Changing Precinct Boundaries: Who Is Affected and Electoral Consequences

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Abstract:

We examine changes to 175,311 precincts between the 2016 and 2020 general presidential elections. Our data are the result of a unique effort to collect precinct boundaries that has never been accomplished before: on a national scale across multiple elections. We observe that precincts that underwent major changes – beyond minor changes that are generally reflective of city and town annexations affecting small populations – contain a greater share of Hispanic and Black residents and are more likely to be found in denser population areas than those that do not change. We find precincts that underwent major changes on average experienced slightly lower turnout rate increases in 2020 than those that did not change.

Introduction

Most voters cast their ballots at polling places. Election officials assign registered voters to geographically-bound units commonly called precincts – in some places known instead as wards or election districts – which are in turn assigned a polling place where voters cast in-person ballots. Of course, there are voting policies such as mail balloting and vote centers that do not require engaged registrants to travel to a specific polling location. However, barring the anomalous 2020 elections, most people typically vote in a rite of passage that takes them through their assigned polling location on Election Day.

Precincts are not static. Election officials may change precinct boundaries for various reasons, which may affect where voters cast ballots on Election Day. These changes to precinct boundaries may also affect voters' behavior. The distance from a person's home to their polling location is negatively correlated with their voter turnout (Gimpel and Schuknecht 2003; Haspel and Knotts 2005), a change in voter's assigned polling place may change a person's preferred mode of voting (Brady and McNulty 2011; Clinton et al. 2021), and a change in a person's assigned polling location may cause confusion that reduces turnout (Amos, Smith, and Ste. Claire 2017). We find precincts that underwent major changes – beyond minor changes that are generally reflective of city and town annexations affecting small populations – contain a greater share of Hispanic and Black residents and are more likely to be found in denser population areas than those that do not change. We further find that precincts that underwent major changes on average experienced lower turnout rate increases in 2020 compared to 2016 than those that did not change.

Background

Precincts serve an important election administration function. Local election officials assign registered voters to precincts. In turn, election officials designate a polling location for each precinct where voters cast their ballots. Local election officials are responsible for creating precinct boundaries within their jurisdictions. As such, precinct boundaries do not cross the jurisdictional boundaries of election officials, which in most states are known as counties.[1]

A primary purpose of precincts is to identify the polling place where election officials distribute ballots to voters, which are the key "point of contact between the average voter and h[er] government" (Beard 1909, 590). Ideally, to reduce the administrative overhead when providing voters with ballots, local election officials prefer to provide a single type of ballot at a polling place – known as a ballot style (Herrnson, Hanmer, and Niemi 2012) – which contains all the offices and ballot questions that voters within a precinct are eligible to vote on. To facilitate creating a single ballot style for each precinct, election officials attempt to conform precincts to the existing political boundaries within their locality, such as cities, towns, and legislative district boundaries – which we broadly construe to be any legislature from the U.S. Congress to local city councils. Conforming precincts to all relevant political boundaries means that a single ballot style can be distributed to voters within a precinct.

Election officials use precincts to make resource allocation decisions. Election officials anticipate the number of in-person voters and distribute voting equipment and poll workers accordingly. States and localities may describe resource allocation formulas in laws and policies,

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[1] Exceptions include Alaska, which utilizes election districts that do not necessarily conform to county boundaries; and Louisiana, which has parishes instead of counties.

such that resources are distributed relatively evenly according to anticipated workload dictated by the number of voters that are to be processed at the polling location.

There are several reasons why precinct boundaries change, through a process akin to redistricting called "reprecincting" (Amos and McDonald 2020). As the preceding discussion implies, reprecincting is likely to occur when political boundaries change due to redistricting of legislative districts. Local political boundaries may also change through annexations, which typically affect only small areas of land and number of people. Reprecincting can also occur when a polling place becomes unavailable and election officials must find a new one. Because polling places have limited capacity, election officials may create new precincts when the number of registered voters within a precinct increases either above the reasonable capacity of a precinct's polling location or due to a formula set by administrative policies. When the number of registered voters within a precinct becomes too small, election officials may consolidate it with another precinct to more efficiently manage their resources. Sometimes precinct splits and consolidations ripple into adjacent precincts, creating a widespread shuffling of precinct boundaries.

There are sometimes practicalities that prevent election officials from achieving the goal of having a single ballot style for each precinct. Local election officials generally prefer to locate polling places within precincts. Districts and local government boundaries often do not conform with one another, such that intersections of district and local government boundaries create slivers that comprise a small population impracticable to administer a polling location for or do not contain a suitable polling location. A common solution to this problem is to allow political boundaries to split precincts and to distribute multiple ballot styles to voters. Technology

facilities this solution with electronic poll books that can identify the proper ballot styles to distribute to voters and with printers that can provide on-demand ballots.

Some states and localities faced with the obstacle of managing precinct operations for a small number of voters or for a geography difficult to find a suitable polling location create special all-mail ballot jurisdictions, where all active registered voters are mailed a ballot and no polling location is provided except for emergency situations at a central election office. Nevada was the first state to create all-mail ballot precincts in 1923 (McDonald 2022). California law requires a precinct for every unique intersection of political boundaries, and similarly runs all-mail ballot elections when the number of registered voters is small (Brady and McNulty 2011). That is, California conducted their elections this way until it joined the ranks of the eight states (as of this writing) that conduct all-mail ballot elections statewide.[2] A few states allow smaller localities the option of conducting all-mail ballot elections and may limit this option to local elections only. All-mail states and localities still have precincts, but they do not serve the same election administration functions as those states with Election Day in-person voting. All-mail jurisdictions primarily serve the purposes of creating appropriate ballots styles and to report election results within small geographies, which assists political campaigns with voter targeting and with redistricting.

Another way technology has transformed precinct operations is through the vote center model. Vote centers are special precincts where any eligible voter within a local jurisdiction may cast their ballot. When election officials locate vote centers in high traffic locations voter turnout increases, even if these localities may have fewer Election Day precincts (Stein and Vonnahme 2008). Election officials commonly deploy vote centers during early in-person voting periods,

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[2] For a summary of all-mail ballot laws, see: https://www.ncsl.org/elections-and-campaigns/table-18-states-with-all-mail-elections (accessed May 11, 2023).

although some states and localities may continue to offer vote centers on Election Day.[3] Some vote-center states are all-mail ballot states with an in-person voting option for those who wish to vote in this manner, and some states specify that vote centers may be used only in local elections or serve specific communities, such as disabled individuals. During the COVID emergency some states and localities, such as Maricopa County, Arizona and the entire state of Kentucky, adopted vote centers.

Theory

The adoption of election reform is politically contested in the United States, with Democrats generally supporting reforms that provide greater voting access, and Republicans opposed to reforms such as mail balloting and vote centers (Hasen 2012; McDonald 2022). Reprecincting is a low-level and routinized election administration procedure that may fly below the radar of these higher-level voting wars. However, there is reason to suspect reprecincting affects voter turnout and these effects can be complicated. Haspel and Knotts (2005) find that voters assigned to an Atlanta, Georgia polling location for a 2001 mayoral election farther from their home were less likely to vote. However, the overall turnout effect of reprecincting was positive for those registrants whose election officials moved them into a new precinct. These scholars attribute this paradoxical result to election officials increasing the number of precincts by splitting some existing precincts into two or more parts, thus reducing the distance from registrants' homes to their polling locations in the aggregate. Thus, when reprecincting is a function of procedures designed to improve voters' experiences it may facilitate participation, even if some registrants may be inconvenienced by changes.

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[3] For a summary of vote-center laws, see: https://www.ncsl.org/elections-and-campaigns/vote-centers (accessed May 11, 2023).

In contrast to the analysis of a 2001 election in Georgia – at a time before Georgia had yet to adopt no-excuse absentee voting (Biggers and Hanmer 2015) – are studies of polling place changes in states that had more robust alternative voting options, such as mail balloting and in-person early voting. In a study of California's 2003 gubernatorial recall election, Brady and McNulty (2011) examine the voting behavior effects of Los Angeles County election officials reducing the number of polling places by consolidating precincts – a policy many localities engage in when voter turnout is expected to be lower than high-turnout general elections. In contrast to Haspel and Knotts' (2005) Atlanta study, these Los Angeles precinct consolidations resulted in fewer polling places and greater transportation costs for voters. Brady and McNulty (2011) find a nearly two-point decline in turnout from precinct changes, which would have been a percentage point greater if some voters had not chosen to alter their voting mode by casting a mail ballot. A study of the 2008, 2012, and 2016 North Carolina presidential elections finds a similar substitution effect of voting mode, with voters moved farther from a polling place more likely to cast an in-person early ballot, nearly entirely offsetting negative effects from precinct changes (Clinton et al. 2021).

Brady and McNulty (2011) lead their paper with a mid-2000's anecdote of Houston's elections official stating he manipulated turnout among favored and disfavored groups by strategically locating polling locations. Amos, Smith, and Ste. Claire (2017) are likewise less sanguine that polling location changes have no or little negative effect on overall turnout. Motivating their investigation of Manatee County was that Supervisor of Elections and former state Senator Mike Bennett argued voting was "a privilege" and that people should have to "walk across town to go over and vote" when he sponsored a suppressive voting law which a federal court later overturned. These scholars find reprecincting for the 2014 general election resulted in

voting mode substitution effects, but unlike the other studies, the substitution effects did not fully compensate an overall lower turnout rate of nearly two percentage points attributable to changing precinct boundaries, particularly depressing Hispanic turnout rates.

We thus have conflicting theoretical predictions about the turnout effects of precinct boundary changes. In one frame, reprecincting is a routinized election administration procedure intended to improve voting experiences and lower voting costs, and thereby increases voter turnout. In the other frame, reprecincting intentionally or unintentionally results in voter confusion or increased distance from polling locations on average across all voters, increases voting costs, and thereby reduces voter turnout.

The extant studies of the effects of precinct changes on turnout do not go much further than examining changes of distance to polling locations and voting mode substitution effects. These studies are limited in their analyses due to their use of administrative data – voting records – and not survey data, which can illuminate individuals' attitudes and opinions motivating behaviors. Scholars speculate that lower turnout may arise due to "information costs associated with locating the new polling station" (Haspel and Knotts 2005: 556). If one mechanism that lowers turnout is that changing precinct boundaries causes voter confusion, we may expect new registrants who move into a precinct – once they have overcome the cost of registering – to be less burdened compared to continuing registrants in the precinct, as they would not have been exposed to voting at the precinct's former polling location. We thus expect precincts with a higher percentage of new population to be less sensitive to precinct boundary changes. To be clear, we conceptualize the dynamic between an influx of new population to be conditional on precinct changes – an interactive effect. We expect the length of time a person lives in a precinct to directly socialize an individual into a community and thus be positively associated with

turnout, as numerous scholars theorize and find such a positive relationship (e.g., Wolfinger and Rosenstone 1980).

If reprecincting is an administrative practice intended to improve voting experiences, especially where population is growing, precinct changes may have positive turnout benefits that offset any negative turnout effects. Election officials may split existing precincts into two or more precincts to reduce workloads and wait times at what would otherwise be overcrowded precincts (Haspel and Knotts 2005).

We infer from extant studies that find a substitution effect on voting mode (Brady and McNulty 2011; Amos, Smith, and Ste. Claire 2017; Clinton et al. 2021) that precinct boundary changes in a state or locality that uses all-mail ballot elections should have no discernable turnout effect. Where mail-ballot states and localities provide for in-person voting options on Election Day, it is at vote centers where anyone in the jurisdiction may vote. Similarly, we expect precinct changes have no turnout effects for states and localities that employ vote centers. In both circumstances, election officials use precincts primarily to manage ballot styles and election results reporting, which are not theoretically connected to turnout. Thus, these states and localities serve as a useful control group from which to test our theories about precinct changes in states where these changes should matter.

Data and Methodology

In a multi-year project, we collected precinct boundaries for the entire United States and merged these boundaries with statewide election results for all general elections spanning 2016

through 2020.[4] For our analysis we wish to detect changes to precinct boundaries occurring between the 2016 and 2020 presidential elections. We cannot rely on identifying changing precincts by examining precincts' names because election officials may name and rename precincts for reasons apart from changing their boundaries.[5] We thus identify precinct boundary changes by overlaying their boundaries. To understand substantive effects of these changes, we further overlay precinct boundaries with census geography. This step allows us to enrich our analyses with aggregate population statistics from the Census Bureau's decennial census and the American Community Survey. A difficulty is that precinct boundaries do not always conform with census geography. We devise a solution to apportioning aggregate statistics to geographic units that intersect and split one another employing a method known as dasymetric mapping (Amos, McDonald, and Watkins 2017). Where a census geographic unit is split by a precinct, we determine how much of the aggregate population statistics to apportion to the split pieces by measuring housing density within the fragments, which we estimate from the National Land Cover Database.

Through this methodology we calculate the voting-age population (VAP) within the 2016 general election precincts, the 2020 general election precincts, and the overlapping geography created by intersecting the 2016 and 2020 precincts. We use the 2020 decennial census for the VAP of the 2020 precincts. Using the precincts election officials created for the 2020 general election as the comparison point, we compute the *Precinct Continuity* of a 2020 precinct's

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[4] We use the generic name "precincts" to refer to these election geographies even though election officials may refer to these administrative units as precincts, wards, or election districts. These data and documentation about their collection are available at: https://dataverse.harvard.edu/dataverse/electionscience

[5] This may happen when election officials adopt new nomenclature to name precincts. It may happen in localities where election officials name precincts after their polling locations, and election officials have assigned a new polling location to a precinct. It is also possible that district boundaries will change without changing precinct names, particularly in places where they are sequentially numbered. Precincts may even be renumbered such that there is no change to the precinct names in use, but the names are attached to different physical precincts.

population with the 2016 precinct that has the largest population overlap, which is the key independent variable in our analyses.
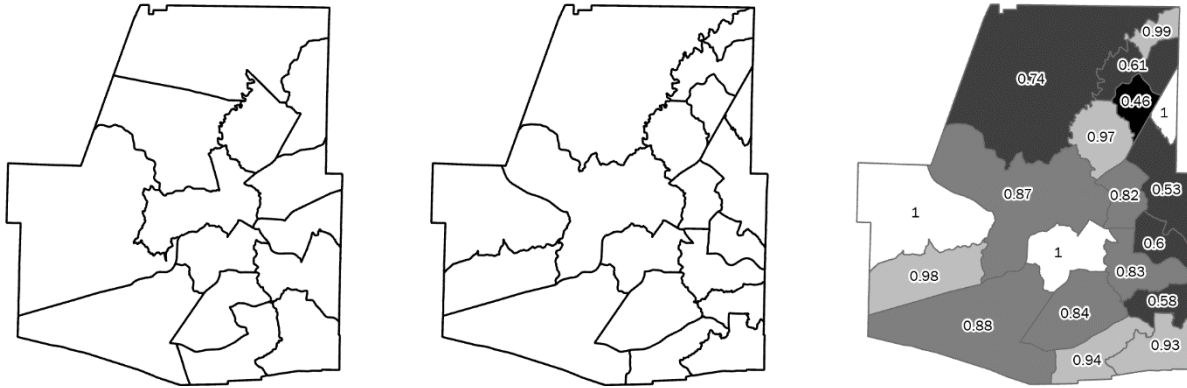

Figure 1. Paulding County, Georgia Precinct Maps. From Left to Right, the Precinct Map in 2016, the Precinct Map in 2020, and the Precinct Map in 2020 Labeled with Precinct Continuity Scores.

Of the 175,426 precincts election officials created for the 2020 general election, 142,408 or 81.2% had no change from the 2016 general election affecting population. In Figure 2, we plot the frequency distribution for the remaining 33,018 precincts. When precincts do change, most frequently these changes affect a relatively small number of people. Nearly half of the precincts that changed – 14,113 – experienced a continuation of 95% or more of the precinct's population. This is consistent with our understanding of the mechanism of precinct changes. These small changes are generally due to minor local annexations that affect a relatively small number of people.[6]

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[6] We exclude from our analyses 1,365 precincts the Census Bureau identifies as having zero voting-age population. Election officials typically create these pseudo-precincts for special uninhabited areas like large parks, or to report election results for non-geographically bound populations, such as overseas civilians or homeless individuals. These latter pseudo-precincts typically comprise a single census block where an election office or county courthouse is located.
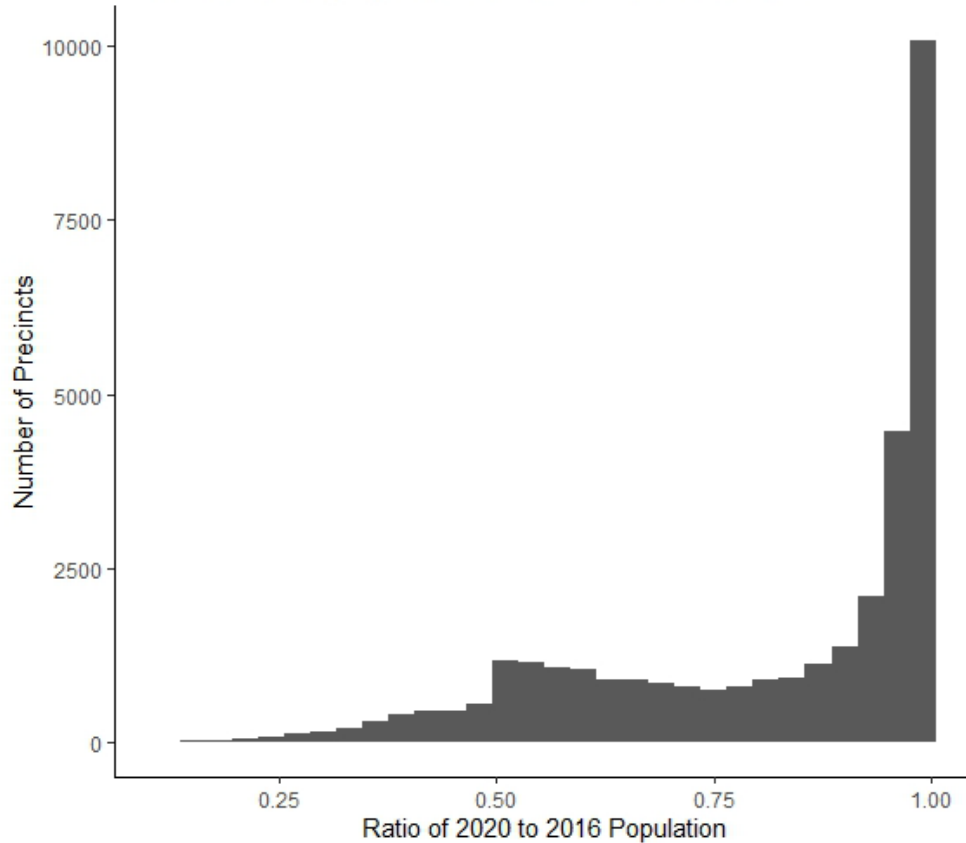
Figure 2. 2020 to 2016 Ratio of Voting-Age Population Within Changed Precincts

Our dependent variable is a turnout rate change measure. The Census Bureau disseminates VAP from the decennial censuses within the smallest census geographic units – census blocks – which allows us to make a relatively precise allocation of VAP to precincts. When investigating how changing precincts affects voter turnout, a measure of eligible voters that takes into account citizenship and ineligible felons may be more desirable to measure (McDonald and Popkin 2001). Unfortunately, constructing measures of eligible voters within precincts is difficult since precise estimates of citizens and prison populations are not readily available. Mitigating this shortfall is that we construct *change* in turnout rates from 2016 to 2020. We do not expect turnout rate change over four years to be greatly biased by our inability to control for citizenship and ineligible felons. We do control for changes to the voting-age

population by interpolating precincts' 2016 VAP from the change in population between the 2010 to 2020 decennial censuses. For the numerator of the turnout rates, we use the vote for president, rather than the total ballots counted, because states are inconsistent in how they report write-in candidates and ballots without valid votes at the precinct level.

We include the following control variables in the model chosen for their typical relationships with voter turnout (Wolfinger and Rosenstone 1980). We construct two racial and ethnicity variables from the 2020 decennial census: percent *Black VAP* and percent *Hispanic VAP* of the precinct. Other variables are drawn primarily drawn from 2016-2020 American Community Survey (ACS) 5-year estimates.[7] These include the precent of the population *Age 18-34* (percent of the precinct age 18 to 34), percent *Some College or More* (the percent who report at least some college education), percent of households with *Income >$75K*, and percent of households with a length of residence in the precinct of *1 Year or Less*.

To generate theoretical expectations for these variables for our dependent variable – the turnout difference within a precinct from 2016 to 2020 – we analyze the Census Bureau's Current Population Voting and Registration Supplement. We present in the first two columns of Table 1 the turnout rates for selected groups in the 2020 and 2016 general elections. The third column is the increase in the turnout rate from the 2016 election to the modern historically high turnout election of 2020. The fourth column provides the increase relative to a reference group, denoted with a dash. From these simple statistics we expect a negative relationship between the turnout difference and *Black VAP* and *Hispanic VAP* relative to the omitted reference category of

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[7] These data are available at the block group level, the next smallest census geography. There is survey error associated with these ACS *survey* data. Even though the 5-year ACS has over 1 million respondents, the subgroups are small for census block groups. Although we use some ACS variables, we choose not to use the ACS's citizenship estimates to constrict citizen-VAP turnout rates. We might use a prior 5-year ACS for 2016 and 2020 CAVP, but these data are noisy for individual years; noise which is compounded when calculating CVAP turnout rates differences between elections.

Whites. We expect a positive relationship for *Age 18-34*, a positive relationship for *Some College or More*, and a small negative relationship for *Income >$75K*.

Category	2020	2016	Diff Across Elections	Diff Within Groups
Race/Ethnicity				
Non-Hispanic White	72.6%	64.7%	7.9%	-
Non-Hispanic Black	65.6%	59.9%	5.7%	-2.2%
Hispanic	52.5%	44.9%	7.6%	-0.3%
Age				
<35	54.2%	44.4%	9.8%	+2.8%
35+	70.4%	63.4%	6.9%	-
Education				
H.S. Grad or Less	50.3%	44.3%	6.0%	-
Some College or More	79.4%	71.5%	8.0%	+2.0%
Household Income				
<$75K	59.9%	53.3%	6.6%	-
>$75K	78.7%	72.4%	6.3%	-0.3%
Length at Residence				
1 Year or Less	54.2%	44.4%	9.8%	-
More than 1 Year	70.4%	63.4%	6.9%	-2.8%

Table 1. Selected 2016 and 2020 CPS Turnout Rates

Notes: Data from the 2016 and 2020 Current Population Survey, Voting and Registration Supplements with Hur and Achen (2013) weight adjustments. A "-" denotes the reference category for difference calculations within groups.

An important ACS variable relevant to our investigation of the effect of precinct changes on turnout is the percentage of the precinct's population that has lived *More than 1 Year* within the precinct. We expect the direct effect of *More than 1 Year* on the turnout change from 2016 to 2020 to be positive. However, we are primarily interested in its interaction with *Ratio*, which we

expect to be negative (to offset the positive direct effect), since newer residents to a precinct should be unaffected by precinct changes they never experienced. Additionally, Haspel and Knotts (2005) argue precinct splits improve voter turnout by locating polling places closer, on average, to registrants in formerly overcrowded precincts. To test these findings, we add to our analyses a variable *Split Precinct,* which identifies if two or more 2020 precincts were entirely and exclusively contained within a single 2016 precinct.

Several studies (Brady and McNulty 2011; Amos, Smith, and Ste. Claire 2017; Clinton et al. 2021) find precinct changes may lead voters to utilize alternatives to in-person Election Day voting. These studies differ in the degree to which changing vote modes can mitigate negative turnout effects from changing precinct boundaries. States and localities where precincts serve primarily the purposes of managing ballot styles and reporting election results thus serve as placebo cases, since these changes should not affect turnout. We subset our data into two categories and estimate separate statistical models: those states and localities that either ran all-mail ballot elections in the 2020 general election or used Election Day vote centers, and those that did not. We classify as all-mail ballot the states of Colorado, California, Hawaii, Nevada, Oregon, Utah, Vermont, Washington, Washington DC, and certain counties within Montana, Nebraska, and North Dakota; and we classify jurisdictions offering vote centers as Kentucky, and Maricopa County, Arizona (McDonald 2022). Unfortunately for our analyses, due to the COVID emergency in 2020, some Kentucky and New Jersey counties reported their election results jurisdiction-wide, so we cannot measure precisely presidential vote within these counties' precincts. At this time, California's 2016 data have numerous issues that require our attention. For these reasons, we exclude California, Kentucky, and New Jersey from our analyses.

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We include a general variable meant to identify the resources and professionalization of election administration within counties, the 2020 voting-age population of the county. Our assumption is that larger counties have a more robust tax base and therefore are able to devote more resources to election administration. Because counties have such widely varying populations, we log to construct *Log County VAP*.

We estimate a linear model with state fixed effects for our estimation, allowing errors to vary between states. We investigated hierarchical linear models at the state and county levels, but the models would not converge. We suspect this is because rural counties may have three or four precincts, thus challenging the estimation procedures that perform better with a larger number of within-group observations. The choice of state fixed effects means that we control for state-specific conditions, but we cannot estimate separately the effects of state-specific laws and electoral contexts, such as the presence of alternative voting modes and electoral competitiveness. Although within some states there are only certain counties that run all-mail elections or use Election Day vote centers, we choose to run a separate model for these states and localities rather than employ a dummy variable identifying these jurisdictions in one grand model. We take this approach to bifurcate our data because it effectively allows us to test for interaction effects among all independent variables, a desirable feature that will become evident as we conduct our analysis.

Analysis

To begin our analyses, we provide some basic demographic statistics for precincts where changing boundaries theoretically affect turnout – that is, states and localities that do not run all-mail elections or have vote centers, setting aside California, Kentucky, and New Jersey for the aforementioned data issues. We further segregate precincts into three categories. First, those

precincts with no change. Second, those precincts with a minor change of 90% or more precinct continuity, which we typically observe in our data work to result from minor local annexations. Third, those precincts with a major change of less than 90% precinct continuity.

We present in Table 2 selected mean statistics across the three types of precincts: those with no, minor, or major changes. Precincts with major changes are the most diverse. Precincts with a major change have on average a Non-Hispanic White VAP percentage of 61.3%, compared to 68.9% for those with no change and 71.5% for those with a minor change. We find the mirror of this examining the non-Hispanic Black and Hispanic share of precincts across the three categories. Precincts with major changes have a larger share of their VAP from both categories than those with no change or with minor changes: on average, 16.7% and 13.0% of the major change precincts are non-Hispanic Black and Hispanic, respectively, while 13.9% and 11.0% are for no change precincts and 12.4% and 9.3% for minor change precincts.

2016 to 2020 Continuity	% Non-Hispanic White	% Non-Hispanic Black	% Hispanic	Density (VAP per Mile^2)	N
No Change	68.9%	13.9%	11.0%	1,820	113,753
Minor Change	71.5%	12.4%	9.3%	741	13,068
Major Change	61.3%	16.7%	13.0%	5,249	5,394

Table 2. Selected Demographics of Precincts with No Change from the 2016 General to 2020 General Election, Minimal Change (>90% VAP Continuity), and Major Change (<90% VAP Continuity)

The pattern of population densities across the three types of precincts are generally consistent with our understanding of where these different types of precincts are located. Those with minimal change tend to be modified due to city and town annexations that occur on the fringe of towns, and the annexed property may contain low-density lands for public use, such as landfills and parks. The voting-age population density of precincts with minor changes is 741

persons per square mile. The precincts with no change have the next highest population density on average of 1,820 persons per square mile. This is again consistent with our experience of collecting precinct boundaries, as small rural counties often do not make changes to their precincts. Reflecting the observation that precinct changes are more frequently an urban phenomenon, precincts experiencing major changes are the most densely populated, with an average 5,394 persons per square mile.

The simple examination of the 2016 and 2020 VAP precinct turnout rates, which we present in Table 3, suggests that major changes negatively affect turnout rates. Keep in mind that turnout increased from 2016 to 2020, which experienced the highest turnout rate among eligible voters since 1900 (McDonald 2022). Those precincts with major changes to their boundaries had the smallest increase of turnout, with a 4.6 point increase. Precincts with no change saw a 5.5 point increase and those with a minor change a 6.5 point increase.

2016 to 2020 Continuity	2016 Turnout	2020 Turnout	Change
No Change	58.5%	63.9%	5.5 pts
Minor Change	59.1%	65.6%	6.5 pts
Major Change	54.6%	59.1%	4.6 pts

Table 3. Estimated 2016 and 2020 VAP Turnout of Precincts with No Change from the 2016 General to 2020 General Election, Minimal Change (>90% Continuity), and Major Change (<90% Continuity)

While the statistics we present in Table 3 are suggestive that reprecincting has a negative effect on turnout rates, we cannot be certain, because Table 1 suggests that precincts are not randomly assigned among the three types of groups. Precincts that experience major changes are more diverse and urban, and it could be other spurious correlations, such as precincts' diversity, account for the turnout differences in Table 2. To further explore the relationship between changing precinct boundaries and voter turnout, we estimate a linear state fixed-effects model

using the various independent variables described previously as predictors. We estimate two models. In Table 3 we present estimated coefficients, standard errors, and t-statistics for Model 1, which excludes states and localities that run all-mail elections or offer Election Day vote centers, and Model 2, which includes only these states and localities.

Our primary interest is the estimated relationship between *Precinct Continuity* and change in voter turnout. Because we estimate linear regression models, the coefficient is the estimated effect of the change of an independent variable on the change in a precinct's VAP voter turnout rate from 2016 to 2020 (here, expressed as a value varying between -1 and 1).[8] In states where voters cast ballots at geographically-bound polling places on Election Day, we see from Model 1 that changing precinct boundaries is negatively associated with turnout. This relationship is statistically significant with a t-statistic of 2.82. The direct effect is that a precinct without a boundary change has a 9.4 point higher turnout rate than one where only 50% of the precinct's VAP continued from 2016 and 2020. Further supporting this effect on turnout is that for states and localities that run all-mail elections or offer Election Day vote centers, the relationship is weaker and in the opposite direction but not statistically significant, with a t-statistic of -1.38.

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[8] We investigated alternative model specifications, such as including the square and higher order polynomials of *Precinct Continuity*, to reflect the apparent non-linear relationship between precinct change and turnout change evident in Table 2. However, we could not recover the apparent non-linear relationships in Table 2 when we control for other factors. We choose to present the simple linear effect of *Precinct Continuity* since it is the easiest to interpret.

Variable	Model 1 Coefficient (Standard Error)	t-stat	Model 2 Coefficient (Standard Error)	t-stat
Precinct Continuity	0.188 (0.067)	2.82	-0.099 (0.071)	-1.38
% At Same Home > 1 Year	0.261 (0.078)	3.35	-0.106 (0.071)	-1.50
Precinct Continuity x % At Same Home > 1 Year	-0.189 (0.078)	-2.43	0.140 (0.095)	1.46
Split Precinct	-0.006 (0.011)	-0.49	-0.010 (0.003)	-3.64
% Non-Hispanic Black	-0.072 (0.008)	-8.49	-0.039 (0.017)	-2.23
% Hispanic	-0.054 (0.010)	-5.42	-0.097 (0.030)	-3.23
% Age 18-34	-0.059 (0.008)	-7.73	-0.030 (0.013)	-2.27
% Some College or More	-0.002 (0.012)	-0.16	-0.060 (0.012)	-5.18
% Income > $75K	0.032 (0.027)	1.19	0.004 (0.048)	0.09
Population Density (per 100,000K VAP)	-0.062 (0.021)	-2.88	-0.535 (0.091)	-5.86
Log County VAP	0.001 (0.001)	0.80	0.003 (0.001)	2.53
(State Fixed-Effects Omitted)			____	
Observations	126,289		17,972	
R-Sq	0.1588		0.0854	

Table 3. OLS Regression Estimating 2016 to 2020 Turnout Change, with State Fixed Effects and Within-State Variance

The evidence that precinct changes negatively affect turnout is supported further when examining the relationship between turnout and precinct changes in precincts with more stable populations. As we expect, the direct relationship between *% At Same Home > 1 Year* in Model 1 is positive, as these people may have deeper ties to their communities. However, having a deeper tie with a community may work against a person who has voted at the same precinct over multiple elections. The negative estimated coefficient on the interaction term between *Precinct Continuity* and *% At Same Home > 1 Year* suggests long-term residents of a precinct may be confused by a change to a precinct boundary change, mistakenly go to the wrong precinct, and then fail to vote. The interactive effect is statistically significant with a t-statistic of -2.43. Fortunately, the substantive effect is small. The average percentage of VAP residing in a precinct one year or longer is 87%, which contributes an additional 2.4 percentage points to lower turnout for the few precincts where only fifty percent of the population continued from 2016 to 2020. Supporting further that precinct boundary changes negatively affect turnout is that in Model 2 – for the all-mail and Election Day vote center states and localities – the interaction effect is not statistically significant, as expected, since voters in these states do not vote at polling places.

There are good governance election administration reasons to split precincts. When they become too large by law or local policy decisions, election officials may create two or three precincts out of a single precinct. There is little support for this in our estimations. *Precinct Split* is signed negative, opposite of the expected effect, although it is not statistically significant with a t-stat of -0.49. Curiously, the effect of *Precinct Split* is negative and statistically significant for those states and localities that use all-mail balloting or Election Day vote centers. The effect is substantively small, however, of a single percentage point.

Another potential indicator of improved election administration is the *Log County VAP*, which we include in our models as an indicator of election official resources. In both models, the estimated coefficients are positive, but it is statistically significant only in Model 2 among states offering all-mail ballot election or Election Day vote centers. We might have expected the opposite since these reforms are generally thought to reduce the cost of administering elections.

The racial and ethnic variables perform as expected on change in VAP turnout rates from 2016 to 2020, as drawn from the Current Population Survey statistics we present in Table 1. The greater the share of the Non-Hispanic Black or percent Hispanic, the lower the change in turnout, compared with the effectively omitted category of non-Hispanic White. This negative relationship among racial and ethnic categories is separate from the statistically significant negative relationships evident in both models between *Population Density* and turnout change, meant to capture urban and rural differences. We add this variable to our models to control for the differences in precinct changes we observed in Table 1 and Table 2. We might have expected a more of a positive relationship given that precincts that experienced major changes had the lowest turnout rate increases. We might interpret *Population Density* as indicative of President Donald Trump's rural support base which he effectively rallied in the 2020 election.

The other demographic variables do not perform as we expect from the Current Population Survey statistics we present in Table 1. The small and statistically insignificant positive relationship between *% Income > $75* and turnout change may be reflective of the small negative relationship in observed in Table 1. The effect of education on turnout change is more difficult to reconcile since Table 1 revealed a positive relationship of higher *% Some College or More*, while our estimation finds a negative relationship that is statistically significant only among states and localities using all-mail elections and those that offer Election Day vote

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centers, and its substantive effect is relatively small. Likewise, *% Age 18-34* of a precinct's VAP is negative and statistically significant in both models when in Table 1 it is positive relative to other age groups. It may be that precincts with the highest density of younger, college educated people could be found in on-campus polling locations that had lower turnout in the midst of the COVID emergency when many campuses had moved to virtual instruction.

Conclusion

Precincts are a critical component to election administration. They define the collection of registered voters who are offered in-person voting at a particular polling place on Election Day, the resources that will be allocated to the precinct, what ballot styles will be distributed to voters, and the reporting of election results. Sometimes election officials change precincts, ostensibly to improve voters' experiences by better managing the flow of voters through polling locations (Haspel and Knotts 2005). It is possible, however, that precinct changes could confuse long-time residents who suddenly have to vote in a new location or increase the distance of some voters to their polling location, thereby decreasing their turnout rates (Amos, Smith, and Ste. Claire 2017). This negative turnout effect may be mitigated fully or partially by alternative voting options, such as mail balloting and in-person early voting (Brady and McNulty 2011; Amos, Smith, and Ste. Claire 2017; Clinton et al. 2021).

Prior studies of precinct changes have essentially been case studies of particular localities or states. We offer the first national investigation of the turnout effects of precincts that changed their boundaries from the 2016 to 2020 presidential elections. We find that even in the unusual 2020 election where voters used mail balloting and in-person early voting options at unprecedented rates (McDonald 2022), states and localities that offered in-person Election Day voting experienced lower turnout among precincts with boundary changes than those that did

not, a finding most consistent with Amos, Smith, and Ste. Claire's (2017) study of Manatee County, Florida. In all-mail ballot and Election Day vote center states, election officials administer precincts primarily for reasons that have little to do with turnout rates, such as determining the ballot style or reporting of election results. For these jurisdictions, we observe no direct turnout effects of precinct boundary changes. This comparison to a pseudo-control group provides us confidence that our observations are not a spurious effect. Indeed, we further see that, consistent with the potential to confuse voters first articulated by Haspel and Knotts (2005), the negative effect of precinct boundary changes is attenuated in precincts with a greater share of new residents, people who should be reasonably less confused by precinct changes and polling place changes that may accompany them. Further, we see that this effect is present only among states and localities that offer in-person Election Day voting within precincts.

We do not observe that election officials splitting precincts because they have grown too large offsets these negative turnout effects of changing precinct boundaries, as supposed by Haspel and Knotts's (2005) study of a 2001 Atlanta mayoral election. There are good reasons for election officials to better manage precinct operations by reducing the number of people who vote at a polling location. Our study suggests that election administrators should take care when doing so to minimize disruptions, and we encourage election officials to avail themselves to robust communication with affected voters.

Finally, we note potential voting rights concerns, as Amos, Smith, and Ste. Claire (2017) find among Manatee County, Florida Hispanic voters. Precincts that undergo major changes to their boundaries tend to be more often located in minority communities. These major changes have the greatest potential to depress voter turnout, and thus further emphasizes the need for

election officials to take care when altering precinct boundaries and to communicate as effectively as possible with affected voters when they do.

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