THE BLUE SHIFT
IN THE 2020 ELECTION

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ABOUT THE AUTHORS

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ABOUT THIS REPORT

EXECUTIVE SUMMARY

The analysis in this report is based on election results supplied by the National Election Pool/Edison research and reported by the *New York Times* on a nearly continuous basis from the time polls closed in the various states until final certification.

At the highest levels of aggregation—the nation and the states—the size of the "overtime vote" (i.e., votes reported after election night) in 2020 was comparable to that in 2016, as was the magnitude of the national "blue shift" (i.e., the tendency of these overtime votes to disproportionately favor the Democratic candidate). The major difference from 2016 is that the inter-state variance in the blue shift was much greater in 2020.

INTER-STATE VARIATION IN THE PACE OF RE-PORTING VOTES

» A large number of states, 31, had reported over 90 percent of their votes within eight hours of polls closing.
» As the number of ballots reported climbed in the states, the vote shares of Biden and Trump tended to converge quickly on the final vote shares. Within eight hours of polls closing 39 states were within at least two percentage points of where their final results would be.
» At four hours after polls closed, states in the west tended to be showing vote totals more favorable to Biden than the final count, whereas states in the east tended to show results more favorable to Trump than the final count.
» At the forty-eight-hour mark after polls closed, fifteen states were still outside of half a percentage point of where their final two-party vote share would be. Three of these states—Arizona, Pennsylvania, and Nevada—were battleground states.

DECLARATION OF LIKELY WINNERS

» A simplified analysis is performed to show the relationship between the unfolding vote reports and the timing of when the Associated Press projected winners in the states. This analysis ignores uncertainty about final vote totals. That analysis shows that declarations of likely winners generally occurred well before the trailing candidate was "mathematically eliminated," with the notable exception of North Carolina. The states that were called the latest, compared to the votes that had been reported, were Florida and Ohio—two states that seemed to lean toward Biden in the pre-election polling, but which quickly saw Trump pull out to an insurmountable lead when election results were released.
» Had the networks waited until a sufficient number of states had certified results to guarantee Joe Biden's victory in the Electoral College to declare a likely winner, they would have waited un-

til December 7, rather than November 7, which is when the networks had declared Biden the likely victor.

THE EFFECT OF PREPROCESSING RESTRICTIONS ON THE PACE OF VOTE REPORTING

» States with prohibitions against preprocessing absentee ballots were slower in reporting election results than states without those prohibitions in the first eight hours after the polls had closed. However, the average differences in reporting paces were not dramatic; several states with preprocessing prohibitions were among the fastest-reporting. Within 24 hours after polls closing, the gap in reporting speed between the two groups of states had disappeared.

THE CORRELATION BETWEEN SIZE, PARTISANSHIP, AND MAIL-BALLOT VOLUME WITH PACE OF REPORTING

» In most states, votes were reported at a faster rate in counties that were smaller and more Republican, although there were exceptions.
» The correlation between the fraction of votes cast by mail in a county and the speed with which votes were reported was positive in about as many states as it was negative. In other words, counties with more absentee ballots were slower to report votes in only about half the states.

VARIABILITY OF REPORTING PACE WITHIN PRECINCTS (GEORGIA CASE STUDY)

» Analyzing precincts in Georgia, we find that the absentee portion of vote returns

tended to come in multiple waves over a twenty-hour period, early-in-person returns were reported over a one-hour period, and Election Day returns were reports almost instantaneously after polls closed.

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INTRODUCTION

The dynamic of the vote count became a major issue in the conduct of the 2020 presidential election. This concern was most frequently expressed by supporters of Joe Biden, who worried that Donald Trump would declare victory on election night based on a theory that only ballots tabulated on Election Day were legitimate. The fact that ballots might be counted in waves, and that Biden and Trump might be momentarily ahead in the released count at various moments after the polls had closed, was communicated to the public to an unprecedented degree before the election, and became woven into the election night narrative by most national media outlets.[1]

In the end, election results were reported much more quickly than many had anticipated. As a result, the shifts that occurred were relatively fleeting, failing to outlast election night. In almost every state, the presidential victor was clear within five hours of polls closing. In the few exceptions, the problem was not wild gyrations in reported election results, but the simple fact that the vote count was close.

At the same time, patterns of election-return reporting played a central role in many of the conspiracy theories that grew up immediately following the election. For instance, Russell Ramsland, Jr. testified several times, and filed numerous reports, arguing that spikes in vote tallies that occurred early on Wednesday morning of election night were evidence of vote tampering that denied Trump reelection.[2]

The purpose of this paper is to put the stream of reported vote totals following the 2020 presidential election in context. Relying on election results gathered and distributed by the National Election Pool and reported by the *New York Times*, we show that the overall size of the "overtime vote," (i.e., votes counted and reported after election night), was comparable in size to the 2016 election, and the degree of the "blue shift" (the disproportionate tendency for overtime votes to trend Democratic) was also comparable to 2016. The pace of vote reporting was quick on election night, with thirty-one states seeing over ninety percent of votes being reported within eight hours of the polls closing.

We perform analysis of the relationship between the pace of reporting (and the related partisan vote share) and the timing decisions by the Associated Press to declare likely winners in states. States were generally "called" well before the winner had mathematically eliminated the trailing candidate, with the notable exceptions of North Carolina, Florida, and Ohio.

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[1] Trip Gabriel, "This Is Democrats' Doomsday Scenario for Election Night," *New York Times*, September 2, 2020, p. A1, https://www.nytimes.com/2020/09/02/us/politics/voting-election-day.html.

[2] Russell James Ramsland, Jr., "Affidavit of Russell James Ramsland, Jr.," *Wood v. Raffensperger*, N.D. Ga. Nov. 20, 2020, 1:20-cv-04651-SDG, https://www.courtlistener.com/recap/gov.uscourts.gand.283580/gov.uscourts.gand.283580.7.1_2.pdf

Finally, state prohibitions against pre-processing absentee ballots had a statistical effect on the speed of vote reporting in the first eight hours after polls were closed, but by 24 hours, there was no statistical difference between states that had or did not have these prohibitions.
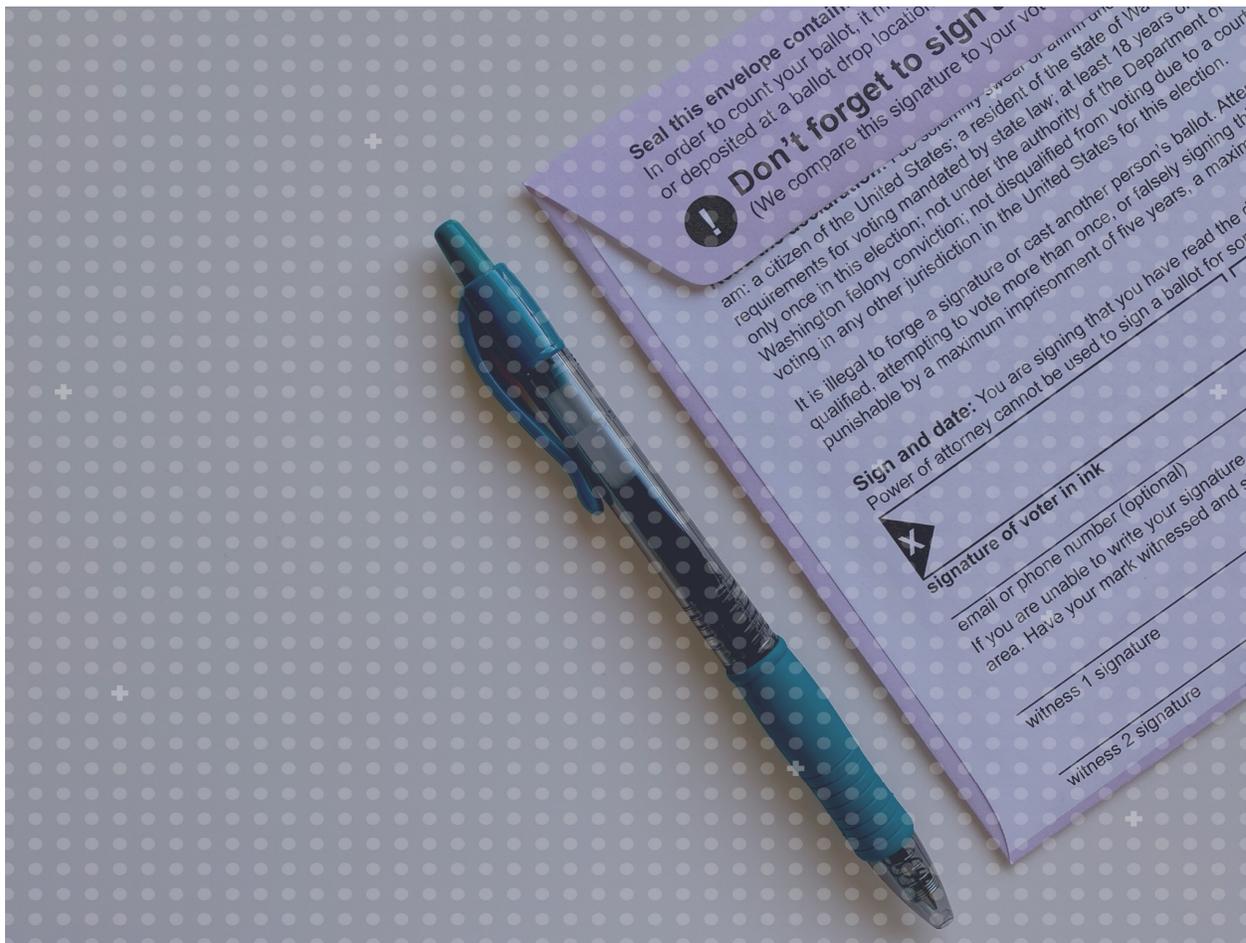
COUNTING AND REPORTING THE RESULTS

The recent academic interest in the non-random reporting of election results can be traced to the scholarship of Foley, who noted that in recent presidential cycles, there was a Democratic tilt to the presidential votes counted and reported after election night.[3] He referred to this phenomenon as the "blue shift," reflecting the empirical regularity of presidential election results becoming "bluer," i.e., more Democratic, in the "overtime" period of vote counting after election night. Subsequent research demonstrated that this shift, and especially its acceleration starting in 2012, was likely due to the tendency of late-arriving absentee ballots and provisional ballots to disproportionately favor Democrats.[4]

The blue shift continued in 2020, although it was more variable than in the recent past. The graph in Figure 1 illustrates the size of the overtime vote, including data from 2020. The baseline is the vote count reported for each state by the *New York Times* in its Thursday-morning edition following Election Day.[5] The "overtime vote" is calculated by dividing the number of votes reported after Thursday morning after Election Day by the total number of votes reported by Thursday morning, and thus can be thought of as the number of votes left to count, normalized by the number of votes counted already.[6] The data tokens reflect each state's overtime vote, with the size of the tokens reflecting the state's total vote in the election. The gold solid line shows the overtime vote for the national popular vote. In 2020, the overtime vote nationally was 10.8 percent, ranging from negative 0.8 percent in South Dakota to 108.2 percent in Alaska.[7]

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[3] Edward B. Foley, "A big blue shift: Measuring an asymmetrically increasing margin of litigation," *Journal of Law and Politics* 24(2013): 501 – 544.

[4] Edward B. Foley and Charles Stewart III, "Explaining the blue shift in election canvassing," *Journal of Political Institutions and Political Economy* 1(2020): 239 – 265.

[5] In 2020, the benchmark was the vote count as reflected on the website of the Times on Thursday morning at 6:00 a.m. Eastern Time. Thursday morning was originally chosen by Foley because it allows for the full set of election night returns to have been reported from western states, which would not normally be reflected in the Wednesday morning edition of the paper. This of course has the effect of over-estimating the true election night vote count and thus under-estimating the overtime vote. In 2020 it was of course possible to calculate this statistic at 6:00 a.m. on Wednesday morning from the website. However, we have chosen to keep the Thursday morning standard in this graph to allow it to be comparable to past years.

[6] For the source of canvassed totals see Foley and Stewart. For 2020, the canvassed totals were taken from the website, *Dave Leip's Atlas of U.S. Presidential Elections*, https://uselectionatlas.org.

[7] Negative values are possible because the vote counts reported by the Times are unofficial. The final vote can go down after the Thursday-morning report both because of errors by NEP Research and because of errors made by local officials that are later corrected.

Figure 1. Size of the post-election-night vote, by state, 1948 – 2020.
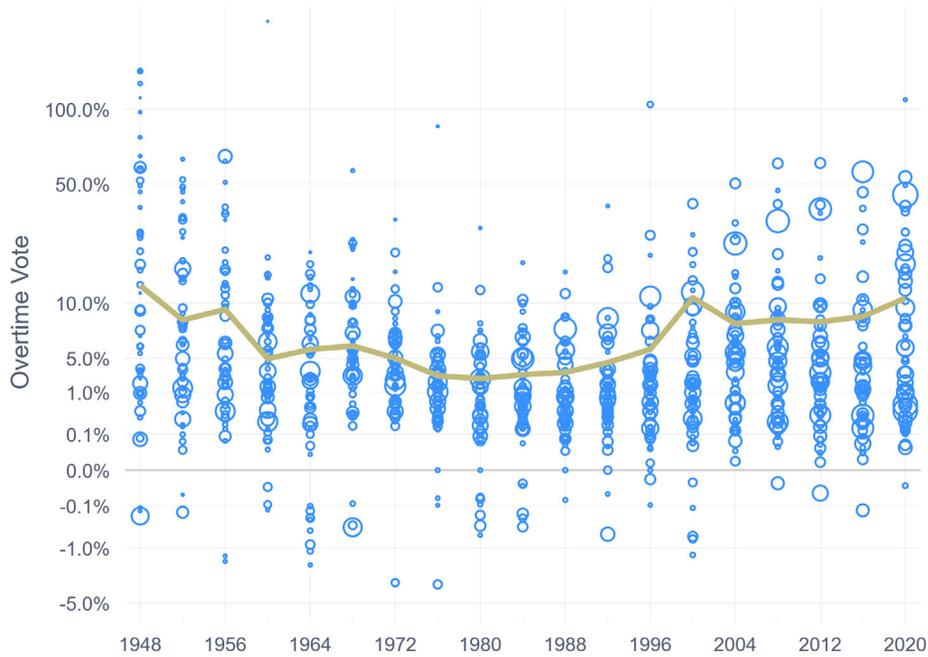
The graph in Figure 2 shows the political leaning of the post-election-night vote, using the same data source as Figure 1. To highlight the partisan direction of the overtime vote, shifts in a Democratic direction are depicted in blue (the "blue shift") while shifts in a Republican direction are depicted in red (the "red shift").

Figure 2. Political leaning of the post-election-night vote, by state, 1948 – 2020.
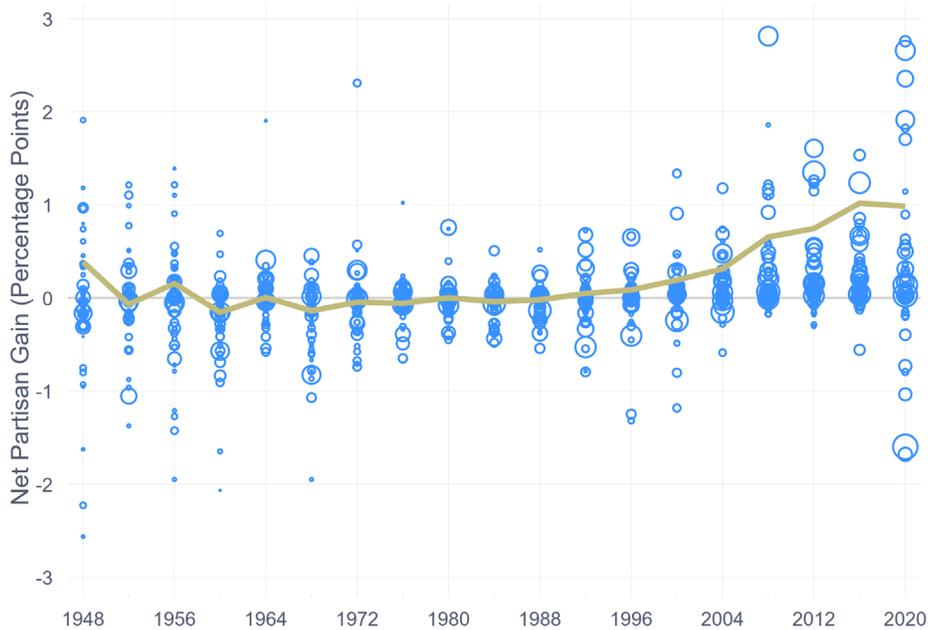
Note: States outside the range of [-3,3] for net partisan gain are excluded from the graph. In 2020, these are Alaska (+10.3) and New Jersey (-3.

The national net gain for Biden after the Thursday-morning vote count was one percentage point, which was nearly identical to that for Hillary Clinton in 2016. Thus, there was a perceptible national blue shift in 2020, just as there has been for the past two decades. This ranged from a 10.3-point increase in Biden's two-party share in Alaska to a 3.3-point increase for Trump in New Jersey. (To preserve the variability shown in Figure 2, these two data points are not shown.) However, unlike these more recent elections, a larger number of states experienced a "red shift" in 2020 than in 2016, and some of these shifts were substantial. Thus, the main change from 2016 was the increase in the variance of the post-election-night vote shift, rather than a change in its mean.

By the time Election Day rolled around, the nation was primed to experience a post-election-night blue shift of the type we just described. The nation was also prepared to witness shifting vote totals within states, and not just between states. Because the inter-state variation has already been the subject of academic research, this report dives deeper, to counties, and ultimately precincts. To do so, we rely on a data source that has yet to be described comprehensively in the academic literature, election results gathered and distributed by the National Election Pool and reported by the *New York Times*.

DESCRIBING THE DATA

The National Election Pool (NEP) uses reporters and state and local computer feeds to collect election returns before distributing them to subscribing news organizations. This data collection and reporting starts from the moment polls are closed and initial results are reported, through to the certification of elections, often many weeks later. Many of the organizations that subscribe to the NEP feed, in turn, repackage those reports through their websites.

One such organization is the *New York Times*, which we rely on here. In particular, starting on election night, the MIT Election Data and Science Lab scraped the *New York Times* state-level election results at five-minute intervals between pulls, going through the 50 states and the District of Columbia until the final tally was reported.[8] The script cycled through the state landing pages; the program run-time ranged between ten and twenty minutes. Excluding failed pulls at certain points in the program's life of 158 hours with 473 snapshots, the program averaged a snapshot every 20 minutes and 2 seconds. To make up for errors or missed updates, we also used the Internet Archive's Wayback Machine to get time-stamped results.[9] All

of the results from the Wayback Machine are publicly available. Furthermore, starting on November 12, we switched over to scraping the JSON source of the *New York Times* data, instead of the web page itself, at three-minute intervals.[10]

Before proceeding, we must be very clear about one thing. The data we gathered are the election results *as they were reported by the NEP and distributed by the New York Times*. We did not systematically gather election results directly from state and local election offices for comparison, nor did we compare the results with those gathered by the competing organization, the Associated Press. We did scrape the websites of a small number of official state election-night reporting sites, and have spot-checked those reports against the NEP data.

The research in this paper proceeds under the assumption that the timing of the release of the reported results corresponds very closely to the release of election results by the states and localities. Because of competitive pressures between the NEP and the AP, in addition to those among all the subscribing news organizations, this

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[8] "Presidential Election Results: Biden Wins," *New York Times*, https://www.nytimes.com/interactive/2020/11/03/us/elections/results-president.html?action=click&pgtype=Article&state=default&module=styln-elections-2020&region=TOP_BANNER&context=storyline_menu_recirc.

[9] Internet Archive, "Wayback Machine," https://archive.org/web/.

[10] The JSON source is at this URL: https://static01.nyt.com/elections-assets/2020/data/api/2020-11-03/national-map-page/national/president.json.

assumption seems reasonable.[11] However, we have spotted occasional errors, some of which went uncorrected for several hours and even days. (Some of these errors have been fodder for conspiracy theorists.) The errors appear to be infrequent, and do not affect the overall analysis presented here.

Beginning on election night and continuing until November 12, we downloaded state election results from the *New York Times* election result website every 10-20 minutes, yielding 473 datasets with vote totals for the major presidential candidates. Further, we added Wayback Machine snapshots to fill in missed places, which contributed an additional 4,865 snapshots of the *New York Times* state results webpages, national results webpages, and original data file between November 3 and November 12. Once we switched over to the JSON source on November 12, we began to scrape the source data in 4 – 5-minute intervals, which yielded 7,554 snapshots between November 12 and December 11.

We can compare the 5,098 unique updates we recorded to the 10,963 records in the "time series" section of the source data, which appears to have a complete record of their updates. Typically, the election results

for state *s* at time *t* were identical to those reported 15 minutes before. In these cases, we removed duplicates, allowing us to focus on changes to vote counts. It is possible for changes to the vote counts to show a decline in votes from one time to the next, owing to error corrections, but such instances were infrequent. (Only 0.014 percent of reports show a decline in votes from the previous report.)

We analyze two major metrics in this paper, (1) total votes that had been reported by time t and (2) the two-party vote share at time t. When comparing across states, it is convenient to normalize these measures. Total votes reported by time t are normalized to be the percentage of the total number of votes in the final vote count. The two-party vote share is normalized to the percentage-point difference between the two-party vote share at time t and the vote share at the end of the count.

As an example, the following figure shows these two measures for Georgia at the times when the websites were scraped. Georgia's polls closed at 7:00 p.m., EST. The first votes were reported at 7:25:55 p.m. In the first hour, Biden received 47.1 percent of the two-party vote of the 281,914 votes that were reported. By 11:00 p.m., 3,291,575 votes had been reported, but because the votes reported between 8:00 p.m. and 11:00 p.m. were considerably more Republican than the first hour's, Biden's share fell to 45.0 percent.

Around this point, Biden's fortunes in the reported vote count turned around. By 3:14 a.m. on Wednesday morning, 4,719,993 votes had been counted, of which Biden had received 48.9 percent. This means that in the previous four hours, over 1.4 million votes had been counted, with Biden receiv-

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[11] We feel it necessary to make this point because one of the conspiracy theories floating around after the election related to changed election results that were detected by others who were scraping the same data, either from the *New York Times* or other media outlets. State and local officials make mistakes in reporting election results, and sometimes those changes reflect correction of mistakes made by those officials. In other instances, the changes are necessary because of data-entry errors on the part of NEP Research that were corrected. For those looking at these data, hoping to audit election results, it is important to keep in mind that data-entry errors are likely to be greater than errors made by election officials, mainly because data-entry by NEP is more likely to be done manually.

ing 57 percent of the newly reported votes. From that point forward, Biden's vote share slowly climbed, until he eventually received a bare majority of the two-party vote in the certified results.

Figure 3. Example of election return reporting data for Georgia.
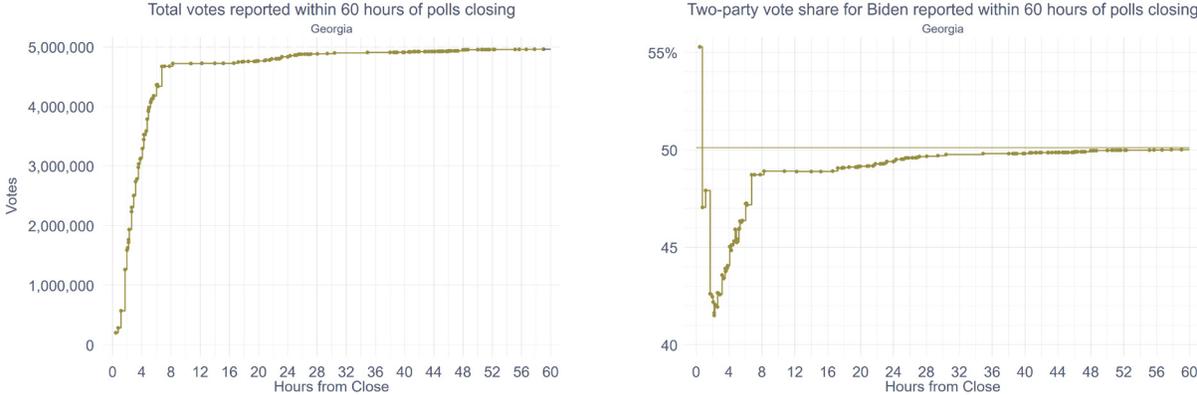
Data source: National Election Pool / Edison Research via the New York Times
Graph Source: MIT Election Data + Science Lab

Georgia's vote reporting trajectory is just one of several seen in the data. Figure 4 shows the trajectories for all fifty states and the District of Columbia within sixty hours of the polls closing, along with the patterns of convergence during this time toward the final vote-share outcome. Almost every state saw a burst of results reported in the first four hours following the close of polls. At that point, the reporting pace slowed — or at least the data stream reporting how many votes the states had reported to the public slowed down significantly.[12] At the same time, the vote shares from the states converged much more rapidly onto the final results.

Figure 4. Summary of all election return reporting trajectories
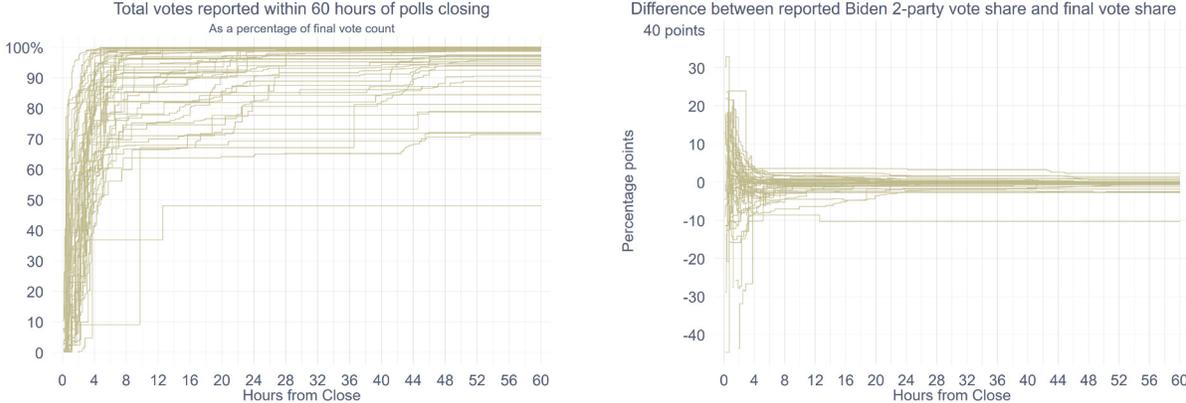
Data source: National Election Pool / Edison Research via the New York Times
Graph Source: MIT Election Data + Science Lab

[12] We have learned informally that updates to non-battleground states may have slowed down after the initial burst of reports, so that reporting efforts could be concentrated on the states that were closely contested. We have not confirmed this directly with NEP, however.

Figure 5 allows us to inspect which states reported election results faster than others by displaying the fraction of the final vote that was reported by the 4-, 8-, 24- and 48-hour points. The states at the top of the figure were the slowest; the ones at the bottom were the fastest. Among the slow reporters were D.C., which had only reported less than 10 percent of its votes within four hours of the polls closing, and Alaska, which had not reported half their votes within the first 48 hours. On the other hand, a large number of states — 31 in all — had reported over 90 percent of their votes within 8 hours of poll closing.

Figure 5. Velocity of vote reporting
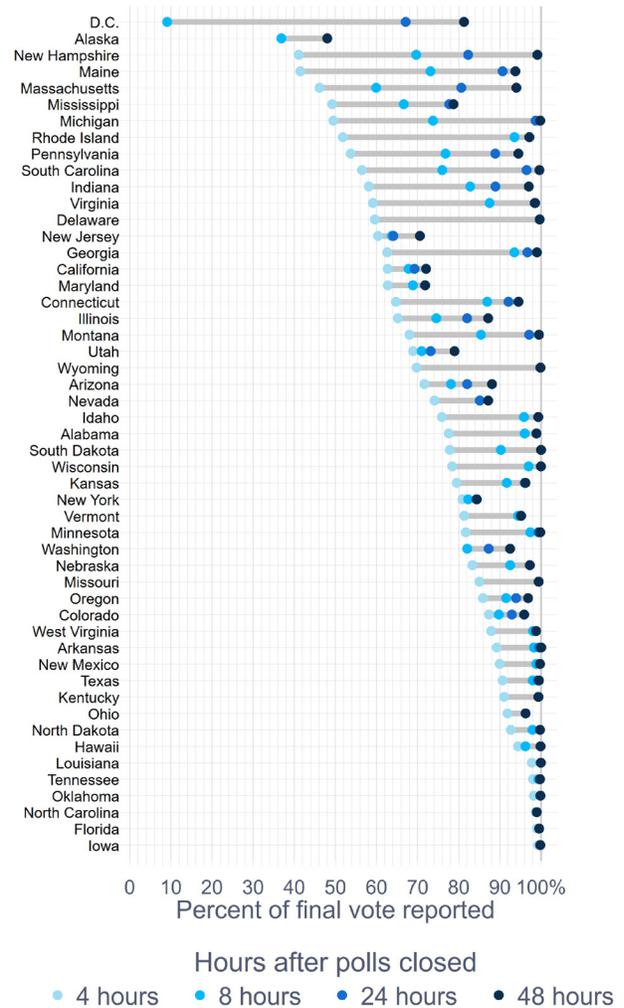
Data source: National Election Pool / Edison Research via the New York Times
Graph Source: MIT Election Data + Science Lab

Note: The circles represent the percentage of the final vote total that was reported by NEP by the indicated number of hours after polls closed.

To further help visualize the speed with which election results were reported, Figure 6 maps out the results.

Figure 6. Pace of election result reporting.
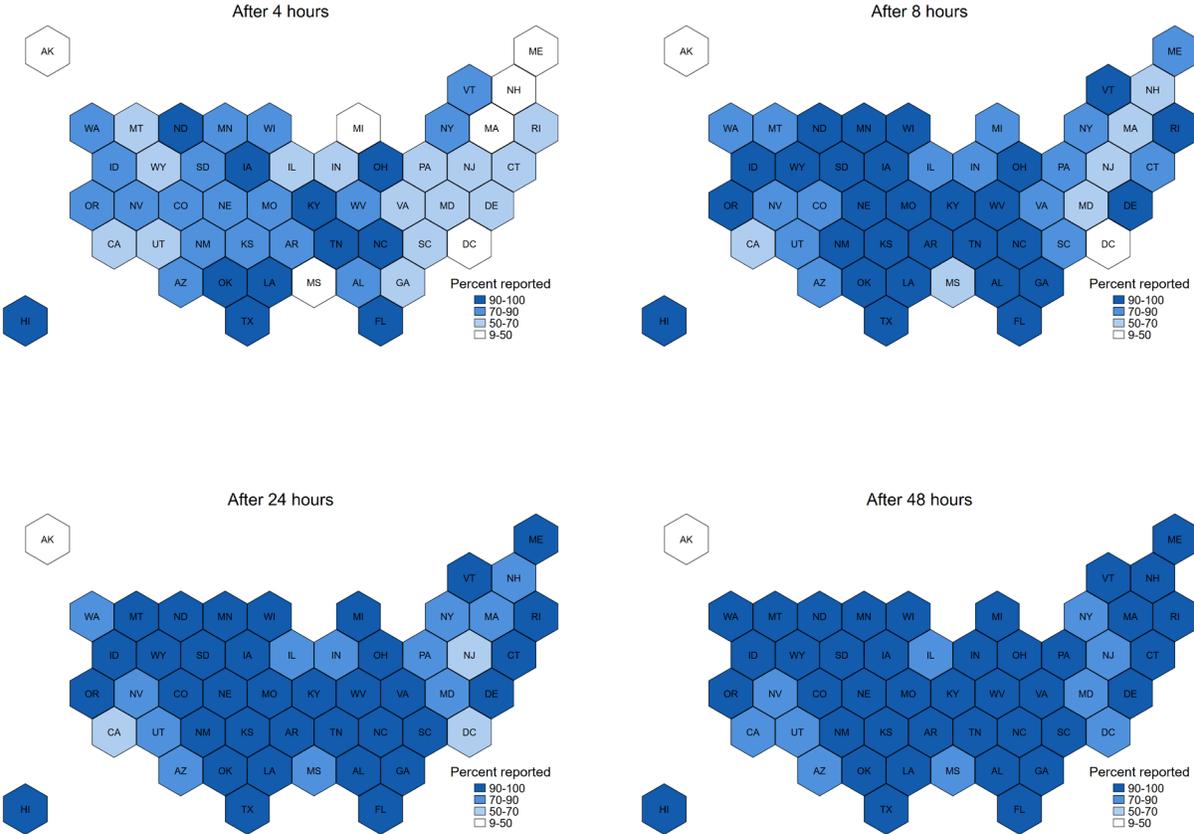
As the number of ballots reported climbed in the states, the vote shares of Biden and Trump tended to converge quickly on the respective states' final totals. As shown in Figure 7, within four hours of the polls closing, 28 states were within two percentage points of where their final two-party vote share would end up. Within eight hours, 39 states were at least this close. Forty-eight hours after polls had closed, only five were outside of two percentage points — Alaska, Maryland, Illinois, New Jersey, and Hawaii — while 35 states were within half a point.

The maps in Figure 8 emphasize the geographic pattern of how states converged on their final outcome during the early count-reporting period. The colors in the maps indicate whether the reported count at the particular time point was within half a point, either way, from the final result (grey), more in favor of Biden by greater than half a point (blue), or more in favor of Trump by more than half a point (red). At the four-hour mark, most states were outside the half-point band, with states in the west generally showing vote totals more favorable to Biden than the final result and states in the east generally showing vote totals more favorable to Trump. As time progressed, the sea of grey increased, until at the forty-eight-hour mark, fifteen states were outside the half-point range. Three of these states — Arizona, Pennsylvania, and Nevada — were closely watched battleground states.

Figure 7. Difference between reported vote share at periods after the polls closed and the final vote share.

Figure 8. Divergence from final vote count
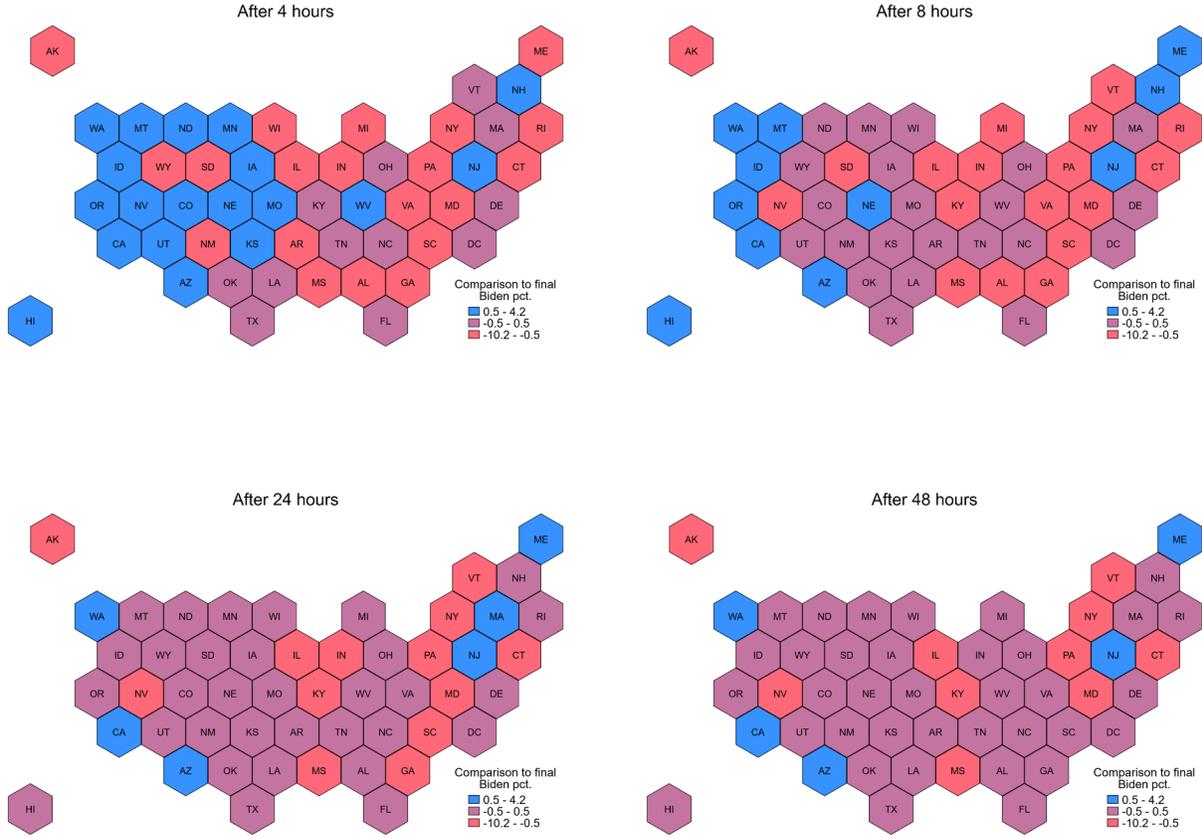
Although the great majority of states saw a fairly monotonic convergence on their final vote share as more votes were added, there were some notable exceptions, including Alaska, Maine, South Carolina, Illinois, Vermont, Kentucky, Maryland, and Nevada. Each of these states moved away from their final vote on Tuesday evening before reversing course later on.

Nevada, being a battleground state, was the one state of this group that brought attention to itself because of this pattern. The final vote share for Biden in Nevada was 51.2 percent. Four hours after the polls had closed at 7:00 p.m. MST, Biden's share stood at 52.4 percent, with 74.1 percent of ballots counted. At eight hours after polls closed, Biden had dropped to 50.3 percent, with 85.1 percent counted, which is roughly

where things stood until Thursday morning, when Biden's margins began to grow steadily, because of an infusion of votes reported from Clark County (Las Vegas).

The typical pattern of election-return reports was monotonic convergence, with some exceptions. There is no obvious pattern to explain why some states monotonically converged while others didn't, other than the obvious reason that the states without monotonic convergence had a less representative sampling of reporting counties throughout the reporting period than those *with* monotonic convergence.

ELECTION RETURNS AND THE PROJECTION OF STATE WINNERS

One of the most notable features of election night is the act of projecting who will be the popular-vote winner of a state, sometimes referred to as "calling" a state or, least accurately of all, "declaring" a state's winner. Media outlets have been projecting winners of presidential contests, both at the state and national levels, since at least the election of 1844, when the predecessor of the Associated Press declared James K. Polk victor over Henry Clay the morning after Election Day.

The act of projecting a winner has been controversial over the years, but the controversy rose in 2020, owing to worries that idiosyncratic patterns of election return reports might lead the networks to call a state for a candidate prematurely, leading to a cascade of misinformation.

The major national media outlets operate decision desks that help them make the editorial decision about whether and when to project a winner in a state. Although the decision desks operate independently of each other, they rely on a common core of data that was supplied in 2020 by one of two operations, the Associated Press and the National Election Pool/Edison Research. New to 2020, the AP and Edison each supplied their clients with election returns. Edison continued to conduct an exit poll (in addition to pre-election surveying of absentee voters and exit polls of early voting sites), while AP utilized VoteCast—a "probability-based, state-by-state survey of regis-

tered voters that is combined with a large opt-in survey of Americans conducted online"—for its public opinion coverage of the electorate.[13] Using this common information, plus other data that might be unique to each outlet, the networks employed data systems to track the returns as they received and modeled the likely outcomes.

Likely outcomes can be forecast from the incoming election returns using a variety of methods. Ultimately, though, the question comes down to whether the trailing candidate at any given moment has a chance to overtake the leader, given the current margin and the number and likely composition of the ballots that have yet to be reported. As Scott Tranter of DecisionDesk HQ put it:

The key variable in all this as tabulation nears completion is, how many votes are left? . . . If you know how many votes are left you can determine if there are enough votes to move a second-place candidate into first place, and if there is not, then you can assume the current vote leader will win.[14]

[13] NORC, "AP VoteCast," https://www.norc.org/Research/Projects/Pages/ap-votecast.aspx.

[14] Dylan Matthew and Kay Steiger, "How the Press Calls Elections, Explained," *Vox*, Nov. 6, 2020, https://www.vox.com/policy-and-politics/21535103/when-will-we-get-election-results-calls-networks.

This estimate of the likelihood that the trailing candidate will overtake the leading candidate. This can be done based on three different criteria, (1) surveys or priors, (2) models that predict the final vote margin, and (3) calculations based on the outstanding vote. In practice, most media outlets rely on some mix of these three methods, often simultaneously.[15]

The survey- or prior-based method is in evidence when an outlet projects a victor at the moment the polls close and not even a single vote has been reported. Models that predict the final vote margin rely on comparing current election results, especially from counties that have finished counting ballots, with past election results. In 2020, for instance, if the earliest completed returns showed that Biden was consistently running five points ahead of Clinton in counties that had completed their count, and if those early-reporting counties came from a variety of counties across the state (rural, suburban, urban, etc.), an outlet might declare a likely winner if the statistical models being used support the decision.

Here, we perform analysis that is consistent with a simplified version of the final method—basing the decision on the outstanding vote. This method is the easiest to implement given the data we have. It would also be insightful to analyze the second method,

but that would involve reverse-engineering the statistical models that have been developed over a half century, which is beyond the scope of this report.

We can use the reported election returns to gain some insight into how quickly the outcome of the 2020 election came into view, why some states may have taken longer to be projected, and which states were likely called mostly because of priors that had been formed ahead of the election, or because statistical models revealed a high probability that one candidate would be ahead once all the votes were counted.

To do this, we examine a simple benchmark. For a given time point t in state s, we calculate the number of votes the trailing candidate needs to overtake the leading candidate once all the votes are counted. For this exercise, we assume that we know *with certainty* the number of ballots that were cast in state s, so that the question can be reduced to simple algebra.

Obviously, the media organizations did not know ahead of time what final turnout would be, although they made pre-election projections. The values of this exercise, therefore, is as a heuristic.

Without loss of generality, we can write the equation to express the number of outstanding votes the Democratic candidate needs to guarantee a victory over the Republican as:

[15] Some outlets do in fact declare likely winners for some states based solely on surveys or priors, especially states that are well-known to be solidly "blue" or "red," such as Wyoming and Vermont. Others wait a beat or two, until the first votes are reported, to make sure that the earliest votes are consistent with expectations. Because of how quickly the very first votes are reported, especially in small states dominated by one party, it can be difficult for the viewer to distinguish between a media outlet deciding based solely on priors and one waiting until at least the initial vote reports are consistent with the priors.

$$.5T - D_t,$$

where

» D_t = number of votes for the Democrat at time t,
» T_t = total number of votes for both candidates at time t, and
» T = total number of votes for the Democrat and Republican in the final tally.

When $.5T - D_t < 0$, the Republican can no longer overtake the Democrat; when $.5T - D_t > (T - T_t)$, the Democrat can no longer overtake the Republican.

This equation can be expressed as a percentage of the outstanding vote with the following formula:

$$100 \times (.5T - D_t) / (T - T_t)$$

To illustrate the application of this formula, consider the case of Michigan. Michigan was beset with an archaic state law that prohibited local election officials from beginning to process mail ballots before Election Day — a law that was eased somewhat when the state legislature voted to allow ballot processing to begin for ten hours the Monday before.[16] With over half the state casting ballots by mail, vote reporting started slowly. In contrast with almost every other state, three hours after the polls closed in Michigan, only 41 percent of the vote had been reported; the largest county, Wayne (Detroit) had reported virtually no results. The percentage of reported votes statewide did not pass 50 percent until just after midnight, or four hours after polls had closed. (Also see Figure 5, above.)

Figure 9. Vote-reporting pace in Michigan and the likelihood that Biden would prevail.
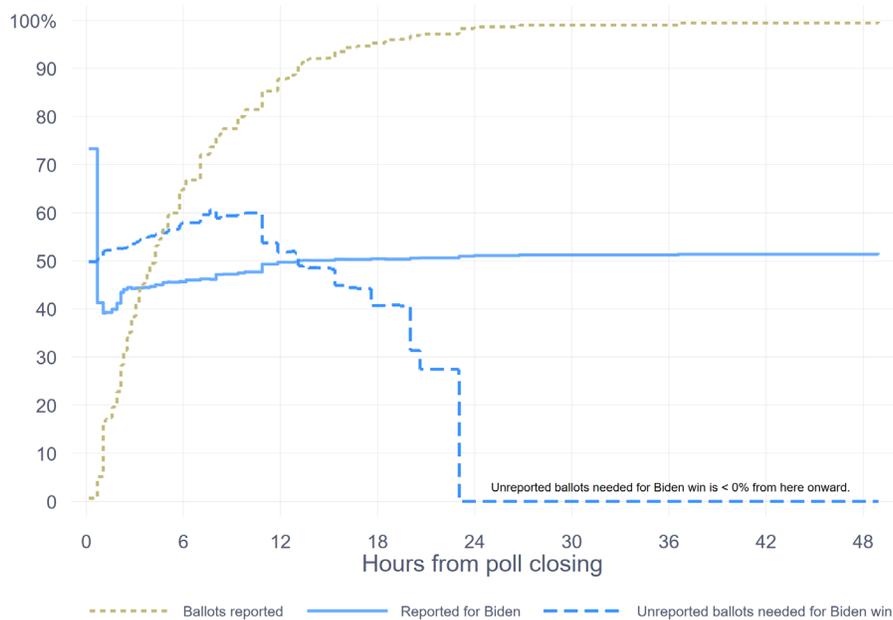
[16] Zach Montellardo, "Michigan Allows Limited Early Ballot Processing, But Counting Still Expected to Stretch Past Election Night," *Politico* October 6, 2020, https://www.politico.com/news/2020/10/06/michigan-early-mail-ballot-processing-426809.

By midnight, when half the state's ballots had been reported, Biden stood at 44.7 percent of the vote, needing 55.1 percent of the remaining votes to prevail. Overnight, Biden's share of the vote gradually rose, but so, too, did the number of votes reported. By Wednesday morning at nearly 6:00 a.m., his vote share had risen to 47.7 percent, but by now the remaining vote share he needed to win had risen even more, to 59.3 percent.

At that point, although the pace of reporting actually slowed, the mix of ballots became much more favorable to Biden. By 9:00 a.m. on Wednesday morning, Biden's vote share breached 50 percent for good. But with approximately 9 percent of the vote outstanding and his share hovering just over 50 percent, he still needed around 49 percent of the remaining vote to make a Trump victory impossible.

Between 4:00 p.m. and 7:00 p.m. on Wednesday, roughly 100,000 ballots with a large margin for Biden were reported. This sent Biden's share from 50.36 percent to 50.97 percent, and raised the reporting rate to 98.3 percent (from 96.2 percent). This caused the percentage of the outstanding vote Biden needed to win the state to plummet from 26 percent to -7 percent, which is displayed on the graph as 0 percent. A Trump victory was now mathematically impossible, because Biden held a lead of 103,755 votes with 93,910 votes left to count.

At this point, of course, the total number of votes that would eventually be counted was unknown, and at best estimated with uncertainty. However, the remaining votes were predominantly located in Democratic cities of Detroit, Flint, and Kalamazoo, which was the qualitative information the AP needed to declare Michigan for Biden

at 5:56 p.m. on Wednesday, despite the fact that the margin might be considered by some to still be close.

Michigan illustrates that inferences made by the national news media about who is likely to win a state are due to a mix of factors. The pace of reporting, which we focus on here, is certainly a factor, but so, too is a judgement about how likely the outstanding ballots will overturn the current lead.

The Associated Press mostly projected winners in states before their victory was a mathematical certainty.[17] We see this in Figure 10, which summarizes the times when the Associated Press projected state winners, superimposed over measures that indicate how far ahead the leading candidate was at various points in time. The graph is sorted in the order in which the AP called the states, relative to their poll-closing times.[18]

[17] We are aware that at this point in the report, we are mixing data from NEP/Edison research with editorial decisions made by the Associated Press to declare states in favor of the candidate. For this exercise to be credible, we have to assume that the data stream from the AP approximated that from the NEP. For reasons discussed above, we believe this to be reasonable.

[18] Brian Slodysko, "EXPLAINING RACE CALLS: How AP called the race for Biden," Associated Press, November 7, 2020. https://apnews.com/article/ap-explains-race-calls-0b1988605f9101f4b799f-c63b01e0090 (accessed November 17, 2020).

Figure 10. State winner projection times
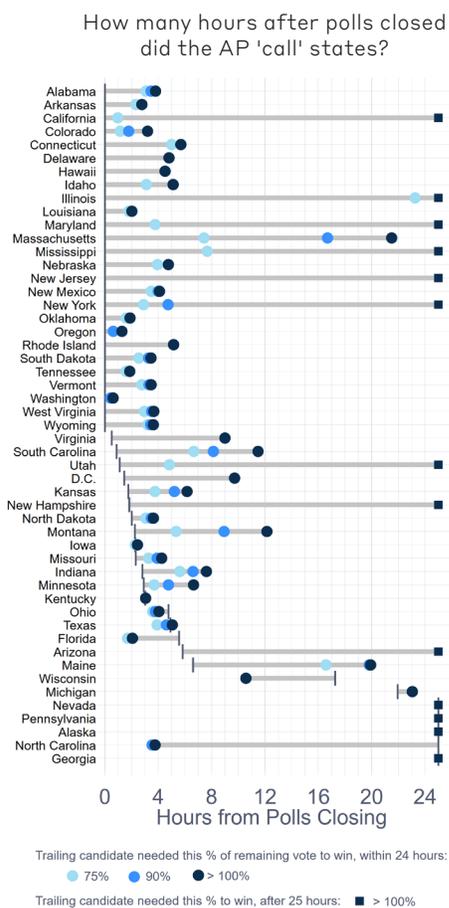
How many hours after polls closed
did the AP 'call' states?

Trailing candidate needed this % of remaining vote to win, within 24 hours:
75%   90%   > 100%

Trailing candidate needed this % to win, after 25 hours: > 100%

Data source: National Election Pool / Edison Research via the New York Times
Graph Source: MIT Election Data + Science Lab

The first twenty-six states in Figure 10, from Alabama to Wyoming, were called as soon as the polls closed, based entirely on priors from the AP VoteCast survey and election data such as early voting statistics — but not on election returns. Some of these states, such as Alabama, Arkansas, Louisiana, and New Mexico, counted their ballots quickly enough and saw the winner pull out to a lead fast enough that the trailing candidate was mathematically eliminated just a couple of hours after the polls had closed.

Other states — notably California, Illinois, Maryland, Mississippi, and New Jer-

sey — were also called immediately, but had much longer to go before the election returns caught up with the calls. In these states, the leading candidate pulled out to a comfortable lead early-on, but the counting pace was so slow that the trailing candidate still had a theoretical chance twenty-four hours after the polls had closed.

For the remaining states and the District of Columbia, there was some delay between poll closing and projecting a winner. For most of these states, the AP explained its decision in terms of an analysis that used a combination of the early returns compared to the VoteCast results, plus an analysis of the likely composition of the outstanding vote, as the following quotes from the AP indicate:[19]

> **New Hampshire:** "Completed vote counts in a representative selection of precincts in communities across New Hampshire also showed Biden comfortably ahead of Trump."

> **Montana:** "With 56 percent of the expected vote counted, Trump led Biden by nearly 6 percentage points. The remaining vote count in Democratic leaning areas was not enough to overcome Trump's lead."

> **Minnesota:** "With 85 percent of the expected vote counted, Biden led Trump by roughly 4 percentage points — or about 190,000 votes out of about 2.3 million ballots cast. The remaining votes in Republican-leaning areas are not enough for Trump to overtake Biden's lead."

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[19] Brian Slodysko, "EXPLAINING RACE CALLS: How AP called the race for Biden," Associated Press, November 7, 2020. https://apnews.com/article/ap-explains-race-calls-0b1988605f9101f4b799f-c63b01e0090 (accessed November 17, 2020).

Notably, Ohio and Florida were the only states that were declared *after* the trailing candidate — in this case, Biden — had been mathematically eliminated. The delay in these cases is on its face puzzling, especially in light of the speed with which other states were declared when there was at least a slim possibility that the second-place candidate could pull ahead. Of course, both Ohio and Florida were battleground states, and Biden had been given a slight edge in these states by the forecasting sites FiveThirtyEight and the *Economist* on the eve of the election. These factors no doubt added a degree of risk aversion in calling these states, even as Trump was performing better than anticipated.

Of course, it must be remembered that in this discussion, "mathematical elimina-

tion" depends on us knowing *with certainty* what turnout will be. In the case of North Carolina specifically, the state accepted absentee ballots until November 12th, if the ballots were postmarked by November 3rd.[20] On election night, turnout was unknown with certainty, and this uncertainty may very well have caused the AP and the other media outlets to pause before calling the race.

At the bottom of Figure 10 are five states that were not called until at least 24 hours following poll closure. The following table reports how long after poll closing a winner was projected, and when the trailing candidate was mathematically eliminated:

Table 1. Hours after poll closing a winner was projected, among states with a projected winner more than 24 hours after polls closed.

STATE	MATHEMATICAL ELIMINATION (HOURS AFTER POLLS CLOSED)	CALLED (HOURS AFTER POLLS CLOSED)
NEVADA	250.9	86.5
PENNSYLVANIA	287.3	87.2
ALASKA	223.9	179.6
NORTH CAROLINA	4.0	220.5
GEORGIA	145.8	385.6

[20] Patrick Gannon, "Receipt Deadline is November 12 for Ballots Postmarked by Election Day." North Carolina State Board of Elections Press Release. https://www.ncsbe.gov/news/press-releases/2020/10/29/receipt-deadline-november-12-ballots-postmarked-election-day (accessed December 14, 2020).

North Carolina, as noted before, is an outlier, because in retrospect Biden was mathematically eliminated less than four hours after polls closed, yet the AP waited nine days to project Trump as the winner. Had there been more certain knowledge about how many mail ballots would arrive after Election Day, the AP could possibly have called the state earlier.

To underscore the agenda-setting significance of the AP and other media outlets calling states for particular candidates, we engaged in a counterfactual exercise, in which we juxtaposed the cumulative number of electoral votes for Joe Biden represented by states declared by the Associated Press with the cumulative number of electorate votes for Biden that would have been awarded to him when his victories in various states were mathematical certainties. We represent this counterfactual in Figure 11, along with the graph of the accumulation of electoral votes as states certified their election results.

Figure 11. *Accumulation of electoral votes for Joe Biden, by different "calling" rules.*
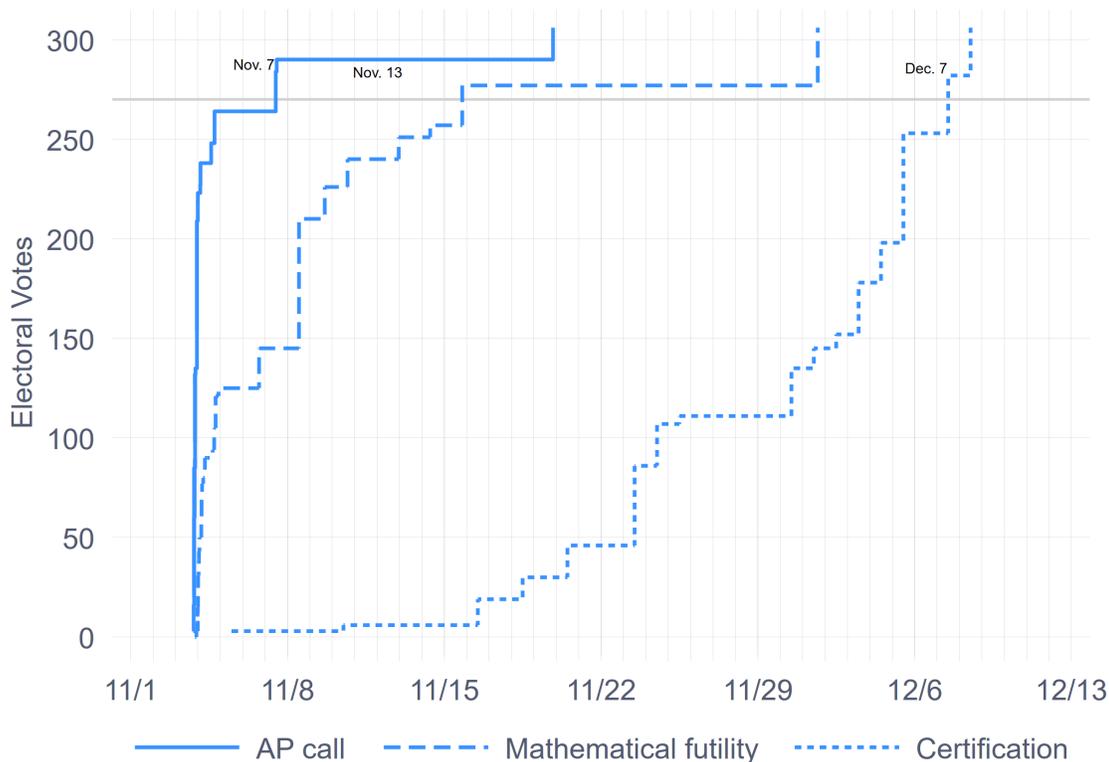
As this graph makes clear, on November 7, when the AP and all other major media outlets declared that Biden would be the next president, many states had enough ballots left to count that it was at least theoretically possible for Trump to have won — ten, to be precise. Of course, for virtually all these states, knowledge about where the remaining votes were likely to come from and a comparison of 2020 results with past election results made the declaration in favor of Biden reasonable. But, it is nonetheless important to note that the network consensus that Biden was the likely winner was based on informed judgements, arrived at in a number of ways, about the nature of the outstanding votes.

MAIL-BALLOT PRE-PROCESSING LAWS AND VOTE COUNTS

A major point of contention and concern in the 2020 election was the ability of states to "preprocess" ballots. "Preprocessing" has many specific meanings, but in general, it refers to the ability of local election officials to begin tabulating — or preparing to tabulate — mail ballots before Election Day. With preprocessing, the returns from mail ballots can be reported in the same timeframe as when Election Day ballots are reported. Without preprocessing, the results of mail ballots could lag far behind Election Day votes.

Laws that allow mail ballots to be pre-processed lead to election results to be reported more rapidly, on average, but there was still considerable variation around these averages in 2020. To examine this, we used data collected by the National Conference of State Legislatures to identify states that had to wait until Election Day to start counting mail ballots. These states were Alabama, Connecticut, DC, Idaho, Kentucky, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New York, Pennsylvania, South Carolina, South Dakota, West Virginia, Wisconsin, and Wyoming.[21]

Figure 12 helps compare how quickly states with and without prohibitions against counting ballots were able to count their ballots. States that were allowed to start tabulating before Election Day got a fast jump "out of the gate" in reporting ballot counts, at least on average. Within four hours of the polls closing, the average state with a vote-counting restriction had reported 63.0 percent of its votes, compared to 77.8 percent among states without the restriction. Within eight hours, there was still a gap between the two groups of states, but it had narrowed. Within twenty-four hours, the gap had essentially disappeared.

[21] Some of these states were allowed to do some preprocessing before Election Day, but could not actually tally ballots.

Figure 12. Pace of counting among states with and without pre-processing restrictions.

Figure 12 also shows that there was variation among states with and without pre-processing restrictions. Kentucky, with pre-processing restrictions, was still the tenth-fastest-counting state in the first four hours, while Alaska and Maine, without these restrictions, were among the slowest. Of course, the nation was not transfixed on these three non-battleground states, but on states such as Michigan, Pennsylvania, and Wisconsin, which had these restrictions in place. Wisconsin actually counted ballots faster than average, among all states, but Michigan and Pennsylvania lagged behind throughout.[22]

The pattern in Figure 12 illustrates two points: that pre-processing restrictions can have an effect on the speed with which states report their election results, but other factors, including whether mail ballots are counted centrally or in precincts and how many mail ballots there are to count, also can influence the speed of the count.

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[22] For an analysis that is similar to this, but focuses on Pennsylvania, see Jonathan Lai, "It Didn't Need to Take that Long: What Pennsylvania's Election Could Have Looked Like with Earlier Counting," *Philadelphia Inquirer*, December 6, 2020, https://www.inquirer.com/politics/election/pennsylvania-mail-ballots-pre-canvassing-20201206.html.

WITHIN-STATE VARIATION IN REPORTING RESULTS

A major source of the drama and uncertainty on election night was the uneven reporting of election results from across the local jurisdictions in the states. Historically, variability has been common and relatively predictable in most states, and has worked its way into the conventional wisdom among close watchers of state politics. These stories have even made it into national political lore, being featured, for instance, in the election night stories of the 1960 presidential election as a waiting game was played out between up-state Democrats and down-state Republicans in Illinois and the 1948 Democratic primary in Texas between Lyndon Johnson and Coke Stevenson.[23]

Most of this variability has tended to revolve around urban/rural differences, with cities being slower to count their ballots and to report them publicly. This has tended to produce an election night "blue shift" in most states.[24] This pattern was potentially exacerbated in 2020, with the explosion in the number of mail ballots cast in most states. Because Democrats were more likely to cast votes by mail than Republicans, and Democrats were more likely to live in large counties, the imbalance in election night reporting was anticipated to be quite pronounced in pre-election commentary.

Was it?

To explore this question, we examined the pace of reporting election results across the counties in all the states. To illustrate our analysis, we begin again with the state of Georgia.

Figure 13 plots the percentage of the final number of votes counted in each Georgia county for the first eight hours following the close of polls at 7:00 p.m. Each data token is placed each time there was an update to the county's reported vote count. Blue circles are counties won by Biden; red circles are counties won by Trump. The circles are proportional to the number of votes eventually counted in the county. In addition, the solid gold line shows the overall percentage of the votes reported counted for the entire state.

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[23] Theodore White, *Making of the President*, 1960, New York, Atheneum, 1961; Edmund F. Kallina, Jr. *Courthouse over White House: Chicago and the Presidential Election of 1960*, Gainesville, University of Florida Press, 1988; Robert Caro, *The Years of Lyndon Johnson: Means of Ascent*, New York, Knopf, 1990.

[24] Foley; Foley and Stewart.

Figure 13. Pace of reporting election results from Georgia counties in the first eight hours following the close of polls
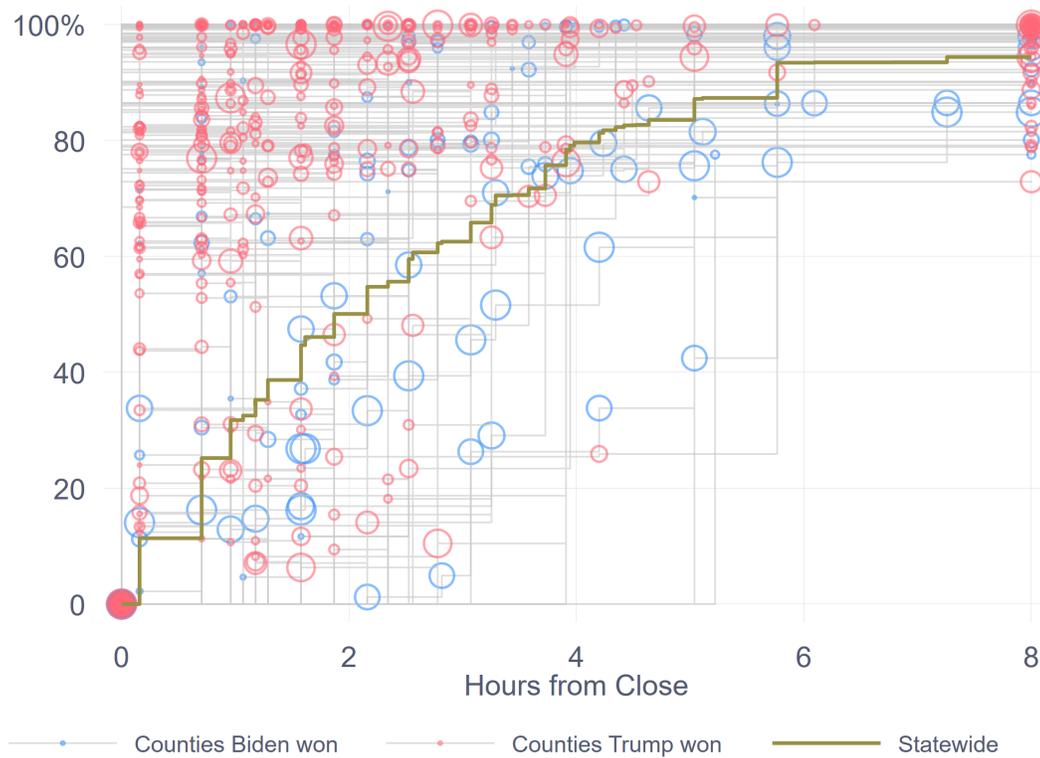
Consistent with the standard story told above, the fastest reporting counties were small and eventually gave a majority to Trump. The larger counties, which mostly went to Biden, lagged behind. This distribution of county reporting patterns explains the evolving vote share for Biden after the polls closed that was shown above in Figure 3.

However, the correlation between county size and county speed was far from perfect, and declined rapidly over time. For instance, at the eight-hour mark, four of the five counties that were the furthest behind in reporting eventually gave their majority to Trump, and the county that had reported the smallest percentage of its count, Houston, voted for Trump and was the sixteenth largest county in the state (of 159).

Indeed, the correlation between the fraction of votes reported at the eight-hour mark and the total number of votes eventually counted is a mere -0.28. Nor is this weak correlation a result of simply choosing eight hours as the point of comparison. The correlation does rise to -.48 at the four-hour mark, but is either -.28 or -.29 at the two-, eight-, sixteen-, and twenty-four hour points.

The correlation between the fraction of votes reported at the eight-hour mark in the eventual two-party vote share for Biden in the county was similarly weak. It was -0.16 at eight hours and never rose above -0.28, which occurred at four hours.

Because the negative correlation between the size of the county and support for Biden was relatively weak, Biden's share of the

statewide vote grew only gradually as the hours and days ticked by.

Also, it is untrue that the counties in Georgia with the highest fraction of absentee ballots were the slowest to report election results. The correlation between the percentage of ballots cast absentee in a county and the percentage of ballots reported eight hours after poll closing is actually positive: 0.31. In other words, counties with more absentee ballots to report actually reported results more quickly.

In the battleground states that took notably longer than election night to call — Arizona, Michigan, Pennsylvania, and Wisconsin — most of the counties were Republican and most of those counties reported at a faster pace than the state average. (See Figure 14.) Because Maricopa County is such a large fraction of the state's population, Arizona is the one state of these four that did not have at least one large Democratic county lagging in reporting the count (relative to the state overall) at eight hours. At the eight-hour point, Wayne County was 47 percent counted, compared to 74 percent for Michigan; Philadelphia County was at 53 percent, compared to 77 percent for Pennsylvania; and Milwaukee County was at 62 percent, compared to 91 percent for Wisconsin.

Figure 14. Pace of reporting election results from Arizona, Michigan, Pennsylvania, and Wisconsin counties in the first eight hours following the close of polls
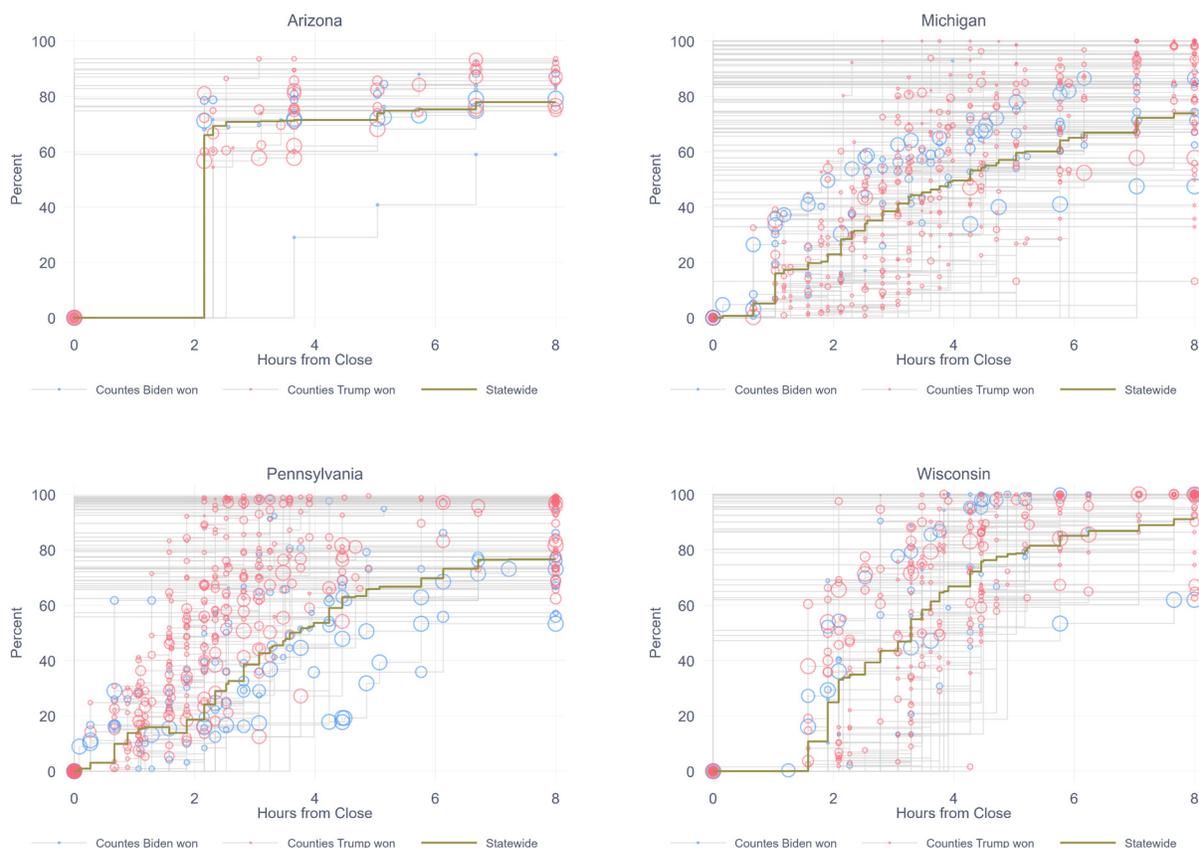
When we look across all the states, there is general support for the claim that election results were reported more slowly in large counties and in counties that supported Biden, but there is no support for the claim that vote counts were more slowly reported in counties with a large fraction of absentee ballots.

There are also exceptions to these generalities, as is illustrated in Figure 15.[25] Here, we have calculated the correlation coefficients measuring the associations between vote-count reporting speed (measured by the percentage of votes counted eight hours after polls closed) and county size (measured by final number of ballots counted), Biden support (measured by final two-party vote share for Biden), and fraction of ballots cast by mail.[26]

Figure 15. Correlation between vote-report speed and county size, support for Trump, and percentage of votes cast by mail.
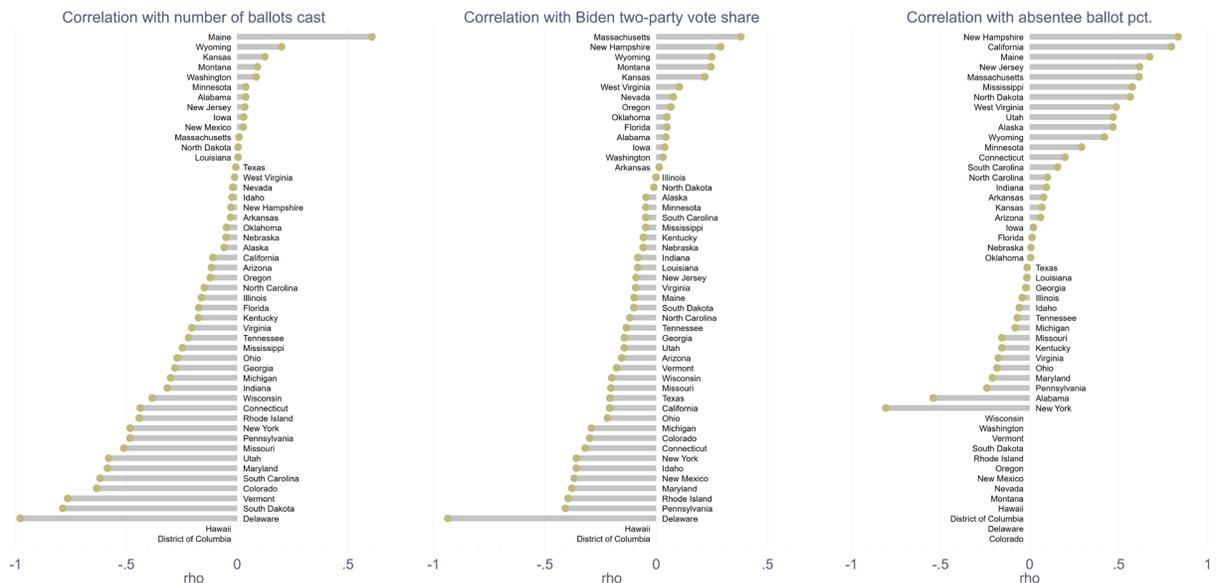
[25] The District of Columbia is excluded from all calculations because it had only one observation. Hawaii is excluded from all calculations because its first report was more than eight hours after polls closed. Numerous other states are excluded from the final graph because Edison did not provide estimates of the number of absentee ballots cast.

[26] On this last measure: we rely on reports from Edison that separate out vote totals for absentee ballots. This information was unavailable for some states, and thus was unreported by Edison. In addition, some states mailed ballots to all their voters, and therefore correlations in those states, when reported, will be uninformative.

In general, the relationship between count-reporting speed and both Biden support and size of jurisdiction was negative, but the correlation with the fraction of ballots cast by mail was positive slightly more often than it was negative. Furthermore, the sign of the correlation with the fraction of ballots cast by mail seems unrelated to restrictions on preprocessing ballots. Among the seventeen states previously identified as prohibiting the counting of absentee ballots before Election Day, seven showed negative correlations (Idaho, Michigan, Kentucky, Maryland, Pennsylvania, Alabama, and New York), seven showed a positive correlation (New Hampshire, Mississippi, West Virginia, Wyoming, Connecticut, and South Carolina), while two of the remaining three did not have absentee ballot statistics reported by Edison (Wisconsin and South Dakota), and D.C. was excluded because it has only one observation.

These results demonstrate that pre-election expectations that large numbers of absentee ballots would slow down the vote count did not come about, nor that prohibiting preprocessing per se slowed things down, either. Some counties in states with preprocessing prohibitions were able to get their counts completed faster than others. New Hampshire and Massachusetts come immediately to mind. Of course, these are states where election administration is handled by municipalities, rather than at the county level, and therefore vote counting in general is highly distributed. It may very well be that the distribution of absentee ballot counting in these states down to the municipality, and eventually to the precincts, overcame any disadvantages these states may have had in getting their vote counts out quickly because of limits on preprocessing.

SUMMARIZING VARIATION IN COUNTY VOTE-COUNTING USING THE GINI COEFFICIENT

Insofar as states reported election results, the burden to tabulate fell to the county and municipal level. These localities serve varied populations, such as urban vs. rural and types of ballots cast. With *New York Times* data broken down by county into 15-minute intervals, it is possible to ascertain the geographic uniformity of tabulation. We first look to the inequality of reporting across counties by calculating the Gini coefficient for a given time interval. The Gini coefficient works by finding the area between the cumulative distribution of percent of ballots reported for each county against the cumulative distribution of counties in a given state, where a score of zero equates to complete equality and uniformity in the rate of reporting, and one complete inequality.[27] There will be two points when the score for a state equals zero: when no results have yet to be reported by any counties, and when all the counties completely reported their results.

We see in Figure 16 that most states converged to approximate complete uniformity by 24 hours after election night. The color coding in the figure, by whether a state was won by Biden or Trump, helps illustrate that Trump's lead was most pronounced in the initial reporting of tabulations. However, there are clear outliers within the distribution. The average Gini coefficient is 0.05, though a total of nine states exceeded a Gini coefficient of 0.10 between 24- and 48-hours following polls closing. The top five are Alaska, Mississippi, New Jersey, Massachusetts, and Montana. Three of these went for Trump, and two Biden. Notably, these states are not the battleground states under contention. It is possible to analyze the rate in which these states converge to 100 percent of reported results below.

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[27] See, Yitzhaki S, Schechtman E (eds). 2013. "More than a dozen alternative ways of spelling Gini," in, *The Gini methodology: a primer on statistical methodology*. Springer, New York, pp 11–31 and, Bernasco, Wim and Wouter Steenbeek. 2017. "More Places than Crimes: Implications for Evaluating the Law of Crime Concentration at Place." J*ournal of Quantitative Criminology* 33: 451 -- 67.

Figure 16. Inequality in county election reports over time
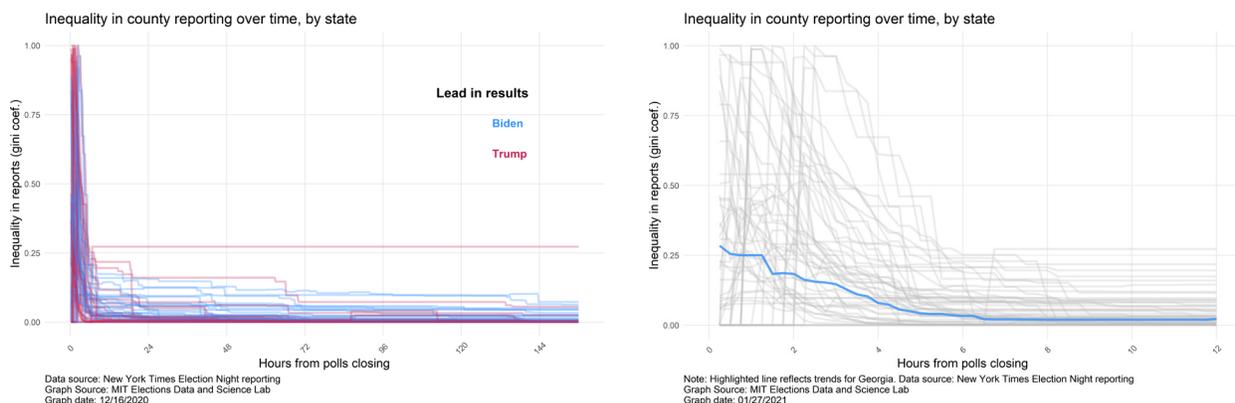
To better convey the results, the right panel of Figure 16 zooms in to the first 12 hours from poll closing, with the results highlighted for Georgia in blue. As previously noted, Georgia reported approximately 50 percent of the total vote two hours after polls had closed, at which time the Gini coefficient reached a score of 0.18, compared to 0.28 when the first returns were reported. Four hours after polls had closed in Georgia, 70 percent of the statewide vote had reported and the Gini coefficient had fallen to 0.08, which means that the counties were more evenly balanced in terms of what fraction of votes had been reported. At the eight-hour mark, with over 94 percent of the vote reported, the Gini coefficient stabilized to 0.02, with the rest of the vote tabulated later into the week. In comparison, the median state reached a Gini coefficient in reporting of 0.26 two hours following poll closures, 0.11 four hours following poll closures, and 0.03 eight hours following poll closures. In other words, the rates at which returns were reported by Georgia counties were more equal than in most states.

WITHIN-COUNTY VARIATION

Thus far, we have explored variation in reporting patterns across states and across counties within states. There is variation within counties, as well. For the vast majority of counties, there will be little cross-time variation at all, because the number of precincts is so small and because the practicalities of reporting the data may limit to two or three the number of times a small county's totals are updated.

To illustrate the point, we turn again to Georgia, and Fulton County (Atlanta) spe-

cifically. Figure 17 shows the pattern of election return reports from Fulton County for the first forty-eight hours after the polls closed. The solid golden line shows the percentage of the final vote count that had been reported by the indicated time. The dashed blue line shows the accumulated two-party vote share for Biden, while the circles show the percentage of each report's share that went for Biden. (The circles are sized proportionally to the number of votes.)

Figure 17. Election return reports from Fulton County, Georgia.
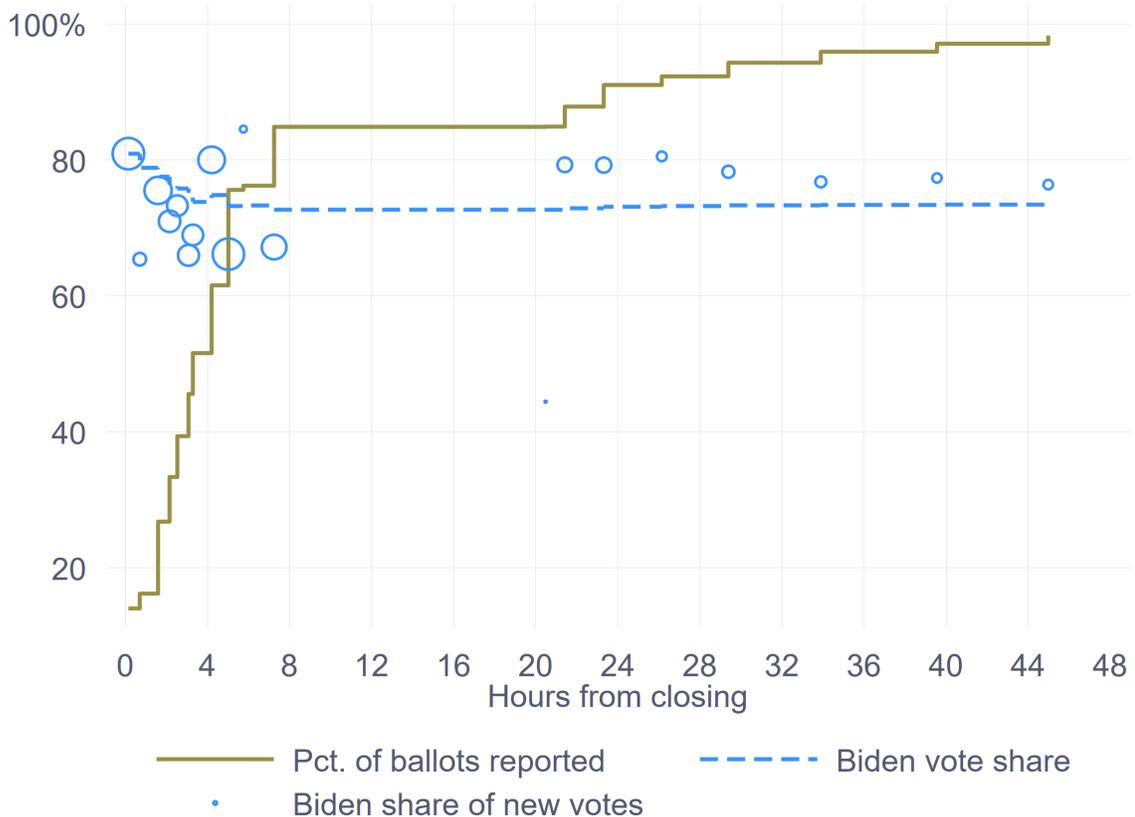
The very first report, which was eight minutes after the polls closed, consisted of 73,523 ballots that gave Biden 80.9 percent of the vote, presumably absentee ballots that had arrived before Election Day.[28] For the next five and a half hours, subsequent reports were a mix of over 356,000 Election Day and early votes that ran at around 72 percent for Biden. This pulled his vote share in the county down to 73.3 percent. The last report from the initial burst of returns came at seven hours and fifteen minutes after poll closing (3:15 a.m. Wednesday morning), when a tranche of 45,000 mostly early votes came in. When reports resumed Wednesday afternoon, a series of reports were released that eventually accounted for 115,000 votes, which were almost entirely early, which were again overwhelmingly for Biden. The net effect, despite the fact that over 444,000 ballots had already been counted, was to raise Biden's share to 73.4 percent by the 48-hour mark.[29]

Although the Fulton County pattern is not as dramatic as some other counties, it illustrates how the sequence of reported ballots can produce a non-monotonic cumulative vote-share pattern for the candidates, as the mix of early and Election Day ballots shifts. In this case, Biden started out at over 80 percent before falling to 72.7 percent, before eventually rising back up to 73.5 percent.

Fulton County constituted only 10 percent of the votes cast in Georgia. If we look at all Georgia counties, we see there was considerable variation in the partisan time trend of particular counties' reports. Figure 18 helps to summarize this view. Unlike previous graphs, which have shown reported vote totals in terms of hours after the polls closed, Figure 18 shows the Biden two-party vote share in each county against the percentage of the vote reported for the county. Counties that eventually gave a majority to Biden are colored in blue; counties that gave a majority to Trump are colored in red. Fulton County is highlighted with a thicker line.

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[28] The Edison vote feed generally combined early and absentee ballots into an "absentee" category. We assume these were all absentee ballots because of the vote share for Biden.

[29] The analysis in these two sentences was based on a careful analysis of the Edison reports. Throughout this period, Edison would initially report a new set of counted ballots and then later issue an update that shifted those ballots into the absentee ballot category. The analysis here is based on where the ballots were eventually allocated, not the initial report.

Figure 18. Biden two-party vote share by county percent reported in Georgia
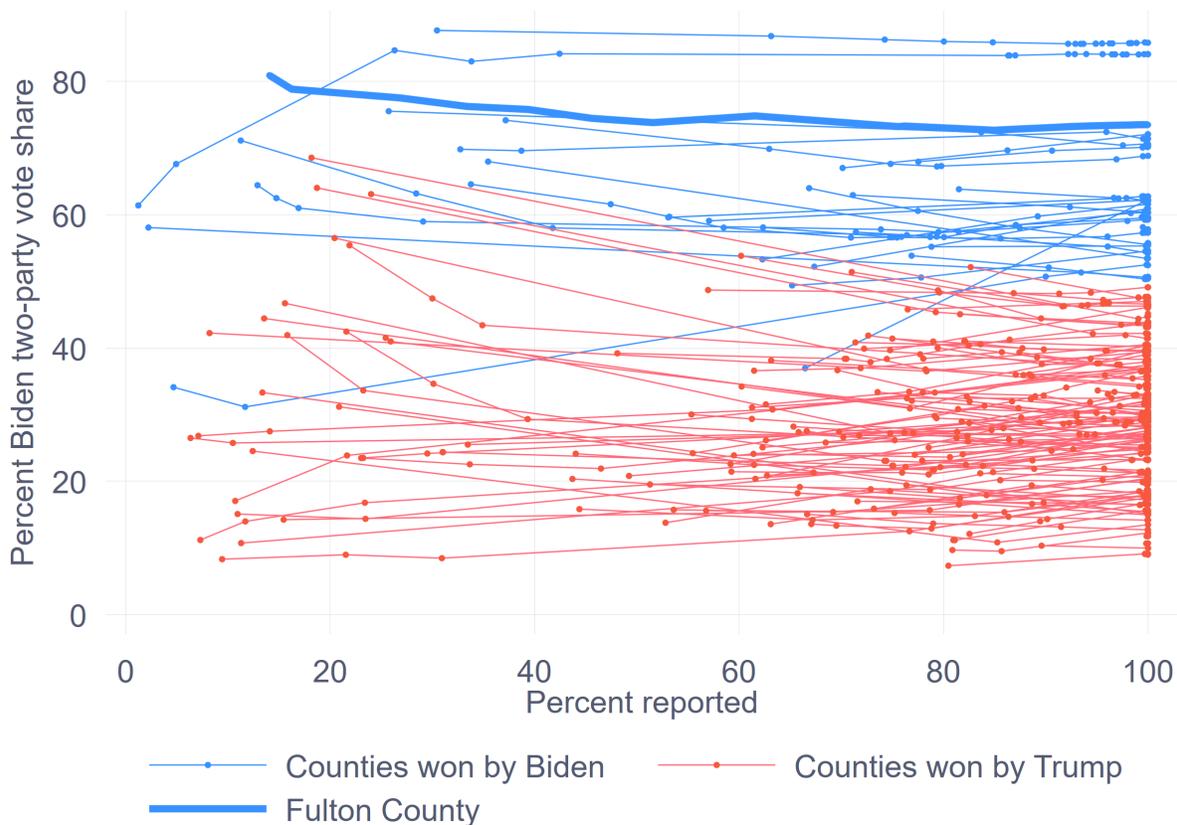
Separating the counties into those won by Biden and Trump alerts us to the fact that the two sets of counties had different trajectories over time. On average, the counties that gave a majority to Biden tended to drift toward Trump, while the counties that eventually gave a majority to Trump drifted toward Biden.[30]

When we expand our view beyond Georgia, we see a variety of patterns within states. Figure 19 shows four other battleground states, Arizona, Michigan, Pennsylvania,

and Wisconsin. In Arizona, Biden's initial lead started eroding almost immediately, and his share of the vote declined over time in virtually every county. Michigan, on the other hand, saw the opposite pattern, in which Biden's vote share grew over time in counties that he eventually both won and lost. The same is true in Wisconsin, although the pro-Biden shift over time is not nearly as pronounced as it is for Michigan. Finally, in Pennsylvania, Biden saw his vote share sag in most counties — Democratic and Republican — before reversing course in the end.

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[30] Supporting this view are two regressions with county fixed effects in which the dependent variable is the two-party vote share and the independent variable is the percent reported. (Observations weighted by the number of votes reported.) For the counties Biden won, the slope coefficient is -0.023 (s.e. = 0.0088, t = 2.65, R^2 = .98); for counties Trump won, the slope coefficient is 0.046 (s.e. = 0.014, t = 3.20, R^2 = .96)

Figure 19. Biden two-party vote share by county percent reported in Arizona, Michigan, Pennsylvania, and Wisconsin.
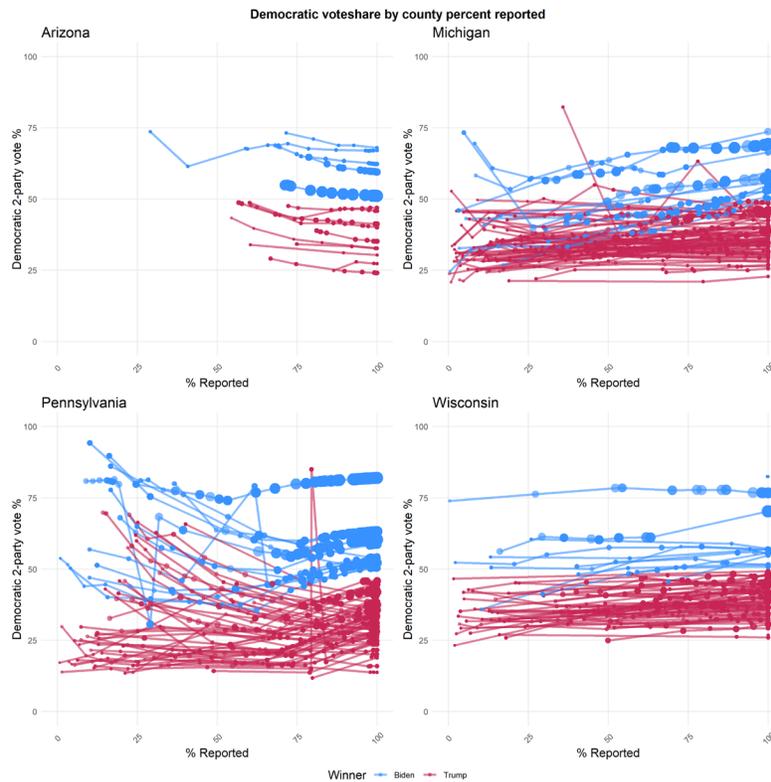
Analyzing the states of Florida and North Carolina reveals fewer counties that originally started in favor of one candidate and then shifted to the other. (See Figure 20.) The reason for this is because nearly all counties in each state reported over 50 percent of their total votes within the first batch of votes. It is therefore necessarily the case that the larger denominator would reduce the mathematical possibility of any future reported ballots to change the winner of the county in question. Had Mich-igan, Pennsylvania, and Wisconsin like-wise reported their initial results in such large batches, there would likewise have been fewer and smaller fluctuations in vote share over time. Therefore, changes in the cumulative vote shares that occur on election night and beyond can be thought of as being mainly determined by the proportion of votes that a county can report in its first batch, which itself is a function of the state laws governing when ballots can be processed.

Figure 20. Biden two-party vote share by county percent reported in Florida and North Carolina.
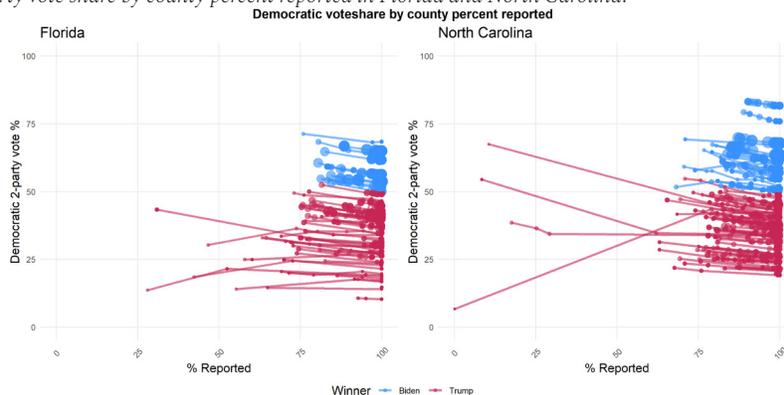
VARIABILITY WITHIN PRECINCTS

The final source of election-result reporting variability is within precincts. Most states have at least two major and separate sources of election results, those originating from Election Day precincts and those originating by mail. A large number have a third source, which is in-person early voting. Unless a state requires the co-mingling of mail and in-person ballots at tabulation, such as Massachusetts, states with multiple modes of voting will see the results from those modes arrive at different paces and in different quantities. This creates the possibility for variability *within precincts*, as the ballots from different modes are allocated back to the precincts that are associated with the voters.

The data source we have been analyzing thus far in this paper, from Edison Research via the *New York Times*, does not record the mode of the ballots, at least not for the public reporting, and certainly does not designate the location of the precincts from which the ballots have been reported. However, some states provide this data. One of those states is Georgia, which we analyze here.

In particular, we downloaded sequential data files from the Georgia election-night reporting system, which is a website maintained by the company Scytl. These files identified election returns by precinct and, within precinct, by mode — Election Day, early in-person (advance), and absentee (by mail). This dataset provides returns from the 2,653 precincts in the state. There are 20,236 individual updates, meaning that each precinct has, on average, 7.6 (s.d. = 6.1) reports across the entire period, from election night to final canvas. (The median is 5.) On average, each precinct has 1.04 (s.d. = 0.2) unique observations for Election Day votes, 3.4 (s.d. = 3.2) for early voting, and 4.2 (s.d. = 3.3) for absentee.

The next three graphs show the reporting pattern from among all of these precincts, by voting mode. Figure 21 starts with absentee ballots. To understand the figure, we have highlighted one precinct and shown it with a red dashed line. That line represents the "East Macon 2" precinct in Bibb County. Polls closed in Georgia at 7:00 p.m. The East Macon 2 precinct eventually saw 805 absentee ballots. At 8:14 p.m., an hour and fourteen minutes after polls closed, the county reported results from 422 of those absentee ballots, or 52.4 percent of all that would be reported. Then, at 10:50 p.m., or three hours and fifty minutes after polls closed, results from another 381 absentee ballots were reported, raising the total to 803, or 99.8 percent of 805. (The final two absentee ballots were reported after the time period covered by the graph.) Note that the graph line for East Macon 2 is a stair-step pattern with two landings.

Figure 21. Pace of election result reporting in Georgia precincts, 2020 general election, absentee ballots, within sixty hours of polls closing.
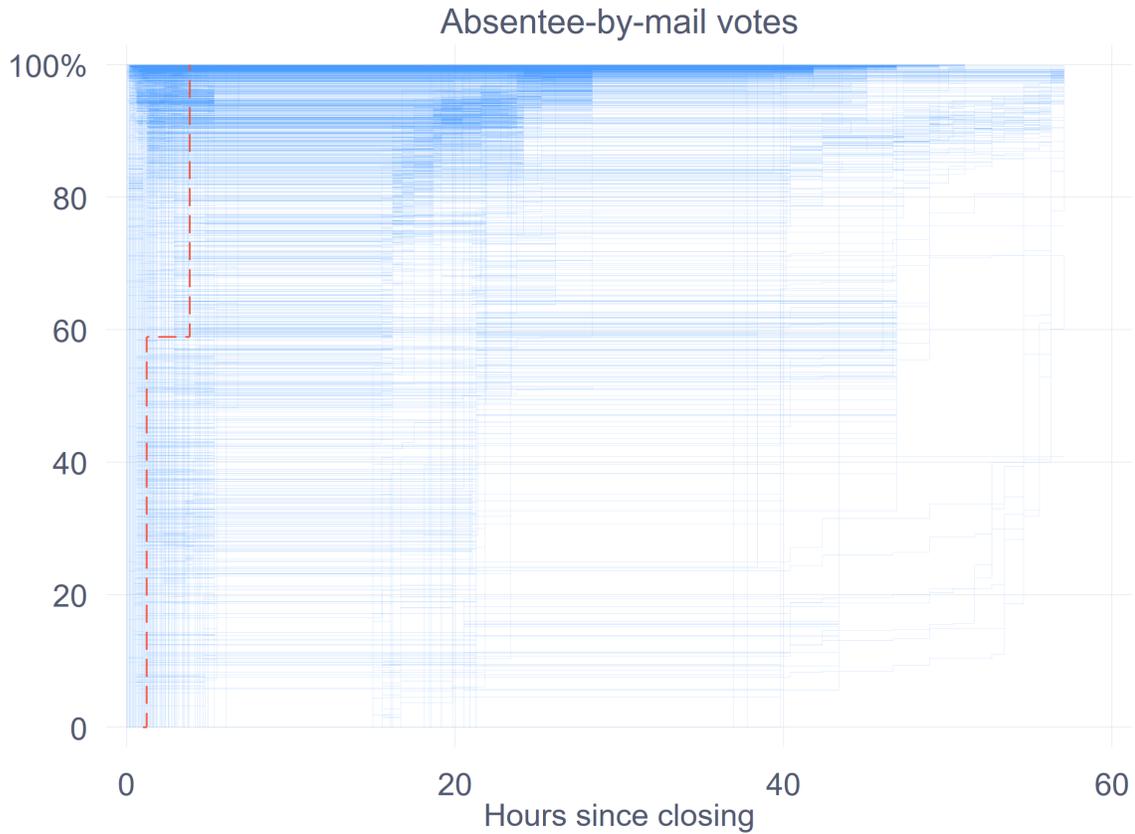
The other, blue lines on the graph show the same information for the other 2,652 precincts in the state. The overall effect of the graph is to show how precincts generally had their absentee ballots reported in multiple tranches. The median first report of absentee returns for a precinct was 1.2 hours after polls closed, with the median time of the second report coming 20.1 hours later.

Reports of early votes came in under quite a different pattern, as is shown in Figure 22. First, they came in quicker. The median time for the first report was also 1.2 hours, but the median time for the second report was just 1.0 hours later. Overall, the median time between updated reports for early voting was 0.8 hours, compared to 5.2 hours for absentee ballots.

Figure 22. Pace of election result reporting in Georgia precincts, 2020 general election, early vote ballots, within sixty hours of polls closing.
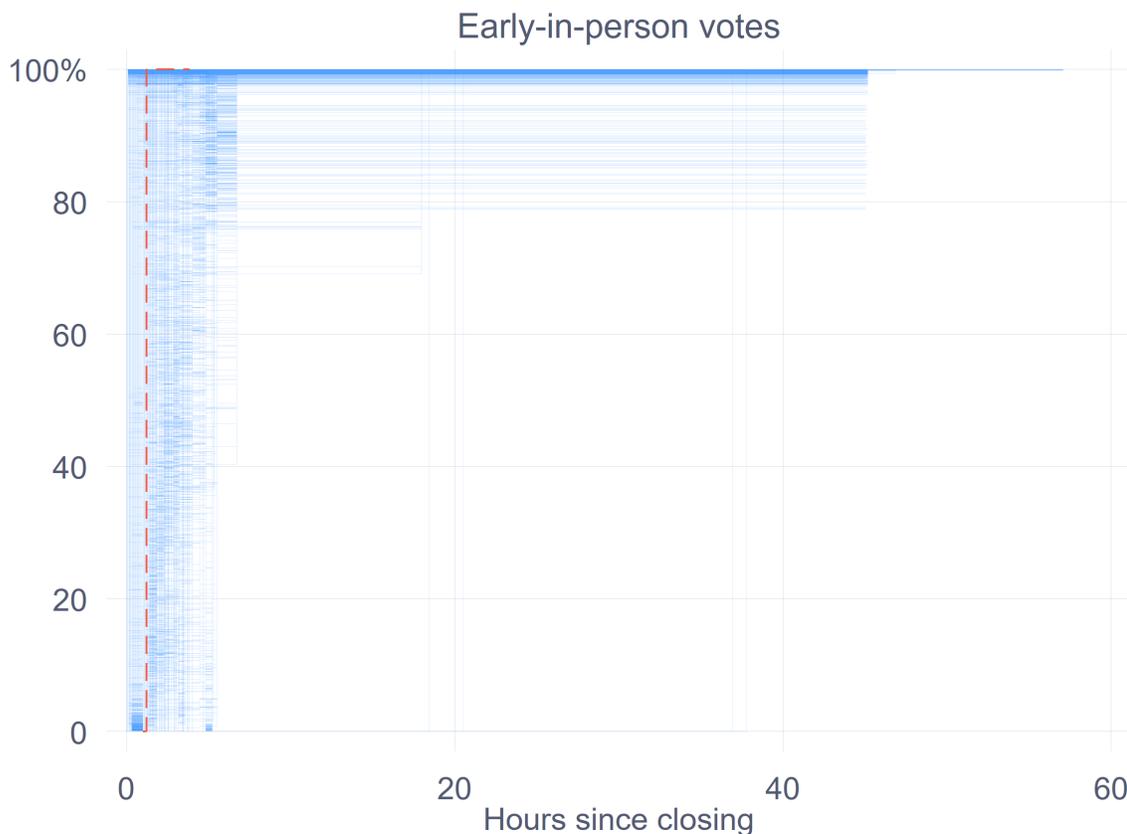
As is evident in the figure, election reports from early voting arrived in bursts for the first couple of hours after polls closed. This reflects the nature of the physical process involved in accumulating the results from early voting. The votes themselves are ingested into the reporting system using smart cards, one for each early voting location. It is possible for each early voting center in a county to contain votes from every precinct in the county. Therefore, every time early votes are updated in the election night reporting system from a particular early voting location, it is possible to update quite a few precincts. As a consequence, there are many reports of early vote totals for each precinct, with those reports arriving in rapid succession.

Finally, Figure 23 shows the time path of Election Day vote reporting. Here, the reporting patterns are quite simple, as almost every precinct had just one Election Day report — only 110 precincts (4.2 percent) reported more than once. Half of all precincts had reported by the two-hour mark, and 99 percent had reported within 5.3 hours.

Figure 23. Pace of election result reporting in Georgia precincts, 2020 general election, Election Day ballots, within sixty hours of polls closing.

Election Day votes
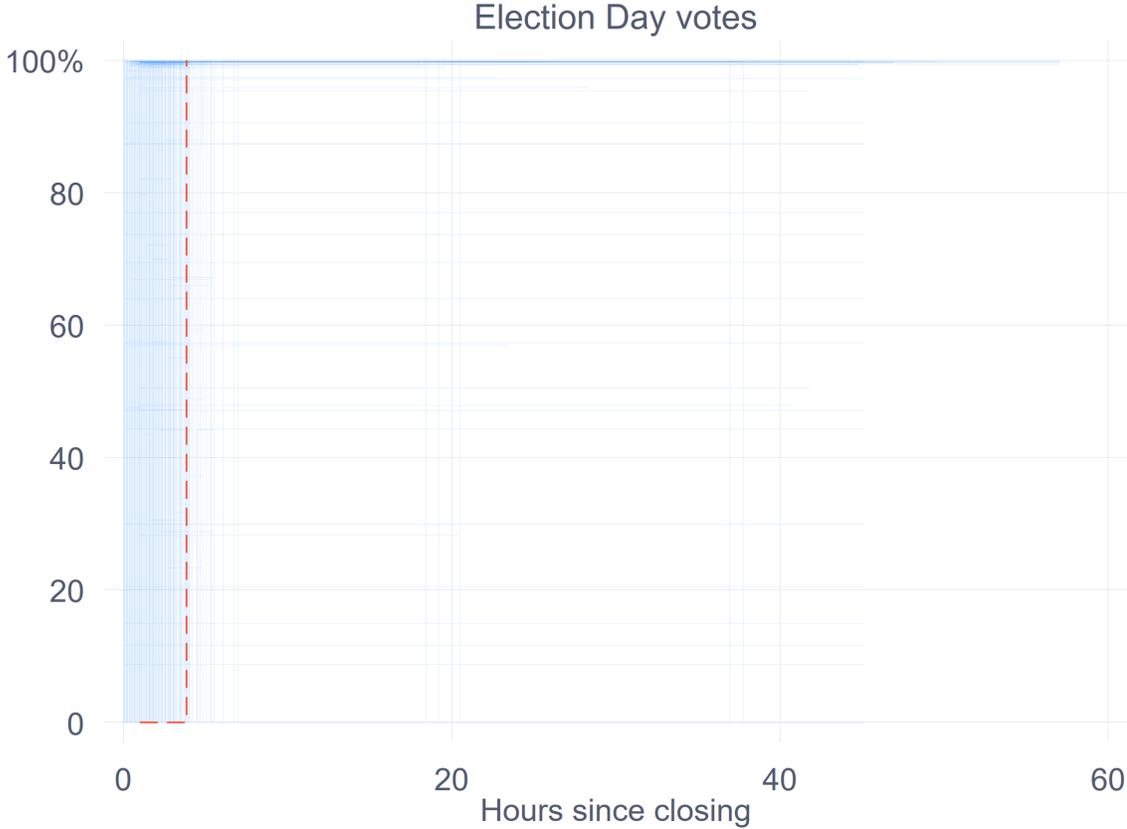
In most circumstances, understanding the variability of the pace of vote counting *within* a precinct is not so important, because of how quickly the different components of the vote get counted once the process starts. However, this analysis does suggest that because votes cast before Election Day can be counted in batches that include ballots from multiple precincts, and that a single precinct may have ballots appear in several batches, there can be instability even in precinct reporting patterns over time.

CONCLUSION

Concern over the reporting of election re-sults was just one of several unusual details surrounding the 2020 presidential election. Much of that concern arose because of wor-ries that an ignorant public could be mis-led into believing that there was something amiss about the election returns as they un-folded. In the final analysis, election offi-cials and numerous media outlets engaged in a historic educational effort to inform voters ahead of the election about what to expect once the election results began to be released. In addition, in most states, the election returns arrived and were reported fairly quickly, so that the returns rapidly homed in on the final result.

Nonetheless, the post-election vote count did witness major controversy. Some of this controversy arose for the simple fact that the election was close in a couple of states, particularly Georgia and Pennsylvania, and therefore even the smallest of discontinu-ities in the reporting pattern garnered great attention. Still, the most troubling contro-versy arose out of willful misrepresenta-tion of the patterns not only in Georgia and Pennsylvania, but also in states like Michi-gan, Arizona, and Nevada.

The goal of this paper has been a simple one: to illustrate the variability in the pat-terns of election-result reporting across the United States. Some of what has been de-scribed here has confirmed the convention-al wisdom that was proposed before Elec-tion Day. Republican counties tended to report their results faster than Democrat-ic counties; small counties reported faster than large counties.

At the same time, patterns that were sup-posed in commentary before the election either did not pan out or were riddled with major exceptions. The one pattern that did not pan out as a general matter was the cor-relation between the volume of absentee ballots and the rapidity of vote count re-porting. In some states, the counties with the most absentee ballots reported earliest; in other states, the opposite was true.

The pattern that showed mixed results con-cerned the preprocessing of absentee bal-lots. Here, we see that some states that al-lowed preprocessing were slower than other states that prohibited preprocessing. The reason for this varied pattern no doubt aris-es because the dichotomy between allow-ing vs. prohibiting preprocessing ignores important administrative details that also influence how quickly votes can be counted and reported. The speed with which states such as Wisconsin reported their results suggests that restricting preprocessing can be overcome by distributing the work among the precincts, rather than counting absentee ballots centrally.

We hope that this report will be of use to researchers who wish to explore the issue of election night reporting of vote counts. The 2020 election illustrates that the issue is not a matter of neutral administrative action. It

is one that can affect the narrative of the elections "final mile." In an era where there is much suspicion over the administration of elections, it is imperative that vote counting be transparent and that the pattern of results be understood widely. This will not completely shut down those who wish to build baseless conspiracy theories, but it will help to support the fact-based parts of the election administration system that are responsible for getting the results right.

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