of the population within each county that is above age 65 ($Pct65Plus_{i,t}$). Finally, the method of voting may influence the needed capacity (Spencer and Markovits 2010). From 2008 to 2016, many Florida counties switched from direct recording electronics (DREs) machines to paper ballots (see Figure EC.2). Within $\mathbf{X}_{i,t}$, we set $UseDRE_{i,t}$ to 1 if a county used any DRE equipment in an election, otherwise it defaults to 0. The Verified Voting Foundation does not provide data on voting equipment for Florida counties in 2010, so we use multiple imputation to account for this missing year (see Section EC.4).

We control for election year and county fixed effects in Equation (1): e_t and c_i. Election year fixed effects, e_t (represented by election year dummy variables *Election*2010, *Election*2012, *Election*2014, *Election*2016), control for statewide time-dependent trends. For example, from Table 1, the total number of active registered voters per poll worker tends to rise in Florida during the span of our study. County fixed effects, c_i, control for unobserved heterogeneity across counties that does not vary across time yet influences the staffing level.

The presence of fixed effects in Equation (1) along with the lagged dependent variables raises a concern of endogeneity bias in its estimation (Nickell 1981). We also identify other regressors that could be endogenous. Shocks to the number of registered voters in an election could impact voters of certain demographics or political parties more than others (i.e., *PctDemocrat* and *PctWhite*). In addition, the first difference of the lagged turnout measures (i.e., *AbsenteeBallots*, *EarlyBallots*, *ElectionDayBallots*, *ProvisionalBallots*) could be related to the first difference of the error term. We use the Arellano and Bond (1991) dynamic panel data model with first differences and lagged variables as instruments to overcome this issue. We limit the number of lags used as instruments in the model (Bowsher 2002). To be specific, for the voting resource lags (*Voters/PollWkr*) and the turnout proxies in $\mathbf{F}_{i,t-j}$ (*AbsenteeBallots*, *EarlyBallots*, *ElectionDayBallots*, *ProvisionalBallots*), we use the second and third lags as instruments (corresponding to both a midterm and presidential election). For voter demographic variables *PctDemocrat* and *PctWhite*, we use the second election lag as an instrument. An instrument is also needed for poll worker recruitment difficulty (*PollDiff*) because we use a dynamic panel data model in which past election shocks to poll workers could impact recruitment difficulty in the current election. We address this through the use of the most recent election lag as an instrument. We do not need instruments for the other regressors (*PersonPerSqMile*, *HousePrice*, *MedInc*, *UseDRE*, *Pct65Plus*) because we believe they should be uncorrelated with shocks to the number of voters or poll workers. Section EC.5 provides further justifications for the instruments selected.

The Hansen test (robust to heteroscedasticity) for overidentifying restrictions assumes a null hypothesis that our instruments meet the exogeneity requirement. We do not find evidence that the exogeneity assumption is violated (Table EC.2). We also address two additional issues with Arellano-Bond estimation. First, it may perform poorly if instruments are weak, which could occur if changes in county election demographics were fully adjustable from one election to the next, thereby having no relation to past values. We believe, however, that county demographics are somewhat rigid over time. Consistent with that view, we do not find evidence of weakness comparing F-statistics from regressions of the first differences of each endogenous

variable (pooled across counties and election years) on its lagged instrument(s) (see Table EC.3) to the rule-of-thumb F-statistic of 10 for two-stage least squares estimations established in Staiger and Stock (1997). Second, Arellano-Bond estimation requires serially uncorrelated errors, which is supported (Table EC.2).

4. Results

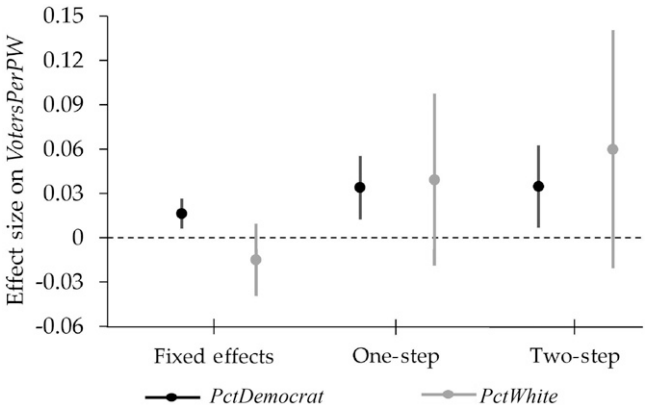
As shown in Figure 2, our results provide support for a disparity in voting resources due to political party. (Table 2 provides all estimates.) For a base reference, Figure 2, *Fixed Effects* provides the fixed effects estimates from a model without instruments for endogenous regressors. Figure 2, *One-Step* and *Two-Step* provide the estimates from our preferred models, the one-step and the two-step Arellano-Bond procedures, respectively. All three models indicate that the number of voters per poll worker increases as a county's percentage of Democrat voters increases (all else being equal). In particular, based on the two-step Arellano-Bond procedure (Figure 2, *Two-Step*), a 1% increase in the percentage of Democrat voters is associated with a 3.5% increase in voters per poll worker. This effect appears to be large—as a point of comparison, in a cross-sectional study of voter resource allocation in Florida's 2012 election, a 1% increase in the percentage of white voters is associated with an increase of 0.26% voters per poll worker on Election Day (Famighetti et al. 2014). (See Section EC.6 for more details on this benchmark calculation.)

In contrast to prior studies (Famighetti et al. 2014, Pettigrew 2017), our results do not support the existence of a racial bias: the coefficients on *PctWhite* in both the one-step and two-step Arellano-Bond procedures are not significant. However, those studies are unable to control for political party affiliation or unobserved differences across counties. Given that race and political party are correlated, it is possible to conflate racial bias with a political party bias.

We estimate additional models (using the two-step Arellano-Bond procedure) to check the robustness of our results. In particular, we replaced the lagged proxies for forecasted voter demand with contemporaneous proxies; removed both lags of the dependent variable; included a variable for voters with no party affiliation; controlled for the 2013 Supreme Court decision *Shelby County* v. *Holder*, which influenced some of the counties in Florida during our study period; and finally we substituted our turnout forecast proxies with turnout proxies from neighboring counties (further addressing potential concerns regarding endogeneity between the turnout measures and the dependent variable). In all of these models, the results are qualitatively similar to our main findings: there is a significant and positive coefficient for *PctDemocrat* and an insignificant effect of *PctWhite* (see Tables EC.4 to EC.6 for descriptions of the robustness checks, results, specification tests, and weak instrument tests).

Our results establish a causal link between shifts in a county's party affiliation and its staffing level for voting. County administrators can control staffing, so this link establishes how they may indirectly influence voter wait times. Unfortunately, available data on voter waiting time is insufficiently detailed to establish a connection between staffing decisions and voter wait times. The next section describes an alternative method to measure how voter waiting times could have changed due to these choices.

Figure 2. Coefficient Estimates from the Regressions That Estimate Equation (1): Fixed Effects Estimates Without Instruments for Endogenous Regressors; and One- and Two-Step Arellano-Bond Procedures



Note. Bars represent the 95% confidence intervals with robust standard errors used for the fixed effects and one-step estimation and Windmeijer corrected standard errors used for the two-step estimation (Windmeijer 2005).

5. Simulation

We use a queue simulation tool, developed by Mark Pelczarski, to examine the impact that changing the number of voters per poll worker could have on the wait time to vote (see https://web.mit.edu/vtp/calc3.htm for more information on the tool). This tool simulates the wait times voters could experience during a voting day based on queueing theory, historical data on polling places, and user-customized inputs on voter demand, voter arrival variability, and polling place capacity.

We calibrate the simulation using data from the 2012 election in Florida because data are available on voter resource levels (Famighetti et al. 2014) and the average voter wait time (Stewart 2015). Table EC.7 reports the parameters selected for our base simulation. For the 2012 election in Florida, the average reported wait time is 42.3 minutes (Stewart 2015) and the average number of ballots cast per polling place on Election

Table 2. Main Regression Results

Dependent variable: *Voters/PollWkr*	Fixed effects†	One-step†	Two-step‡
PctDemocrat	0.016***	0.034***	0.035**
	(0.005)	(0.011)	(0.014)
PctWhite	−0.015	0.039	0.060
	(0.012)	(0.030)	(0.041)
$Voters/PollWkr_{t-1}$	−0.040	−0.080	−0.108
	(0.059)	(0.077)	(0.120)
$Voters/PollWkr_{t-2}$	0.031	0.006	−0.022
	(0.054)	(0.066)	(0.099)
$AbsenteeBallots_{t-1}$	0.201***	0.399***	0.438***
	(0.059)	(0.119)	(0.154)
$AbsenteeBallots_{t-2}$	0.026	0.071	0.087
	(0.053)	(0.069)	(0.084)
$EarlyBallots_{t-1}$	0.025	0.002	0.081
	(0.051)	(0.079)	(0.096)
$EarlyBallots_{t-2}$	−0.002	−0.045	−0.042
	(0.034)	(0.045)	(0.061)
$ElectionDayBallots_{t-1}$	0.113	−0.002	−0.063
	(0.090)	(0.139)	(0.158)
$ElectionDayBallots_{t-2}$	0.013	0.039	0.063
	(0.094)	(0.110)	(0.130)
$ProvisionalBallots_{t-1}$	0.004	0.003	0.006
	(0.012)	(0.024)	(0.024)
$ProvisionalBallots_{t-2}$	−0.012	−0.011	0.010
	(0.017)	(0.020)	(0.022)
PollDiff	0.005	−0.001	0.008
	(0.014)	(0.019)	(0.027)
PersonPerSqMile	−0.517	−0.567	−0.238
	(0.362)	(0.414)	(0.526)
HousePrice	0.000	−0.001	0.000
	(0.001)	(0.001)	(0.001)
MedInc	−0.359	−0.444	−0.700
	(0.276)	(0.385)	(0.481)
UseDRE	0.003	−0.010	0.013
	(0.036)	(0.040)	(0.037)
Pct65Plus	0.001	−0.005	−0.009
	(0.006)	(0.006)	(0.008)
*Election*2010	0.023	−0.082	−0.139
	(0.089)	(0.126)	(0.128)
*Election*2012	0.244***	0.297**	0.312**
	(0.089)	(0.123)	(0.137)
*Election*2014	0.197*	0.221	0.198
	(0.110)	(0.148)	(0.178)
*Election*2016	0.312***	0.478**	0.472*
	(0.118)	(0.189)	(0.251)
Constant	10.027***		
	(2.981)		
Observations	335	268	268

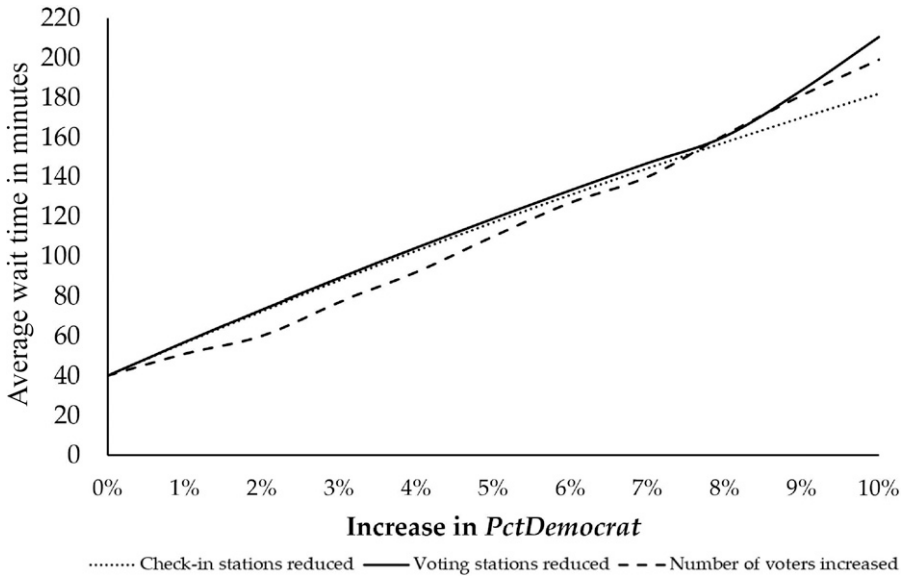
Note. Data is for general election years 2008 to 2016 across all 67 counties in Florida.
† Robust standard errors reported in parentheses.
‡ Windmeijer (2005) corrected standard errors reported in parentheses.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Day for the median county is about 614 (EAVS data). For our base simulation, we selected 660 voters, two check-in stations, and four voting stations because the simulation tool with those parameters yields an average wait time of 40 minutes and 628 votes cast, similar to the actual results.

The simulation tool uses check-in stations and voting machines as the inputted resources. Our estimates focus on poll worker capacity. To make the linkage between our results and the simulation, we presume that voting resources are assigned proportionally. For example, it makes little sense to have three check-in stations and only one poll worker (or, with the other extreme, 12 poll workers).

We use three different methods to adjust capacity relative to demand to measure the impact of a change

Figure 3. Estimated Average Wait Time in a County Resulting from Increases in *PctDemocrat* Using Three Different Methods for Adjusting Capacity Relative to Demand



in the percentage of Democrats on the average wait time. The first adjusts the average number of check-in stations in response to changes in *PctDemocrat*, leaving all other parameters constant, and assuming that the average change in check-in stations per polling place is proportional to our estimate for the average change in poll workers per polling place. (See Section EC.7 for details.) The second method is analogous to the first except now the number of voting stations is reduced. The third method increases the number of voters per polling place holding voting resources constant. With any of these methods, a reduction in voting resources always increases the average time to vote, as to be expected. (Note that in a study of 30 polling stations across three counties in California in one election, Spencer and Markovits (2010) observed that the length of the queue was positively associated with the number of poll workers at the check-in table. Their study cannot rule out reverse causality. For example, a surge in demand may cause more workers to move to the check-in table. Alternatively, if staffing levels fluctuate during the day, then staffing may be increased during peak demand times, thereby creating a positive relationship between staffing and queue length.)

Figure 3 reports the change in wait times as a function of the increase in *PctDemocrat*. The three methods provide comparable results. For example, a 5% increase in *PctDemocrat* raises the average wait time in a county from an initial 40 minutes to about 115 minutes (average across three methods). Our wait time estimate seems realistic given that a 5% increase in *PctDemocrat* is 1.30 times the within-county standard deviation from 2008 to 2016 (3.85%), and the resulting average wait time is 1.32 standard deviations above the average wait time reported by voters in Florida in the 2012 election in the Cooperative Congressional Election Study (Ansolabehere and Schaffner 2013). However, due to insufficient data on actual voter wait times in Florida, we are not able to establish a direct causal link between polling resources and realized voter wait times.

Our study suggests that there may be no direct effect of race on voting resources and voter wait times. However, because race and political party are correlated, indirect effects of race could exist without controlling for political party. For example, when we regress *PctDemocrat* on *PctWhite*, controlling for election year and county fixed effects between 2008 and 2016, we find that a 1% decrease in *PctWhite* is associated with a 1.12% increase in *PctDemocrat*. Table 3 suggests that race could appear to drive voter wait times if political party is not observed.

Table 3. Association Between a County's Racial Composition (*PctWhite*) and Average Wait Time (Across the Three Different Methods of Adjusting Capacity Relative to Demand) Estimated Due to a Predicted Change in the Political Party Affiliation of the County (*PctDemocrat*) Controlling for Election Year and County Fixed Effects Between 2008 and 2016

Δ*PctWhite*	Predicted Δ*PctDemocrat*	Average wait (min)
0%	0%	40
−1%	+1.12%	55.8
−5%	+5.59%	124.6

6. Conclusion

Ensuring there is no disparity in voting resources among voters of different races or political party affiliation is an important endeavor. Ours is the first panel data study of voting resource disparities in elections. Unlike previous studies, we do not find a disparity with respect to race, per se. Instead, we provide evidence, all else being equal, that as the percentage of Democrat voters in a Florida county increases, the voters in that county experience lower staffing levels (through more voters per poll worker) and longer waits to vote (via our simulation findings). Furthermore, our effect size estimates appear to be meaningful.

We presume that voting resource disparities are not desirable. However, there could be conditions in which resource imbalances are optimal. For example, if non-Democrats experience higher waiting costs per unit of time than Democrats, then a benevolent social planner would choose to bias resources away from Democrats: the unobserved cost of waiting can be equal even if the actual waits differ. Alternatively, if Democrats require less time to complete a ballot (or have lower variance in completion times), then equating waiting times would require different levels of resources per voter. If each poll worker is assigned more hours as a county becomes more Democratic, then the reduction in poll workers might not imply a reduction in the total work hours dedicated to voting: that is, fewer workers working more hours could yield a constant total resource level. Finally, unbalanced resources could be socially optimal if Democrats arrive to the polls more consistently throughout the day than non-Democrats. Although these hypotheses are potentially testable, they do not strike us as plausible.

We do emphasize that whereas our data indicates a resource bias based on political party, this bias does deferentially impact racial groups due to their varying support for the political parties. To the extent that nonwhite voters lean toward the Democratic party, they are more likely to be adversely affected.

Although there are media stories regarding long waits to vote, there have not been reports that precincts have explicitly reduced voting resources. However, there is reason to believe that such bias can occur and also be hard to detect. If the overall voting population is growing (as it was during our study period in Florida) but resources were not proportionally added, then Democratic leaning districts could be disadvantaged merely by keeping their resources constant without the need to explicitly have them reduced. They are only reduced relative to the demand they have to serve, which is less visible. Furthermore, voting resource allocations across polling places suffers from consequential integer constraints—the difference between one and two check-in stations can be significant. Thus, the one area that gets the additional resource is given a significant benefit relative to those in which resources are maintained at the status quo.

Although we identify a causal relationship between political party and voting resources in Florida, we are unable to directly test why Democratic party affiliation is affecting staffing. This may occur due to the competition between the two parties—Republicans may seek to lower staffing to reduce the quality of the voting experience in areas that lean relatively to the Democratic party in an effort to gain some advantage through lower turnout of Democratic voters. Alternatively, the parties may differ in the strength of their preferences for adequate staffing, or in their willingness to pay for these resources.

Independent of why staffing depends on party affiliation, if this is considered undesirable for a well-functioning democracy, a practical solution to address this issue is for a state to regulate the amount of resources in each polling location, with a requirement that resources should be provided to equate waiting times across all voters. Unlike Florida, some states, such as South Carolina, have laws that mandate a maximum number of voters per voting resource. Our analysis in Table EC.8 suggests that South Carolina has consistently maintained better poll worker service levels than Florida since 2010. Although many laws related to the voting process are controversial (e.g., voter identification laws), laws that ensure democracy is equally served across all citizens should be less contentious.

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