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Cross-State Strategic Voting

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ABSTRACT

We estimate 3% of the U.S. voter population is registered to vote in two states. Which state these double-registrants choose to vote in reflects incentives and costs, being more prevalent in swing states (higher incentive) and states which automatically send out mail-in ballots (lower cost). We call this behavior cross-state strategic voting (CSSV) and estimate there were 317,000 such votes in the 2020 presidential election. Because both Democrats and Republicans engaged in CSSV, the net effect was small, although it could matter in closer elections (e.g., Florida in 2000) or if one party increased CSSV relative to the other.

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1. INTRODUCTION

Trust in elections is critical to the legitimacy of a democracy, but many Americans have little confidence in how elections are administered (e.g., Marist Poll, 2021, MIT Election Lab, 2021). Court cases and the literature have focused on *within*-state election issues, such as certification, polling locations and voter ID laws. Far less is known about *cross*-state issues because states run their elections independently, with no formal mechanism to coordinate voter registrations or votes across states.

The lack of central coordination introduces the possibility that individuals could vote in states they no longer live in, creating concern about election integrity and fairness.¹ For example, Senate Bill 1260, signed into Arizona law in June 2021, specifies that “A person is guilty of a class 5 felony who ... [k]nowingly provides a mechanism for voting to another person who is registered in another state.” Moreover, if some individuals are choosing where to vote, this gives them disproportionate – and arguably unfair – influence due to the Electoral College. These legislative actions and concerns exist despite a lack of evidence on how many people are registered to vote in two different states (*double-registrants*) and their voting behavior.

We provide this evidence using comprehensive data on all 203 million U.S. voter registrations. This paper is the first in the literature to (i) estimate the number of double registrants and (ii) document how their voting responds to incentives and costs.

We begin by estimating the number of voters who are double-registered as of October 2020. The same name appearing on the voting rolls of two different states could either be the same person or different people who happen to share a name. If it is the same person, the probability of the same birthday is 1; if they are different people, this probability will be much smaller. We use the empirical frequency that same-named people share the same birthday and the Law of Total Probability to estimate that 3% of voters are registered in two states. In other words, pairs of registrants in different states with the same name have the same birthday more often than would be expected by chance, and we use that excess probability to estimate that 6.1 million individuals are double-registrants.

¹See, for example Washington Post (2021), Vox.com (2017), Fox News (2022).

This approach allows us to estimate the size of the double-registered population, but does not identify which individuals are double-registrants. To do this we exploit cell phone data, which we have for a subpopulation of registrants. The characteristics of this group closely match those of the full population (Table 1). We show that two people with the same name, gender, birthdate information, and cell phone number registered in two different states are almost certainly the same person. Using this novel approach, we identify a sample of 590,991 double-registrants.

Having identified a sample of double-registrants, we next turn to their voting behavior in the 2020 presidential election. *Ceteris paribus*, these individuals may prefer to vote in the state with a strategic advantage. For example, a voter registered in both Mississippi and Georgia may choose to vote in Georgia because it is a swing state and Mississippi is not. Similarly, a voter registered in both Oregon and Idaho may prefer to vote in Oregon because it automatically sent them a mail-in ballot, unlike Idaho. We call this behavior *Cross-State Strategic Voting* (CSSV).²

Regardless of voter preferences, most state election laws specify that citizens should vote in the state of their legal domicile, and they can have only one (Greabe, 2012). Characteristics which help courts determine an individual’s domicile include where they have a driver’s license, where they pay state taxes, and where they spend the majority of the year. For example, the guidance given to service members, who relocate frequently, by the government is: “Your voting residence is within your state of legal residence or domicile ... [it] is used for state income tax purposes, and determines eligibility to vote for federal and state elections ... You have the option to establish residency or domicile each time you are transferred to a new location. Once you change your residence or domicile, you may not revert to a previous residence without re-establishing a new physical presence according to residency laws of that state” (Federal Voting Assistance Program, 2022).

If individuals are choosing where to vote based on costs and incentives (CSSV), there are two possible ways this could happen. First, someone may vote in a state which is

²Strategic voting (e.g., Duverger, 1954, Farquharson, 1969, Myerson and Weber, 1993) typically refers to voting as if one’s vote is pivotal, which can lead to voting for a less-preferred candidate if the preferred candidate is unlikely to win. In contrast, voters engaging in CSSV are strategic in their choice of state to vote in.

not their legal domicile. This could be purposeful or due to ignorance of state voting laws.³ Alternatively, voters may be willing to incur some costs to establish – or reestablish – domicile in a state they prefer to vote in. For example, a double-registrant who moved from Arizona to California might spend resources or time in Arizona to reestablish domicile there in order to vote in a swing state. Absent these strategic behaviors, we would not expect where double-registrants vote to coincide with whether states are swing or whether states make it easier to vote.

Nevertheless, we find strong evidence of CSSV in our sample. For each double-registrant, we call the state with the earlier date of registration the “first” state and the state with the later registration the “second” state. If an individual’s first state is a swing state but the second is not, their likelihood of voting in the first state is 4.6 percentage points (pp) higher than if neither state is swing. This amounts to a 31% increase relative to the mean of 15%. In other words, when the opportunity to participate in a consequential election only exists in the first state, voters are more likely to vote there, despite having registered in another state more recently. Likewise, if only the second state is swing, they are 2.9 pp less likely to vote in the first state.

Our main measure of voting costs is whether a state automatically mails out ballots. We find that double-registrants disproportionately choose to vote in the state which makes voting less costly. If only the first state auto-mails ballots, the likelihood of voting there increases by 63% of the mean. However, if only the second state does, the likelihood of voting in the first state decreases by 37%. We find smaller effects for early voting, another measure of voting costs.

Choosing which state to vote in presupposes that a person will vote in the first place. Thus, one potential concern is that incentive and cost considerations influence the likelihood a person will vote at all rather than the particular state they will vote in. We address this concern by considering a subset of double-registrants who are over 99% likely to vote based on observables, such as their voting history. This “identification at infinity” approach continues to show strong evidence of CSSV.

³Voting in a state which is not one’s legal domicile is illegal and has resulted in a handful of prosecutions (New York Times, 2022).

Our main analysis uses a binary measure for whether a state is swing. However, not all swing states are created equal: Iowa was much less of a swing state than Georgia in 2020. Moreover, the difference in closeness between a double-registrant’s pair of states will also vary. For example, Georgia could be paired with a similarly close swing state like Arizona or with a less-close swing state like Iowa. We find that, holding the closeness of the first state fixed, as the second state’s election becomes less close, double-registrants are more likely to vote in their first state.

A related question is whether the same incentives and costs lead double-registrants to cast a ballot in both states. CSSV predicts that double voting should be most prevalent when both states are swing, which is exactly what we find. We also document that auto-mailed ballots increase the likelihood of double voting. While not the focus of this paper, we find double voting to be extremely rare in the 2020 election (at most 0.034% of voter registrations), in line with prior work by Goel et al. (2020) for the 2012 election.

We next consider how CSSV affected the 2020 election. To calculate how votes shifted across states due to CSSV we (i) estimate the number of double-registrants by party and state, (ii) apply incentive and cost estimates to calculate vote flows from double-registrants for each party and state, and (iii) map these votes to candidates using exit polls. We estimate 317,000 CSSV votes, 217,000 of which involved at least one swing state. However, CSSV was not pivotal in any state because both Republicans and Democrats engaged in it. The net vote gains we estimate for swing states range from a Republican gain of around 5,000 votes in Texas to a Democratic gain of 700 votes in Nevada. These *net* effects were small relative to the margins of victory, the closest of which was 10,500 votes in Georgia. Nevertheless, CSSV could be important in closer elections, such as the 2000 election, which was won by 537 votes in Florida. In the same election, only 366 votes separated the candidates in New Mexico.

Our paper relates to three strands of the literature. The first tests for the presence of classical strategic voting, where individuals behave as if their vote is pivotal, including Fujiwara (2011), Kawai and Watanabe (2013), Spenkuch (2015), Anagol and Fujiwara (2016), Pons and Tricaud (2018), Spenkuch (2018), and Clark et al. (2022). Our contribution is to identify a new and potentially consequential form of strategic voting: *Cross-State Strategic*

Voting. In other words, while the existing literature demonstrates strategic choice of *who* to vote for, we show individuals strategically choose *where* to vote.

Second, we contribute to the literature on potential violations of election law (e.g., Gronke et al., 2008, Minnite, 2010, Cottrell et al., 2018, Eggers et al., 2021, Cantoni and Pons, 2021, Ferlenga and Knight, 2022). Given new legislation targeting double-registrants, we contribute by estimating the size of this population and examining their behavior.

Third, our paper relates to work examining determinants of voting, including features of elections designed to lower voting costs, such as early voting, voting technology, and mail-in ballots (e.g., Braconnier et al., 2017, Cantoni and Pons, 2022, Yoder et al., 2021, Cantoni, 2020, Kaplan and Yuan, 2020, Bechtel et al., 2018, Spenkuch and Toniatti, 2018, Fujiwara et al., 2016, DellaVigna et al., 2016, Fujiwara, 2015, Ortoleva and Snowberg, 2015, Gerber et al., 2013, Gentzkow et al., 2011). We find consistent evidence that costs matter using a new empirical design and a unique sample of voters. We also document an unintended effect of reducing such costs: states which make voting easier pull votes from swing states, most of which are not low-cost.

2. DATA

Our data on voter registrations across the United States is from L2, a well-known, non-partisan data vendor used by political campaigns and the academic literature (e.g., Allcott et al., 2020, Billings et al., 2021, Spenkuch et al., 2021). The L2 dataset contains information on registered voters in all 50 states (and DC), including their name, address, birthdate, and voting history. In addition, L2 merges the state-level voter files with other administrative and commercial datasets, adding additional voter characteristics such as cell phone number.

The data also contain information on individuals' political partisanship. For 34 states (and DC), L2 assigns political affiliation using self-reported voter registration. For the remaining states, L2 infers party using a variety of data sources, including voter participation in primaries, demographics, exit polling, and commercial lifestyle data.⁴

L2 data is regularly tested by political campaigns in the field. Academic papers have also

⁴Party identification is inferred in Alabama, Georgia, Hawaii, Illinois, Indiana, Michigan, Minnesota, Missouri, Montana, North Dakota, Ohio, South Carolina, Texas, Vermont, Virginia, Washington.

verified the accuracy of the partisanship measures in voter files. For example, Bernstein et al. (2022) validates the accuracy of L2 partisanship by comparing state files to L2 data; Brown and Enos (2021) runs a survey to verify L2 partisanship; Pew (2018) compares commercial voter file data to Pew national survey microdata. In addition, when we sum L2’s individual-level voting records by state they closely match certified state totals. In all but six states the vote totals in the L2 files exceed those in the certified totals (by 0.8% on average), consistent with (i) “residual voting” (casting a ballot to vote for some offices but not for president (Stewart III et al., 2020)), and (ii) some ballots not being counted for procedural reasons. In five of the remaining six states the difference is small (-0.4% on average), which could be due to minor differences in when vote totals are certified versus when L2 receives the data.⁵

2.1 SUMMARY STATISTICS

Table 1 presents summary statistics. The first column considers the full dataset of L2 voters as of October 2020; the second column is for voters for which we have the data (e.g., cell phone number) necessary to identify them as double-registrants; the final column reports statistics for our sample of identified double-registrants. Specifically, these are individuals with the same cell phone number, first name, last name, gender, month of birth, and year of birth but are registered in two different states. As we will show in Section 4.1, the likelihood of two people from different states having these same matched characteristics but *not* being the same person is less than 0.001%.

There were 203 million voter registrations as of October 2020 (31% Republican and 41% Democratic); 74% voted in the 2020 presidential election. The characteristics of voters with the required variables for our matching procedure (in column 2) are remarkably similar to the full dataset in terms of voting history, partisan fractions, and demographics. In contrast, double-registered voters (column 3) are quite different. This is unsurprising, because double-registrants have necessarily moved, and so tend to have characteristics associated with geographic mobility: higher income (59% in column 3 vs. 37% in column 2), younger

⁵The lone outlier is Utah, where the certified vote total is 16% larger than the number of cast ballots in the L2 data. Upon examining the original voter file that L2 received from the state of Utah, we find the same difference. In other words, the discrepancy is attributable to the state of Utah, not L2. Our results are unaffected when dropping Utah.

(59% vs. 40% for the fraction born after 1975), and less likely to be a homeowner (50% vs. 67%). Double-registrants are also less likely to be Republicans (21% vs. 33%). In fact, Democrats outnumber Republicans 2:1 among double registrants.

Appendix Table A2 columns 1-3 shows how the likelihood of being a double-registrant varies with political affiliation, demographics, and geography. The negative coefficient on Republican in column 1 mirrors the univariate results in Table 1. However, the coefficient on Republican shrinks by over 80% from column 1 to 3 as we add control variables, indicating Republican party membership is correlated with many characteristics that predict double-registration. In columns 4 and 5 we investigate geographic mobility directly using Cooperative Election Study (CES) survey data, regressing the likelihood of moving within the last year on personal characteristics. The negative coefficient on Republican in column 4 indicates that Republicans are less likely to move unconditionally; as we add geographic and demographic controls in column 5, the coefficient shrinks by roughly 70%, mirroring the results in the first three columns.⁶ Taken together, this evidence suggests that Republicans are less likely to be double-registrants mostly because they have characteristics associated with lower geographic mobility.

3. ESTIMATING THE PREVALENCE OF DOUBLE-REGISTRANTS

In this section, we estimate how many of the 203 million registrations correspond to the same individual in two states. For example, if a person is initially registered in Arizona and then moves to and registers in California, but remains on the voter roll in Arizona, they will be counted twice in the 203 million total.⁷

We estimate the number of double-registrants in our sample by measuring how many people have the same name and birthdate in two different states, in excess of the number expected by chance. We define Name Uniqueness (NU) as the total number of times a (first name, last name) combination occurs in our voter registration data. We remove the 54,067,832 registered voters whose names occur only once in the sample ($NU = 1$) because

⁶CES data do not provide zip code information so we are unable to control for zip-code fixed effects.

⁷L2 performs a data cleaning process before making their data available to academics and campaigns. To the extent that L2 removes some double-registrants in this process, our estimate of the number of double-registrants will be an underestimate.

these names have no corresponding match in any other state.

Among the remaining voters, we find pairs with the same first name, last name and birth year in two states, and consider the subset for which we have birth day and month for both voters in the pair.⁸

The estimate proceeds as follows. By chance, pairs of *different* people with the same name and birth year will have the *same* birth day and month in $1/353$ or 0.2833% of cases, assuming birthdays are uniformly distributed through the year.⁹ If the empirically observed percentage of cases with the same birth month and day is higher than 0.2833%, then we can infer that some of these pairs are in fact the same person. For a pair of records, we define D_1 and D_2 as the birth day and month of records 1 and 2, respectively. We can then apply the Law of Total Probability:

$$\begin{aligned}
 P(D_1 = D_2) &= P(D_1 = D_2 \mid \text{same person}) \times P(\text{same person}) \\
 &+ P(D_1 = D_2 \mid \text{not same person}) \times P(\text{not same person})
 \end{aligned}
 \tag{1}$$

Absent recording errors, $P(D_1 = D_2 \mid \text{same person}) = 1$. Assuming births are evenly distributed across days of the year, $P(D_1 = D_2 \mid \text{not same person}) = 0.2833\%$. For each level of NU we can estimate $P(D_1 = D_2)$. Using this information and rearranging terms, for each NU we obtain:

$$P(\text{same person}) = \frac{P(D_1 = D_2) - 0.2833\%}{1 - 0.2833\%}
 \tag{2}$$

For example, when $NU = 2$, we find that $P(D_1 = D_2) = 87.511\%$, but we would expect this to occur by chance in only 0.2833% of pairs if they are not the same person. Using equation 2 we can infer that $\frac{87.511\% - 0.2833\%}{1 - 0.2833\%} = 87.476\%$ of these pairs are the same person, which translates to 1,294,288 voters. Since our sample has 16,923,844 voters with $NU=2$,

⁸27 states are missing day of birth information at a non-trivial rate, and states often record the day of birth as 1 when information is missing. We estimate the percentage of double-registrants among pairs of observations for which day is available and is not the first of the month. We apply this estimate to the full population of matched pairs of registrations, based on the assumption that the two missing conditions are uncorrelated with double-registrant status.

⁹Using the empirical distribution of birthdays would not materially alter the results of this calculation. Relatedly, we first match on name and year because specifying a counterfactual probability based on day, month, and year is less straightforward.

we estimate that $1,294,288/16,923,844 = 7.65\%$ of them are double-registrants.

We calculate this for each value of NU from 2 to 150 and plot them in Appendix Figure A1. As the value of NU increases, the probability that a pair is the same person registered in two states (a double-registrant) falls, converging to approximately 2.55%. The intuition for this decline is that a pair of registrations with the same very unusual name (e.g., NU = 2) has a considerable chance of being the same person, but this likelihood is much lower (and converges to 2.55%) for more common name pairs (e.g., NU=50 or higher).¹⁰

Summing over all levels of NU generates an estimate of 5.1 million voters that were double registered for the 2020 general election. This implies that of the 203 million voter registrations there are 192.8 million single-registrants and 5.1 million double-registrants, so that double-registrants make up 2.6% of all voters.

This analysis has assumed all double-registrants have identical recorded first and last names in both state registrations. However, this is not always the case for a variety of reasons, such as name changes following marriage, name recording errors, use of nicknames (e.g., Thomas vs. Tom) and so on. We correct for this by estimating a scaling factor capturing the ratio of double-registrants with identically recorded first and last names to the full set of double-registered individuals (see Appendix 1 for details). Applying the adjustment factor of 1.1954, we estimate there were 6.1 million double-registrants, or 3.1% of voters as of October 2020.

4. CROSS-STATE STRATEGIC VOTING

4.1 IDENTIFYING A SAMPLE OF INDIVIDUAL DOUBLE-REGISTRANTS

The preceding section allows us to estimate the size of the double-registered population, but does not identify which individuals are double-registrants. To construct a sample of identified double-registrants, we take advantage of cell phone data. As we showed in Table 1, the characteristics of the population for which we have cell phone data closely matches those of voters without it. We match voters from different states on first name, last name, gender,

¹⁰We performed this calculation for all values up to NU=150. Because the probability remains approximately 2.55% after NU=100 we use this value from then on.

year and month of birth, and cell phone number. Note that cell phone number is a non-redundant piece of information for matching because numbers are merged to an individual voter registration using name and *address* by the data provider (and hence within each state voter file) before we perform cross-state matching.

The analysis proceeds as follows: we first find all pairs of voters from different states that have the same first name, last name, gender, year of birth, and matching first 9 digits of their cell phone number. The tenth digit of each voter’s cell phone number and month of birth are used as “check digits” to ensure a correct match; we use two check digits instead of one to minimize the effects of recording errors on our calculations.¹¹ At the pair level, we have the following conditional probabilities:

$$P(\text{Either check digit matches} \mid \text{same person}) \approx 1$$

$$P(\text{Either check digit matches} \mid \text{not same person}) = 1 - (9/10 \times 11/12) = .175$$

Empirically, we find that among the 629,035 matches, 99.9703% of them have at least one check digit that matches (either the same cell phone 10th digit, same month of birth, or both). Using the above conditional probabilities and the Law of Total Probability, we find that 99.964% of our matches are indeed the same person. To define our sample, we require that *both* check digits match (reducing the sample to 611,129 matches). Applying Bayes rule yields a final estimated probability of over 99.999% that the matches in our sample correspond to the same person. For our final regression sample we further drop the approximately 20,000 voters registered in more than two states.¹² This leaves us with a sample of 590,991 double registrants.

4.2 MAIN RESULTS

We now explore whether a double-registrant chooses to vote in a state depends on that state’s election characteristics. Specifically, elections in “swing states” are more consequen-

¹¹We do not use day of birth to define the sample as this would exclude individuals in states that do not consistently record day of birth, as noted in Section 3.

¹²We also exclude registered voters whose birthdays are on January 1st because there is an abnormal mass of voters, suggesting that some states assign this date by default when only year of birth is known. We drop 62 voters recorded as registering in two states on the same day.

tial for national-level outcomes, which may incentivize voters to participate more than elections that are near-certain. Indeed, despite the near-zero probability that an individual vote will be pivotal in any election, individuals seem more likely to vote in closer elections (e.g., Blais, 2006, Alvarez et al., 2006). In addition, some states make it easier to vote, for example by automatically mailing ballots to all registered voters, which lowers the time and effort cost of voting. We call voting that responds to these incentives and costs when choosing where to vote Cross-State Strategic Voting (CSSV).

To put our analysis in context, a majority of states have laws that restrict voting to one’s state of domicile. Domicile is a legal term: “the place where a person has fixed his habitation and has a permanent residence, without any present intention of removing there from” (Black’s Law Dictionary). Individuals may have multiple residences but only one legal domicile at a time. Typically, the government determines a person’s domicile based on characteristics such as where they have a driver’s license, where they pay state taxes, and where they spend the majority of the year. For example, service members, who relocate often, are advised that “Your voting residence is within your state of legal residence or domicile... [it] is used for state income tax purposes, and determines eligibility to vote for federal and state elections” (Federal Voting Assistance Program, 2022).

If double-registrants are choosing where to vote based on incentives and costs (CSSV), there are two possible ways this could happen. First, they could vote in a state which is not their legal domicile, either purposefully or due to ignorance of state laws. Alternatively, they could incur some costs to establish or reestablish domicile in a state. Returning to our service member example, the government instructs: “You have the option to establish residency or domicile each time you are transferred to a new location. Once you change your residence or domicile, you may not revert to a previous residence without re-establishing a new physical presence according to residency laws of that state” (Federal Voting Assistance Program, 2022). Absent any strategic behaviors among double-registrants, we would not expect where they vote to coincide with whether states are swing or whether states make it easier to vote.

Among our sample of 590,991 double-registrants we know the date of voter registration in each of their two states; we call the state with the earlier registration the “first” state and

the state with the later registration the “second” state. A voter’s second state is their most likely state of domicile, as this is the one they most recently registered to vote in. Consistent with this, only 15% of double-registrants voted in their first state in the 2020 presidential election.

In Figure 1, we show both the source (second states) and destination (first states) of these vote flows. States that are neither swing nor auto-mail lose the largest share of their votes and attract the fewest. In other words, within each destination group, the white bars (*from: neither*) are always taller than the black (*from: swing*) and grey (*from: auto-mail*). For example, in the middle destination group, neither states lose 19% of votes to swing states, whereas swing states and auto-mail states only lose 16% and 13%, respectively. Looking across destination groups, the left-most group of bars (*to: neither*) are shorter than those of the other destination groups. For instance, neither states attract only 14% from other neither states, whereas swing and auto-mail states attract 19% and 27%, respectively.

We estimate these effects more systematically in the following regression framework:

$$\begin{aligned} \text{Vote } first_i = & \gamma_0 + \gamma_1 \text{Only } first \text{ swing}_i + \gamma_2 \text{Both } swing_i + \gamma_3 \text{Only } second \text{ swing}_i \\ & + \gamma_4 \text{Only } first \text{ low-cost}_i + \gamma_5 \text{Both } low-cost_i + \gamma_6 \text{Only } second \text{ low-cost}_i + \epsilon_i \end{aligned} \quad (3)$$

$\text{Vote } first_i$ is an indicator equal to one if individual i , who is double-registered in a pair of states, voted in their first state in the 2020 presidential election, and zero otherwise. The omitted categories are pairs of states that are both not swing, and pairs that are both not low-cost. We identify swing states as those for which the less favored party has at least a 20 percent chance of winning according to the betting market PredictIt (PredictIt, 2020) one month before the election (October 3, 2020). This regression exploits the variation across 2,332 ordered state pairs (out of a theoretical maximum of $51!/(51-2)! = 2,550$).

We find strong evidence of CSSV in Table 2. The positive and statistically significant coefficient on *only first swing* in column 1 indicates that when the first state is swing but the second is not, double-registrants are 4.6 pp more likely to vote in their first state, which translates to a 31% increase relative to the mean. Moreover, when double-registrants’ second state is swing and their first is not, they are 20% *less* likely to vote in their first state relative

to the mean. Overall, votes among double-registered individuals flow to the states that are more consequential.

We also find evidence that the cost of voting affects where double-registrants choose to vote. Automatically receiving a mail-in ballot reduces the effort required to vote and so typically increases voting participation (e.g., Gerber et al., 2013, Hodler et al., 2015).¹³ We find that if only the first state automatically mails out ballots, the likelihood of voting there increases by 72% relative to the mean (column 1). If both states have auto-mailed ballots, this effect shrinks to 47%. However, when only the second state has auto-mailed ballots, double-registrants become less likely to vote in their first state (-40%). Note that our estimates for CSSV in response to incentives (swing states) and costs (auto-mailed ballots) are largely independent, as only one state – Nevada – had both characteristics in 2020.

Early voting which allows people to vote before election day constitute another dimension of voting costs. We find similar, albeit more muted, cost effects for these policies in column 2, while the main incentive and cost effects of swing states and auto-mailed ballot policies are essentially unchanged.

4.3 ROBUSTNESS

Our outcome variable potentially embeds two components: (1) deciding whether to vote and (2) conditional on voting, choosing which state to vote in. Only the second of these two would be considered CSSV. To isolate this second component, in Table 2 columns 3 and 4 we consider registrants who are predicted to vote in the 2020 presidential election with a very high probability ex-ante. In column 3 we select all individuals who voted in the 2020 primary election. This group has a 97.4% chance of voting in the general election. In column 4, we select individuals who have a high predicted probability of voting estimated from a probit model with demographics interacted with political donor status and voting history (see Appendix Figure A2). We use individuals with a predicted probability of voting above 99%.

This “identification at infinity” approach (d’Haultfoeuille and Maurel, 2013) in columns

¹³While the USPS will not forward ballots, a mail-in ballot is still more flexible than early in-person voting or in-person voting on election day.

3 and 4 reveals that our results in column 2 are robust. If anything, the estimated coefficients are larger among these near-certain voters. This could be due to two reasons. First, 25% of double-registrants do not vote at all, which will attenuate the coefficients in column 2. Second, near-certain voters might be more politically engaged and therefore more responsive to strategic incentives.¹⁴

4.4 RELATIVE CLOSENESS OF ELECTIONS

Thus far we have used a binary measure for whether a state is swing and compared swing to non-swing states. However, not all swing states are equally close: Iowa (which went +8% for Trump) is much less of a swing state than Georgia (+0.2% Biden). Moreover, the difference in closeness between a double-registrant’s pair of states will also vary. For example, Georgia could be paired with a similarly close swing state like Arizona (+0.3% Biden) or with a less-close swing state like Iowa. If the relative closeness of elections affects CSSV behavior, the incentive to vote in Georgia will be higher when it is paired with Iowa.

Figure 2 and Table 3 explore these effects. Panel (a) of Figure 2 plots the probability of voting in the first state against the first state “win gap,” defined as the absolute value of the Democratic minus Republican win probability in prediction markets. As the first state’s win gap becomes larger (i.e., the election becomes less close), individuals are less likely to vote there. Panel (b) changes the horizontal axis to be the difference in win gaps between the second and first state in each pair. While panel (a) has 51 possible values for the win gap (50 states plus DC), panel (b) has 2,332 possible values for the difference in win gaps (the number of ordered state pairs in our sample). There is a clear positive slope in panel (b), indicating that as an individual’s incentive to vote in their first state increases (because the difference in win gaps between their second and first state is larger), they are more likely to vote in their first state. Panels (c) and (d) repeat these graphs, but residualize out the early voting and auto-mailed ballot variables of Table 2 from the voting probability. This reduces the dispersion of the observations around the fitted lines without changing the slopes.

Table 3 mirrors Table 2, but we replace the binary measures for swing states with two

¹⁴2.7% of double-registrants are FEC donors; this rises to 4.9% among primary voters and to 8.1% among those who have a predicted probability of voting above 99%.

continuous variables: (i) the first state win gap (*first win gap*) and (ii) the difference in win gaps between the second and first state (*second – first win gap*). We find that a one standard deviation (30 pp) increase in the first state’s predicted win gap (*first win gap*) reduces a double-registrant’s likelihood of voting there by 0.9 pp (30×-0.031). A one standard deviation increase in *second – first win gap* (46 pp) increases the likelihood of voting in the first state by 2.4 pp. In other words, holding the first state win gap fixed, as the second state’s election becomes less close, voters are more likely to vote in their first state. The coefficients on *auto-mailed ballot* and *early voting* are largely unaffected.

4.5 CSSV AND DOUBLE VOTING

A natural question is whether double-registrants double vote *for president* since this is illegal under the Voting Rights Act of 1965 (52 U.S.C. §10307(e)).¹⁵ We observe a mean rate of double voting of approximately 1% among double-registrants in our sample, amounting to 0.034% of voter registrations. Hence, we reach the same conclusion as Goel et al. (2020) that double voting is exceedingly rare.

Moreover, even this low rate is likely an over-estimate for two reasons. First, outcome means close to zero are sensitive to small data recording errors in this setting (Goel et al., 2020). While data recording errors could inflate the *level* of double voting, they should not inflate the coefficient estimates for incentives and costs, which are the main focus of the paper.¹⁶

Second, even if a voter did cast a ballot in two states, this need not imply double voting for president. Failing to vote for president despite turning in a ballot is not uncommon (“residual voting”). In fact, Stewart III et al. (2020) find that 1.4% of ballots were residual votes in the 2016 election. “Ballot roll-off” is a closely related concept, where someone votes for president but not for other items on the ballot. Because how an individual votes is confidential, in our data we only observe whether someone cast a ballot, but not which items they voted on. Thus, it is possible that a double voter casts a ballot in state A for president

¹⁵National Conference of State Legislatures (2021) finds that there have only been a small number of cases of double voting prosecuted under state law and none under federal law.

¹⁶Meyer and Mittag (2017) shows that a binary dependent variable with conditionally random measurement error attenuates coefficients in most situations.

(but not for U.S. senator) and in state B for senator (but not for president).

We now investigate whether the same CSSV forces that affect which state to vote in – incentives and costs – influence the likelihood of double voting. We estimate equation 3 but change the outcome to be an indicator for voting in two states in the 2020 presidential election. Table 4 reports the results and finds evidence of CSSV. When only the first state is swing, the probability of double voting increases by 24% of the mean in column 2, and when both states are swing this rises to 43%. Double-registrants respond even more strongly to costs. Double voting increases by 104% if both states send out auto-mailed ballots. The effect is similar for *only first auto-mailed* (106%) and smaller for *only second auto-mailed* (19%), likely because cost considerations matter less in the state where double-registrants live.¹⁷

Columns 3 and 4 condition on near-certain voters, as in Table 2. The influence of incentives increases, with the coefficient in column 4 on *both swing* rising to 64% of the subsample mean. For cost-related variables, we see a decrease in effect sizes, suggesting that individuals that are very likely to vote are less influenced by cost considerations.

5. DID CSSV AFFECT THE OUTCOME OF THE 2020 ELECTION?

The prior section documents strong evidence of CSSV behavior in the 2020 election. To quantify the number of votes involved, columns 1 and 2 of Table 5 provide back-of-the-envelope estimates of the total number of CSSV votes flowing in and out of each of the 13 swing states. We do this by estimating the number of double-registrants using the same strategy as in Section 3, calculating the number of votes that flow in and out of each pair of states using estimated CSSV coefficients, and summing the inflows and outflows for each swing state. To put these numbers in perspective, column 3 lists the actual vote margins in the 2020 election. In some states, the inflows and outflows are of the same order of magnitude as the actual victory margins.

However, whether this behavior affected the outcome of the election depends on whether one party engaged in CSSV more than the other in swing states. The overall effect depends on

¹⁷Appendix Table A4 shows that these estimates are robust to the same set of robustness checks as in Appendix Table A3.

(i) the share of Democrats vs. Republicans among double-registrants and their distribution across states and (ii) the intensity of CSSV behavior among Democrats vs. Republicans. Ultimately, what matters is the party composition of both inflows and outflows in swing states. For example, if the inflows were all votes for Biden and the outflows were all votes for Trump, then the elections in Arizona and Georgia would have flipped to Trump in the absence of CSSV. However, this is an extreme example, and in reality each flow will include votes for both candidates. Indeed, the calculated inflows and outflows in columns 1 and 2 use party-specific estimates for the number of double-registrants and for the CSSV coefficients.

In Section 2 we showed that there are approximately twice as many Democratic as Republican double-registrants. Appendix Table A5 runs the regression from Table 2 column 2 separately for Democrats, Republicans, and Independents. While voters from all parties display CSSV behavior, an F-test confirms that the coefficients are different (p value < 0.01). The coefficients on *only first swing* and *only second swing* are larger in absolute value among Republicans than Democrats, while the converse is true for the auto-mail coefficients.¹⁸ In other words, Republicans are more responsive to incentives, while Democrats are more responsive to costs.

The remaining columns in Table 5 estimate the number of votes gained or lost by each party's candidate and the net effect. To translate party affiliation into votes for each candidate, we use exit polls (Schaffner et al., 2021). Aggregating these incentive effects across all state pairs, we report the net number of votes flowing into each swing state for the candidates in columns 4-5 and the difference between them (Dem-Rep) in column 6. For example, in Georgia, the Democratic candidate (Biden) gained 2,947 votes due to incentive-based CSSV, while the Republican candidate (Trump) gained 2,150, for a net difference of +798. Biden gained more incentive-based CSSV votes despite Republicans' greater responsiveness to incentives because there are more Democratic double-registrants. In contrast, the net difference for cost-based CSSV is -1,389. Since Georgia was not an auto-mail state, Democrats' higher responsiveness to this cost measure combined with their greater numbers disproportionately pulled Biden votes out of Georgia and into auto-mail states. Combined,

¹⁸While the *both swing (both auto-mail)* coefficient is bigger (smaller) for Democrats, there are few voters whose states are both swing, which means they have little effect on the 2020 election.

CSSV added only 591 votes in favor of Trump in Georgia on net, despite there being 15,836 (=10,209+5,627) total CSSV-induced votes.

These two patterns observed in Georgia are present more generally across the other swing states, none of which had auto-mailed ballots except Nevada. First, incentive-based CSSV generally favored Biden because the larger number of Democratic double-registrants more than offset the higher responsiveness of Republicans to incentives. Second, cost-based CSSV generally favored Trump by disproportionately pulling votes away from Biden both because Democrats are more responsive to costs and because more Democrats reside in auto-mail states. In summary, there were a large number of CSSV votes in 2020 – 217,000 of which involve at least one swing state – but the *net* effect was inconsequential, because Republican and Democratic CSSV-induced votes largely cancelled out.

While CSSV was not pivotal for any state in 2020, this need not be true for other elections. For example, the 537 vote margin for Florida and 366 for New Mexico in 2000 could well have been affected by CSSV. We focus on the presidential election, but three 2020 House of Representative races were also decided by a handful of votes: New York’s 22nd district (109 votes), California’s 25th (333 votes), and Iowa’s 2nd (6 votes).

6. CONCLUSION

U.S. states administer federal elections independently, giving rise to the possibility of double-registered voters. We estimate there are 6.1 million of these voters, and that they respond to incentives and costs, voting more often in swing states (higher incentive) and states that automatically send out mail-in ballots (lower cost).

Double-registration is relevant to long-standing discussions around election laws and policy. For example, laws targeting double-registrants may reduce their number, but at a potential cost to electoral participation and enfranchisement. Coordination across states could also reduce double-registration, but at a cost to state autonomy and individual privacy.¹⁹ As another example, automatic mailing of ballots is often proposed as a way to increase voter participation. Our findings point to an unintended effect: making voting easier in one state

¹⁹For example, some states participate voluntarily in the Electronic Registration Information Center (ERIC) which collects their voter registrations and, upon request, sends reports to member states.

pulls votes away from other states via CSSV. This was evident in 2020, as auto-mail states – which are disproportionately Democratic – drew votes away from Biden in other states.

CSSV is especially important where presidential elections are won or lost: swing states. Because CSSV from each party largely canceled out, the net effect was not pivotal in the 2020 election. However, CSSV has the potential to be important in future elections for several reasons. First, elections could be closer, such as Florida and New Mexico in 2000. Second, campaigns could target double-registrants, highlighting the incentive for them to vote in swing states instead of safe states. Targeting could also lead to changes in the size of the double-registrant population. Finally, states could change their voting procedures, such as removing or adding auto-mailing of ballots. The ultimate effects of such changes on electoral outcomes are uncertain.

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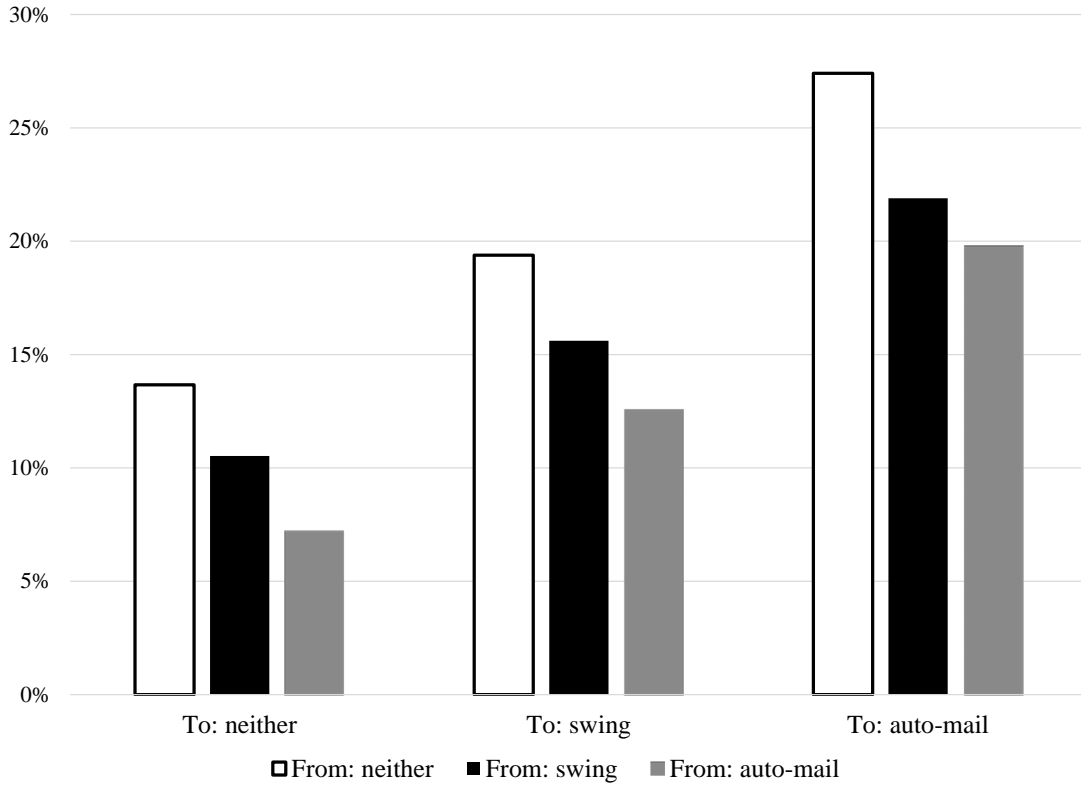


Figure 1: VOTE FLOWS FROM SECOND TO FIRST STATE OF VOTER REGISTRATION

Note: Vote flows are defined as the number of double-registrants who vote in their first state divided by the number of double-registered voters in our sample for each first-state \times second-state characteristic combination. Characteristic combinations are the interaction of *swing*, *auto-mail*, and *neither* (i.e., not swing or auto-mail) between the first and second state in a pair. *From:* refers to voters' second state of registration; *To:* refers to their first state. *Swing* is an indicator for the 13 states where the probability of winning for any candidate on October 3, 2020 did not exceed 80 percent (PredictIt, 2020), and *auto-mail* denotes states that automatically sent mail-in ballots to registered voters in 2020 (National Conference of State Legislatures, 2020b). Nevada is both swing and auto-mail; to create mutually exclusive categories we classify it as swing in this figure only.

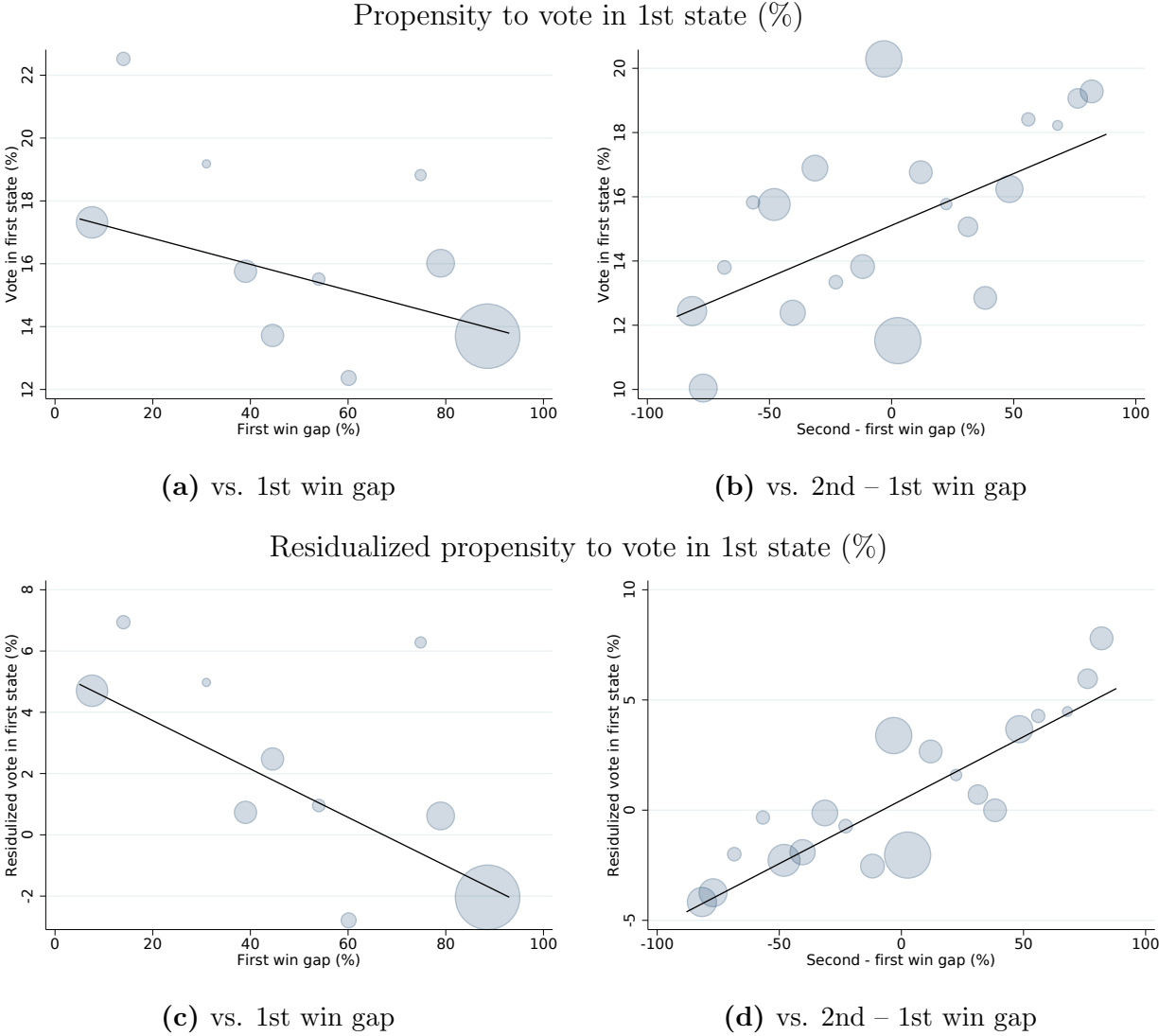


Figure 2: VOTING IN FIRST STATE OF REGISTRATION AND ELECTION CLOSENESS

Note: These are binscatters of a double-registrant’s probability of voting in their first state plotted against (i) the win gap in their first state, i.e., the predicted closeness of an election (panels a and c), and (ii) the difference in the win gap between their second and first states, i.e., the relative closeness of the elections in a pair (panels b and d). Win gap is defined as the absolute value of the Democratic minus Republican win probability in prediction markets on Oct 3, 2020 (PredictIt, 2020). Panels a and b plot the raw vote probabilities on the y-axis, while panels c and d residualize out the auto-mailed ballot and early voting variables in Table 3. Dot sizes are proportional to the number of observations.

Table 1: SUMMARY STATISTICS FOR REGISTERED INDIVIDUALS

	All registrants	Registrants with cell phone & other info	Known double registrants
<i>2020 presidential election (%)</i>			
Vote	74.4	78.1	81.3
Vote in first state	-	-	14.9
<i>Voting history (%)</i>			
Vote in general elections	64.0	65.6	66.6
Vote in primary elections	23.0	23.7	22.3
Vote in minor elections	8.7	8.8	6.5
<i>Party & donations (%)</i>			
Republican	31.1	32.7	21.4
Democrat	41.0	41.6	46.3
Independent	28.0	25.6	32.2
FEC donor	1.5	1.8	2.7
<i>Demographics (%)</i>			
Male	47.0	46.4	52.2
White	70.9	70.4	70.8
Hispanic	13.6	14.4	13.9
Black	11.8	11.7	10.6
Asian	3.7	3.5	4.7
Low income	22.3	21.3	5.8
Middle income	41.7	41.3	34.9
High income	35.9	37.4	59.3
Married	40.8	43.5	42.1
Any children	35.5	38.4	44.6
Homeowner	63.8	66.8	49.5
Born pre-1955	22.9	22.7	12.9
Born 1955-64	17.7	19.7	13.0
Born 1965-74	16.0	18.2	15.7
Born 1975-84	15.6	17.7	22.2
Born 1985-94	16.8	15.5	31.0
Born post-1994	10.9	6.3	5.3
Observations	202,535,296	90,234,280	590,991

Note: Column 1 reports summary statistics for all registrants as of October 2020; column 2 for registrants with necessary information for matching individuals across states, where the main constraint is the availability of mobile phone numbers; and column 3 for registrants who we identify as double-registrants. *Vote in first state* is an indicator for voting in the first (earlier) state of registration. Voting history refers to the share of even-year general, even-year primary, and minor elections that an individual voted in before 2020. In column (3) party affiliation is based on the second (later) state of registration. *FEC donor* is an indicator for making at least one FEC donation by 2020. *Low income*, *middle income*, and *high income* denote L2-imputed annual household income between 1,000 and 49,999, between 50,000 and 99,999, and above 100,000, respectively.

Table 2: HOW INCENTIVES AND COSTS AFFECT VOTING IN FIRST STATE OF REGISTRATION

	Dependent var.: Vote in first state of registration			
	(1)	(2)	(3)	(4)
	All double-registrants		Near certain general election voters	
		Voter in primary	Predicted voter Pr \geq 0.99	
Only first swing	4.628*** (0.807)	4.560*** (0.758)	5.645*** (0.919)	7.633*** (1.350)
Both swing	1.582* (0.956)	1.299* (0.724)	0.234 (1.056)	0.447 (1.496)
Only second swing	-2.947*** (1.045)	-2.917*** (0.964)	-5.749*** (1.976)	-6.746*** (2.418)
Only first auto-mailed ballot	10.762*** (1.629)	9.251*** (1.595)	17.600*** (2.571)	16.445*** (3.668)
Both auto-mailed ballot	6.906*** (1.558)	6.124*** (1.463)	4.894* (2.809)	4.008 (3.084)
Only second auto-mailed ballot	-5.870*** (0.730)	-5.544*** (0.652)	-11.777*** (1.247)	-11.032*** (1.532)
Only first early voting		4.105*** (0.969)	5.828*** (1.608)	7.211*** (1.967)
Both early voting		2.851*** (0.560)	3.422*** (1.010)	1.690 (1.311)
Only second early voting		-0.108 (0.669)	0.093 (1.045)	-2.167* (1.217)
Outcome mean (%)	14.85	14.85	18.57	19.16
Observations	590,991	590,991	174,595	65,024
R^2	0.018	0.021	0.058	0.058

Note: The variables *only first ...*, *both ...*, and *only second ...* indicate whether the first state, both the first and the second state, and only the second state have specific features: swing status, auto-mailed ballots, and early voting. *Swing* is an indicator for the 13 states whose PredictIt winning likelihood for either party on October 3, 2020 did not exceed 80% (PredictIt, 2020); *auto-mailed ballot* denotes states that automatically sent mail-in ballots to registrants in 2020 (National Conference of State Legislatures, 2020b); *early voting* refers to states that allowed voting for at least 19 days before Nov 3, 2020 (the sample median among those with early voting) (National Conference of State Legislatures, 2020a). All independent variables are divided by 100 for presentation purposes. Columns (1)-(2) use all double-registrants in the sample; column (3) double-registrants who voted in a 2020 primary election; column (4) double-registrants whose predicted likelihood of voting in the 2020 presidential election is 0.99 or higher (see note to Figure A2 for details). Standard errors are clustered at the state-pair level.

*** 1%, ** 5%, * 10% significance level

Table 3: RELATIVE CLOSENESS OF ELECTIONS AND CSSV BEHAVIOR

	Dependent var.: Vote in first state of registration
First win gap	-0.031** (0.013)
Second – first win gap	0.052*** (0.012)
Only first auto-mailed ballot	9.668*** (1.577)
Both auto-mailed ballot	6.209*** (1.474)
Only second auto-mailed ballot	-5.824*** (0.652)
Only first early voting	4.042*** (0.960)
Both early voting	2.875*** (0.590)
Only second early voting	-0.134 (0.662)
Outcome mean (%)	14.85
Observations	590,991
R^2	0.022

Note: This table reports the relationship between a double-registered individual’s probability of voting in the first state and the closeness of the election in the first state, as well as the difference in the closeness between the first and second states. *First win gap* refers to the difference in the PredictIt winning likelihood between the Democratic and the Republican parties in the first state on Oct 3, 2020, and *second – first win gap* refers to the difference in the win gaps between the first and the second states. Auto-mailed ballot and early voting variables are divided by 100 for presentation purposes. Other variable definitions and sample selection follow those in Table 2 column 2. Standard errors are clustered at the state-pair level.

*** 1%, ** 5%, * 10% significance level

Table 4: HOW INCENTIVES AND COSTS AFFECT VOTING IN BOTH STATES OF REGISTRATION

	Dependent var.: Vote in both states of registration			
	(1)	(2)	(3)	(4)
	All double-registrants		Near certain general election voters	
		Voter in primary	Predicted voter $Pr \geq 0.99$	
Only first swing	0.244** (0.112)	0.238** (0.109)	0.610*** (0.215)	1.547*** (0.389)
Both swing	0.441*** (0.168)	0.433*** (0.167)	1.050*** (0.403)	2.155*** (0.692)
Only second swing	0.080 (0.123)	0.078 (0.120)	0.088 (0.266)	0.308 (0.460)
Only first auto-mailed ballot	1.157*** (0.192)	1.103*** (0.191)	1.581*** (0.379)	2.146*** (0.617)
Both auto-mailed ballot	1.102*** (0.215)	1.082*** (0.216)	0.810** (0.317)	0.427 (0.515)
Only second auto-mailed ballot	0.178* (0.107)	0.194* (0.105)	-0.238 (0.184)	-0.418 (0.360)
Only first early voting		0.115 (0.128)	0.115 (0.271)	0.193 (0.462)
Both early voting		0.106 (0.153)	0.054 (0.312)	0.102 (0.556)
Only second early voting		-0.046 (0.122)	-0.076 (0.260)	-0.328 (0.465)
Outcome mean (%)	1.04	1.04	1.92	3.35
Observations	590,991	590,991	174,595	65,024
R^2	0.002	0.002	0.002	0.003

Note: All independent variables and sample selections follow those in the corresponding columns in Table 2, including dividing independent variables by 100 for presentation purposes. Standard errors are clustered at the state-pair level.

*** 1%, ** 5%, * 10% significance level

Table 5: EFFECT OF CROSS-STATE STRATEGIC VOTING ON 2020 SWING STATES

	CSSV induced votes		Actual 2020 vote margin	Estimated 2020 vote gain for Democratic and Republican presidential candidates						
	(1)	(2)	(3)	(4)	(5) <i>Incentive</i>		(7) <i>Cost</i> (auto-mail & early voting)			(10) <i>Total</i>
	Inflow	Outflow	Win-Loss	Dem	Rep	Dem-Rep	Dem	Rep	Dem-Rep	Dem-Rep
AZ	5,307	5,506	10,457	1,466	1,610	-144	-1,834	-1,453	-382	-525
GA	10,209	5,627	11,779	2,947	2,150	798	-1,008	382	-1,389	-591
WI	3,091	2,598	20,682	1,500	1,296	205	-1,239	-1,090	-149	56
NV	10,623	5,750	33,596	1,703	1,742	-38	979	202	777	739
NH	1,279	508	59,267	723	490	233	-306	-163	-142	91
NC	7,650	3,584	74,481	2,210	2,178	32	-466	-16	-450	-418
PA	24,711	14,497	80,555	8,293	5,724	2,570	-3,878	-481	-3,397	-828
IA	4,458	1,962	138,611	1,261	1,128	133	-46	25	-71	61
MI	5,569	2,356	154,188	1,503	1,084	419	-57	420	-477	-58
MN	1,344	855	233,012	250	276	-27	-128	69	-197	-224
FL	29,607	28,301	371,686	13,100	13,855	-755	-13,128	-12,910	-217	-972
OH	13,295	5,550	475,669	3,317	2,785	533	823	1,520	-697	-164
TX	20,132	24,610	631,221	8,941	8,869	72	-13,517	-8,698	-4,819	-4,747

Note: This table uses estimates of the number of double-registrants by party for each ordered state pair, estimates of the party-specific CSSV coefficients from Table A5, and exit polls for how party affiliation translates into votes for a candidate (Schaffner et al., 2021). As an example, we estimate that there are 5,415 (Florida, New York) Republican double-registrants, 22,064 (Florida, New York) Democrats, and 10,884 (Florida, New York) Independents using the procedure in Section 3. We then combine these numbers with the CSSV coefficients in Table A5 to calculate the number of votes that flow in and out of this ordered state pair. Since the first state (Florida) is the only swing state in the pair, we calculate 304 ($= 5,415 \times 5.617/100$) votes from Republican double-registrants, 867 votes from Democrats, and 521 votes from Independents flowed out of New York and into Florida. Exit polls in New York indicate that 87.5% of Republicans voted for Trump and 11.5% for Biden, so the 304 incentive-driven votes among (Florida, New York) Republican double-registrants led to a 266 vote gain for Trump and 35 vote gain for Biden in Florida, with the same votes lost in New York. A similar calculation using exit-poll data yields vote flows for Democratic and Independent double-registrants. The table performs these calculations for CSSV-induced votes for all ordered state-pairs and aggregates them. Columns 4 to 6 report the party-specific net inflow minus outflow for incentive-based CSSV; columns 7 to 9 do this for cost-based CSSV. Column 10 sums columns 6 and 9.

ONLINE APPENDIX

CROSS-STATE STRATEGIC VOTING

Gordon B. Dahl, Joseph Engelberg, Runjing Lu, and William Mullins

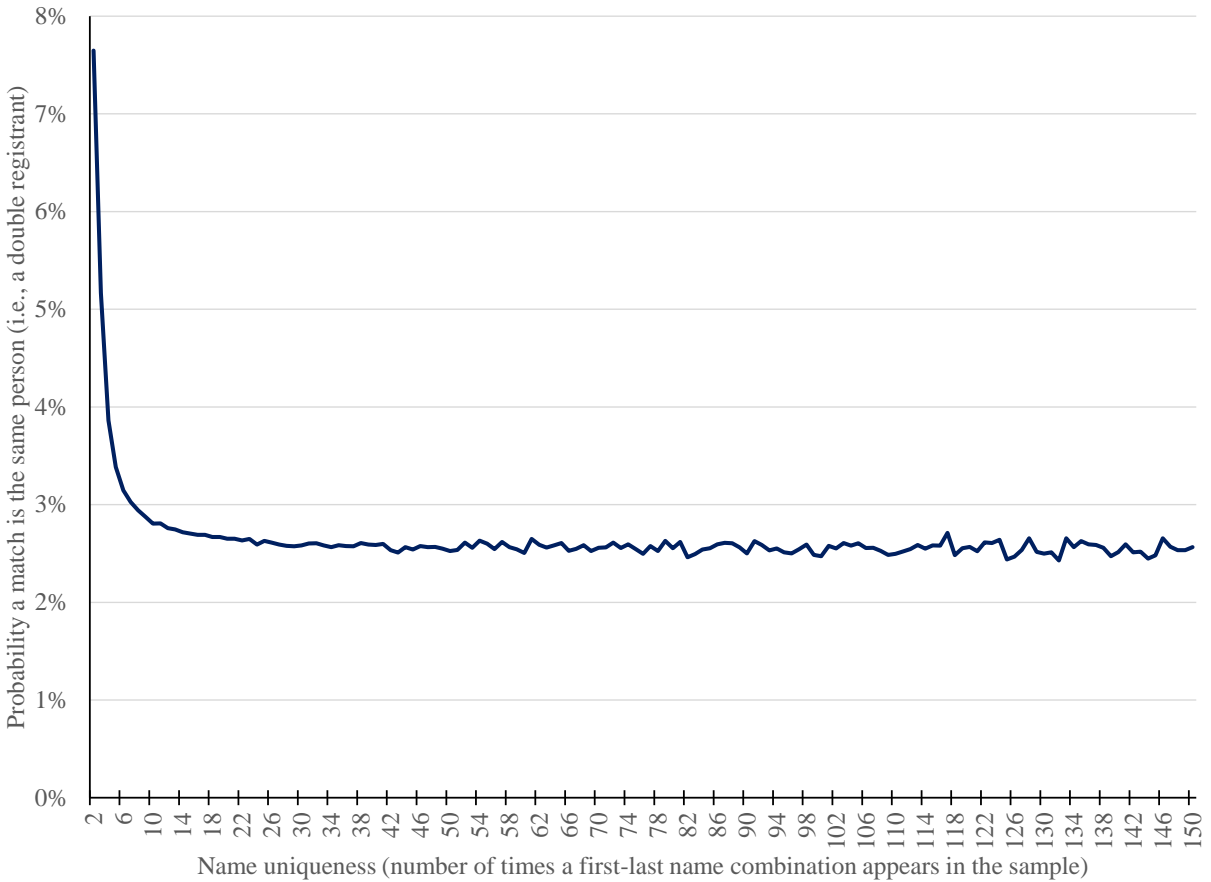


Figure A1: PROBABILITY A NAME MATCH ACROSS STATES IS THE SAME PERSON BY LEVEL OF NAME UNIQUENESS

Note: This figure plots the estimated probability that two records in different states with matching first and last names correspond to the same person, estimated separately for each level of name uniqueness. Name uniqueness (NU) is the total number of times a (first name, last name) combination occurs in our sample of 2020 U.S. voter registration records. Section 3 describes the estimation procedure.

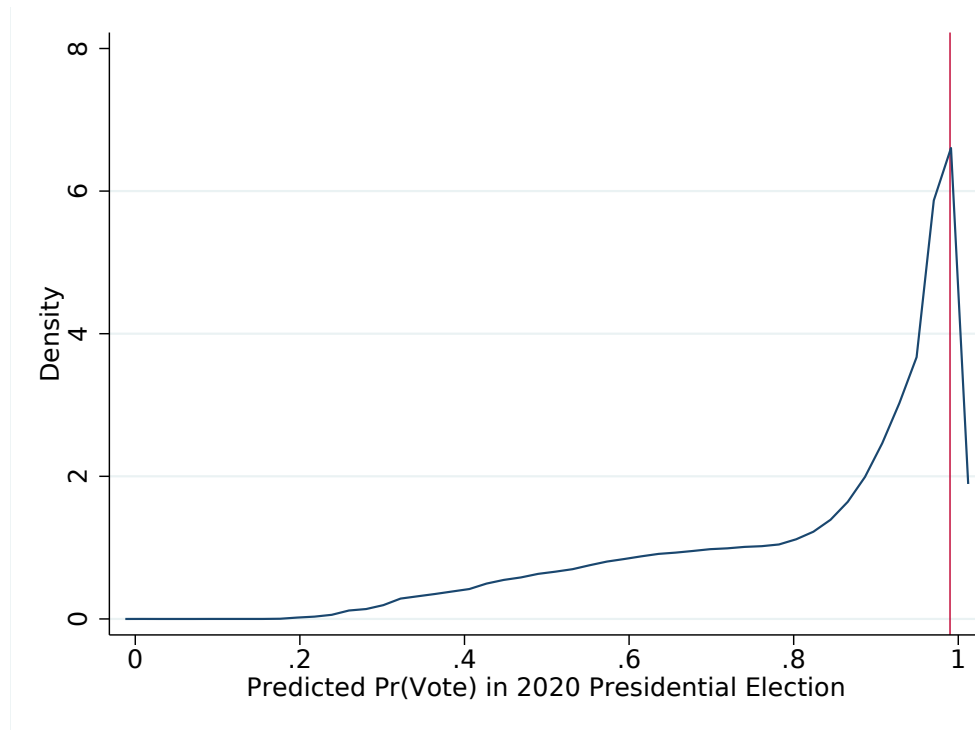


Figure A2: PREDICTED PROBABILITY OF VOTING IN THE 2020 PRESIDENTIAL ELECTION

Note: This figure plots the kernel density of double-registrants' predicted likelihood of voting in the 2020 presidential election. The likelihood is estimated from a probit model in our double-registrant sample using as predictors the following variables: occupation, work industry, and demographics (gender, race, birth cohort, income group, marital status, presence of children in home, homeownership) interacted with political donor status and voting history in even-year general and primary elections (2008-2020). The vertical red line displays the cutoff used in Tables 2 and 4: a predicted voting probability of 0.99.

Table A1: STATE ELECTION CHARACTERISTICS

State	Swing	Auto-mailed	Auto absentee	Early voting	Alternate swing definitions		
	PredictIt	ballot	application		NYT	Ex-ante	Ex-post
AK	N	N	N	N	N	Y	N
AL	N	N	N	Y	N	N	N
AR	N	N	N	N	N	N	N
AZ	Y	N	N	Y	Y	Y	Y
CA	N	Y	N	Y	N	N	N
CO	N	Y	N	N	N	N	N
CT	N	N	Y	N	N	N	N
DC	N	Y	N	N	N	N	N
DE	N	N	Y	N	N	N	N
FL	Y	N	N	N	Y	Y	Y
GA	Y	N	N	Y	Y	Y	Y
HI	N	Y	N	N	N	N	N
IA	Y	N	Y	Y	Y	Y	Y
ID	N	N	N	N	N	N	N
IL	N	N	Y	Y	N	N	N
IN	N	N	N	Y	N	N	N
KS	N	N	N	Y	N	N	N
KY	N	N	N	N	N	N	N
LA	N	N	N	N	N	N	N
MA	N	N	Y	N	N	N	N
MD	N	N	Y	N	N	N	N
ME	N	N	N	Y	N	N	Y
MI	Y	N	Y	Y	Y	Y	Y
MN	Y	N	N	Y	Y	Y	Y
MO	N	N	N	N	N	Y	N
MS	N	N	N	N	N	N	N
MT	N	Y	N	Y	N	Y	N
NC	Y	N	N	Y	Y	Y	Y
ND	N	N	N	N	N	N	N
NE	N	N	Y	Y	N	Y	N
NH	Y	N	N	N	N	N	Y
NJ	N	Y	N	Y	N	N	N
NM	N	N	Y	N	N	N	N
NV	Y	Y	N	N	N	Y	Y
NY	N	N	N	N	N	N	N
OH	Y	N	Y	Y	Y	Y	Y
OK	N	N	N	N	N	N	N
OR	N	Y	N	N	N	N	N
PA	Y	N	N	Y	Y	Y	Y
RI	N	N	Y	Y	N	N	N
SC	N	N	N	N	N	Y	N
SD	N	N	N	Y	N	N	N
TN	N	N	N	Y	N	N	N
TX	Y	N	N	N	N	Y	Y
UT	N	Y	N	N	N	Y	N
VA	N	N	N	Y	N	N	N
VT	N	Y	N	Y	N	N	N
WA	N	Y	N	N	N	N	N
WI	Y	N	Y	N	Y	Y	Y
WV	N	N	N	N	N	N	N
WY	N	N	N	Y	N	N	N

Note: This table lists state election characteristics in the 2020 presidential election. See note to Tables 2 and A3 for definitions of characteristics.

Table A2: PROBABILITY OF BEING A DOUBLE-REGISTRANT AMONG L2 REGISTRANTS AND PROBABILITY OF MOVING AMONG CES 2020 RESPONDENTS

	Dep. var.: being double-registrant (L2)			Dep. var.: moved in last year (CES)	
	(1)	(2)	(3)	(4)	(5)
Republican	-0.521*** (0.091)	-0.245*** (0.038)	-0.100*** (0.031)	-2.592*** (0.459)	-0.754** (0.368)
Independent	0.242** (0.116)	-0.002 (0.070)	0.103 (0.063)	0.634 (0.714)	-0.297 (0.539)
Outcome mean (%)	1.3	1.3	1.3	8.77	8.77
Observations	90,234,280	90,234,280	90,226,031	33,605	33,605
R^2	0.001	0.011	0.016	0.002	0.086
State FE	N	Y	N	N	Y
Zip-code FE	N	N	Y	N	N
Industry FE	N	Y	Y	N	Y
Demographics	N	Y	Y	N	Y

Note: This table reports the relationship between a registrant’s characteristics and their likelihood of (i) being a double-registrant or (ii) moving. The outcome is an indicator equal to one if a voter is a double-registrant (columns 1-3) or has lived in their current residence for no longer than 11 months (columns 4-5). The sample in columns 1-3 consists of all registrants in the L2 data with the information necessary for matching (i.e., non-missing first name, last name, year and month of birth, cellphone, and gender) and excluding January 1st birthdays. The sample in columns 4-5 consists of all respondents who are registered to vote in the 2020 Cooperative Election Study (CES) (Schaffner et al., 2021). Columns 1 and 4 have no controls. Columns 2 and 5 control for state fixed effects, job industry fixed effects, and voters’ demographics: gender, race, birth cohort, income level, marital status, presence of children in the home, and homeownership (see note to Table 1 for definitions). Column 3 replaces state fixed effects with zip-code fixed effects, which are only available in the L2 data. Democrats are the omitted group. All independent variables are divided by 100 for presentation purposes. Standard errors are clustered at the state level.

*** 1%, ** 5%, * 10% significance level

Table A3: VOTING IN FIRST STATE OF REGISTRATION – ALTERNATIVE DEFINITIONS OF SWING STATES AND SAMPLE

	(1)	(2)	(3)	(4)	(5)
	Dependent var.: Vote in first state of registration				
	Swing NYT	Swing ex-ante	Swing ex-post	Drop Goel et al. (2020) states	Add auto absentee application
Only first swing	5.019*** (0.930)	4.885*** (0.799)	4.539*** (0.758)	5.145*** (0.805)	4.737*** (0.787)
Both swing	3.518*** (0.679)	1.534** (0.770)	1.291* (0.723)	1.309* (0.741)	1.426* (0.754)
Only second swing	-1.844** (0.912)	-3.493*** (1.032)	-2.898*** (0.966)	-3.158*** (0.988)	-2.842*** (1.006)
Only first auto-mailed ballot	9.600*** (1.677)	9.353*** (1.566)	9.263*** (1.596)	9.468*** (1.636)	9.660*** (1.607)
Both auto-mailed ballot	6.909*** (1.458)	5.992*** (1.495)	6.137*** (1.463)	6.282*** (1.517)	6.520*** (1.476)
Only second auto-mailed ballot	-4.867*** (0.705)	-5.734*** (0.661)	-5.543*** (0.654)	-5.811*** (0.681)	-5.456*** (0.747)
Only first early voting	3.281*** (1.012)	4.363*** (0.966)	4.075*** (0.970)	4.158*** (0.988)	3.976*** (0.972)
Both early voting	2.586*** (0.623)	2.852*** (0.570)	2.846*** (0.560)	3.084*** (0.558)	2.647*** (0.550)
Only second early voting	0.288 (0.668)	-0.348 (0.689)	-0.094 (0.668)	0.213 (0.691)	-0.091 (0.658)
Only first auto absentee application					1.195 (0.854)
Both auto absentee application					1.264 (0.828)
Only second auto absentee application					0.149 (0.902)
Outcome mean (%)	14.85	14.85	14.85	67.41	67.5
Observations	590,991	590,991	590,991	561,001	590,991
R^2	0.020	0.022	0.021	0.023	0.021

Note: This table reports robustness tests for Table 2. All independent variables are defined in the same way as in Table 2 except for those related to *swing*. Column 1 defines swing states as those listed by the New York Times (2020); column 2 uses statewide opinion polling aggregated by FiveThirtyEight (2020), classifying swing states as those with an expected vote margin within 10 percentage points (pp); column 3 classifies swing states as those whose actual vote margin in the 2020 election was within 10 pp (MIT Election Data and Science Lab, 2020). Column 5 includes additional indicators for the first state, both the first and the second states, and only the second state automatically mailing applications to request an absentee ballot to registered individuals (National Conference of State Legislatures, 2020b), respectively. Column 4 excludes states identified by Goel et al. (2020) as having potentially lower data quality in the 2012 presidential election due to multi-generational households. These are Arkansas, Hawaii, Mississippi, New Hampshire, Wisconsin, Wyoming and D.C. Standard errors are clustered at the state-pair level.

*** 1%, ** 5%, * 10% significance level

Table A4: DOUBLE VOTING – ALTERNATIVE DEFINITIONS OF SWING STATES AND SAMPLE

	(1)	(2)	(3)	(4)	(5)
	Dependent var.: Vote in both states of registration				
	Swing NYT	Swing ex-ante	Swing ex-post	Drop Goel et al. (2020) states	Add auto absentee application
Only first swing	0.222** (0.099)	0.237* (0.125)	0.241** (0.108)	0.255** (0.104)	0.299*** (0.106)
Both swing	0.490** (0.238)	0.346** (0.153)	0.467*** (0.170)	0.384*** (0.133)	0.517*** (0.153)
Only second swing	0.048 (0.140)	-0.007 (0.134)	0.083 (0.120)	0.082 (0.110)	0.163 (0.113)
Only first auto-mailed ballot	1.121*** (0.191)	1.107*** (0.191)	1.110*** (0.191)	1.121*** (0.193)	1.226*** (0.182)
Both auto-mailed ballot	1.093*** (0.218)	1.053*** (0.212)	1.091*** (0.216)	1.140*** (0.215)	1.275*** (0.225)
Only second auto-mailed ballot	0.197* (0.114)	0.160 (0.106)	0.200* (0.105)	0.168* (0.095)	0.321*** (0.098)
Only first early voting	0.066 (0.128)	0.131 (0.125)	0.111 (0.129)	0.194** (0.098)	0.092 (0.114)
Both early voting	0.037 (0.154)	0.115 (0.151)	0.105 (0.153)	0.287** (0.132)	0.023 (0.144)
Only second early voting	-0.080 (0.134)	-0.046 (0.117)	-0.047 (0.122)	0.081 (0.091)	-0.054 (0.106)
Only first auto absentee application					0.328*** (0.099)
Both auto absentee application					0.593*** (0.222)
Only second auto absentee application					0.405*** (0.113)
Outcome mean (%)	1.04	1.04	1.04	67.41	67.5
Observations	590,991	590,991	590,991	561,001	590,991
R^2	0.002	0.002	0.002	0.002	0.002

Note: This table reports robustness tests for Table 4. The outcome is an indicator for a double-registrant voting in both states of registration in the 2020 presidential election. Definitions of independent variables and sample selections follow those in the corresponding columns in Table A3. Standard errors are clustered at the state-pair level.

*** 1%, ** 5%, * 10% significance level

Table A5: CSSV BY PARTY REGISTRATION

	Dependent var.: Vote in first state of registration		
	(1) Democrat	(2) Republican	(3) Independent
Only first swing	3.928*** (0.803)	5.617*** (1.226)	4.790*** (0.796)
Both swing	1.937** (0.970)	0.409 (1.059)	1.066 (0.686)
Only second swing	-2.090* (1.243)	-4.232*** (1.016)	-2.929*** (0.901)
Only first auto-mailed ballot	9.482*** (1.964)	7.032*** (1.530)	10.653*** (1.647)
Both auto-mailed ballot	4.629** (1.979)	9.068*** (1.421)	7.249*** (1.482)
Only second auto-mailed ballot	-5.328*** (0.759)	-4.388*** (0.890)	-5.583*** (0.687)
Only first early voting	3.791*** (1.104)	5.344*** (1.160)	3.630*** (0.957)
Both early voting	1.553** (0.705)	3.013*** (0.791)	4.059*** (0.608)
Only second early voting	-0.365 (0.751)	-1.362 (0.868)	0.710 (0.763)
Outcome mean (%)	13.88	14.7	16.35
Observations	273,914	126,599	190,478
R^2	0.022	0.022	0.021

Note: This table reports party heterogeneity in the relationship between a double-registrant's propensity to vote strategically and the characteristics of the two states they are registered in. The outcome is an indicator for an individual voting in their first state in the 2020 presidential election. The sample in columns 1, 2, 3 consists of Democrats, Republicans, and Independents, respectively; party affiliation is based on an individual's second state of registration. All specifications and variable definitions mirror those in Table 2 column 2. Standard errors are clustered at the state-pair level

*** 1%, ** 5%, * 10% significance level

APPENDIX 1. SCALING FACTOR

This appendix describes the scaling factor used in the estimate for the prevalence of double-registrants. The initial analysis in Section 3 assumes all double-registrants have *identical* recorded first and last names in both state registrations. However, this is not always the case for a variety of reasons, such as name changes following marriage, name recording errors, use of nicknames (e.g., Thomas vs. Tom) and so on. We correct for this by estimating a scaling factor capturing the ratio of double-registrants with identical recorded first and last names to the full set of double-registered individuals.

In order to do this we build a reference sample of double-registrants *without* matching on both first and last name, but which correspond to the same person with a high degree of confidence. We begin with all cross-state matches with the same cellphone number, birth date (day, month, and year) and gender. We then apply an additional matching criterion to ensure a high match quality for the reference dataset. Specifically, we require at least one of the following to match: (i) first name, (ii) last name, (iii) middle initial, or that (iv) the full name matches are above a textual similarity threshold.¹ In the reference dataset, 83.65% of pairs have identical first and last names, which means that for every 100 pairs with identically matching first and last names, we estimate that there are an additional 19.5 double-registrants without identical names across both of their records, despite being the same person (i.e., we use a scaling factor of $1/0.83654 = 1.1954$).

¹Textual similarity is determined by removing spaces between the text of the full name, then calculating the fraction of letter pairs that match, irrespective of position. For example, BOB SMITH and ROB SMITH have a textual similarity score of 6/7 because 6 out of the 7 pairs of adjacent letters match. We require this to be above 0.2.