Online Appendices

Appendix A   Data Availability and Replication

Upon publication, the full reproducible code will be available on the GitHub repository along with a final, anonymized dataset. Due to the confidential nature of the voter registration data and the USPS data, and the data access agreement with OCROV, I cannot share or post publicly the data used in this study. Researchers who want to use these data can request access from the Orange County Registrar of Voters.

Appendix B   Legislation Related to Voter Registration

B.1   The National Voter Registration Act of 1993

The National Voter Registration Act of 1993 (NVRA), also known as the "motor voter law," is about increasing the opportunities of voter registration through various means. Its various Sections decree that the States[1] offer citizens the chance to register to vote through motor vehicle agencies, by mail-in applications, and by public assistance and disability offices.

Section 8, *Administration of Voter Registration*, requires States to maintain accurate and up-to-date data. Specifically, it mandates that the States conduct "a general voter registration list maintenance program that makes a reasonable effort to remove ineligible persons from the voter rolls by reason of the person's death, or a change in the residence of the registrant outside of the jurisdiction, in accordance with procedures set forth in the NVRA" (The United States Department of Justice, 2020).

B.2   The National Change of Address Program (NCOA)

For the second requirement, the NVRA offers one example. The States can use the permanent change-of-address records submitted to the USPS by voters. A United States resident can fill out a change of address form on the Official USPS Change of Address website or physically at a local post office to have her mail forwarded to the new residence or a P.O. Box. While from a voter's point of view, this serves primarily not to lose any mail while moving for a price of 1.05 USD,[2] the accumulated data contains movers' old and new addresses, including the date they requested the service to start.

The States can use this data to check their voter data and to discern voters who have moved. By distinguishing those who have moved away from the jurisdiction, the election officials can remove the names of some voters. This is an important step in list maintenance because it can reduce the cost of direct mail operations by creating a cleaner list with fewer undeliverables and mistakes in delivery.

The only legal requirement is that this removal is performed 90 days prior to the date of the federal election. To see the actual screenshots of change-of-address applications and how it prompts voter registration data update, see Appendix B. Note that the usage of the NCOA data is not mandatory.[3] The NCOA processing is just one example of a potential list maintenance

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[1]The States here indicate 44 States and the District of Columbia, with Idaho, Minnesota, New Hampshire, North Dakota, Wisconsin, and Wyoming as exceptions.

[2]This is for ID verification.

[3]Highton and Wolfinger (1998) wrote as follows (page 92):

> The NVRA provides one alternative to this daunting list-cleaning procedure: States may identify movers

activity that can be performed by the States. A majority of the states do implement the NCOA processing (National Association of Secretaries of State, 2017), California being one prominent state that mandates NCOA processing by its own election laws.

B.3 California Elections Code

In California, counties can opt in to integrate NCOA processing into their list maintenance as an alternative to a residency confirmation postcard (CA Elec Code § 2222 (2017); 52 U.S.C. § 20507(c)(1)(A)). This is classified as third-party address changes, as opposed to first-party address changes. Because there is a statewide voter registration system in California, it is the Secretary of State that is in charge of obtaining and disseminating the NCOA data (California Secretary of State, 2019).

Pursuant to California Code of Regulations § 20108.50 National Change of Address Processing, the Secretary of State must NCOA process the statewide voter list and send any records of registrants that seem to have changed their address to the relevant county officials.

B.4 Justice Department's Summary

The following is the 36th question posted in the Justice Department's questions and answers over the NVRA (The United States Department of Justice, 2020). It details the role that NCOA processing plays in voter list maintenance.

> 36. Do States have to use the NCOA process to initiate the notice process?
>
> No. States do not have to use the NCOA process. Under the NVRA, States must have a general program that makes a reasonable effort to identify and remove the names of voters who have become ineligible to vote by means of a change of address. The program has to be uniform, non-discriminatory, in compliance with the Voting Rights Act and must be completed 90 days before a federal election. States otherwise have discretion under the NVRA and HAVA in how they design their general program, and States
>
> For example, some general programs involve a State undertaking a uniform mailing of a voter registration card, sample ballot, or other election mailing to all voters in a jurisdiction, and then using information obtained from returned non-deliverable mail as the basis for correcting voter registration records (for apparent moves within a jurisdiction) or for initiating the notice process (for apparent moves outside a jurisdiction or non-deliverable mail with no forwarding address noted).
>
> Another example involves general programs where States initiate the notice process based on information showing that a voter has not voted in elections nor made contact with a registrar over some period of time. This is not prohibited by the NVRA and its bar on removing voters from the list solely for failure to vote, since it relies on

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with the Postal Service's computer file of address-change information, known as the National Change of Address (NCOA) program. About 40 million permanent change-of-address notices are filed each year with the Postal Service. The NCOA file is updated daily and each change is kept for three years. This information can be bought from two dozen licensed vendors who distribute customized NCOA data sets. The NVRA requires that people purged by NCOA who move inside the same county (about 60% of all movers) be automatically re-registered at their new address.

the NVRA notice process, and thus utilizes both a notice and a waiting period of two federal general elections.

The following is the 38th question from the same source, detailing how the within-county movers can vote.

38. Are there any protections in the NVRA for those eligible registered voters who have changed address to another location within a registrar's jurisdiction, or are otherwise on an inactive voter list, but have not notified the registrar prior to the date of a federal election?

Yes. The NVRA contains fail-safe provisions to enable such persons who show up to vote on a federal election day to update their registration and to vote in that election even though they have not notified the registrar of the address change:

1. An eligible registered voter who has moved to an address in an area covered by the same polling place as his or her previous address is permitted to vote at that same polling place upon oral or written affirmation by the registrant of the change of address at the polling place;

2. An eligible registered voter who has moved to an address in an area covered by a different polling place from the polling place for his or her previous address, but within the same registrar's jurisdiction and the same congressional district, at the option of the registrant:

   (a) shall be permitted to correct the voting records and vote at the old polling place upon oral or written affirmation by the registrant of the new address before an election official at that polling place; or

   (b) shall be permitted to correct the voting records and vote at a designated central location within the same registrar's jurisdiction, upon written affirmation by the registrant of the new address on a standard form provided by the registrar; or

   (c) shall be permitted to correct the voting records for purposes of future elections at the new polling place, and shall be permitted vote in the current election at that polling place if allowed under State law, upon confirmation by the registrant of the new address by such means as are required by law.

A central voting location need not be made available by the registrar if State law allows the person to vote at either the old or new polling place in the current election upon oral or written affirmation of the address change.

The failsafe provisions of Section 8 draw a distinction between the registrant's need for "affirmation" or "confirmation" of a new address, depending upon the circumstances in which the failsafe voting occurs.

B.5 California Elections Code Section 2225

The following is the full text of CA Elec Code § 2225 (2017).

(a) Based on change-of-address data received from the United States Postal Service or its licensees, the county elections official shall send a forwardable notice, including a

postage-paid and preaddressed return form, to enable the voter to verify or correct address information.

Notification received through NCOA or Operation Mail that a voter has moved and has given no forwarding address shall not require the mailing of a forwardable notice to that voter.

(b) If postal service change-of-address data indicates that the voter has moved to a new residence address in California, the forwardable notice shall be in substantially the following form:

"We have received notification that you have moved to a new residence address in California. You will be registered to vote at your new address unless you notify our office within 15 days that the address to which this card was mailed is not a change of your permanent residence. You must notify our office by either returning the attached postage-paid postcard, or by calling toll free. If this is not a permanent residence, and if you do not notify us within 15 days, you may be required to provide proof of your residence address in order to vote at future elections."

(c) If postal service change-of-address data received from a nonforwardable mailing indicates that a voter has moved and left no forwarding address, a forwardable notice shall be sent in substantially the following form:

"We are attempting to verify postal notification that the voter to whom this card is addressed has moved and left no forwarding address. If the person receiving this card is the addressed voter, please confirm your continued residence or provide current residence information on the attached postage-paid postcard within 15 days. If you do not return this card and continue to reside in California, you may be required to provide proof of your residence address in order to vote at future elections and, if you do not offer to vote at any election in the period between the date of this notice and the second federal general election following this notice, your voter registration will be cancelled and you will have to reregister in order to vote."

(d) The use of a toll-free number to confirm the old residence address is optional. Any change to the voter address must be received in writing.

(Amended by Stats. 2015, Ch. 728, Sec. 68. (AB 1020) Effective January 1, 2016. Operative September 26, 2016, when the Secretary of State issued the certification prescribed by Stats. 2015, Ch. 728, Sec. 88.)

B.6   California Code of Regulations, Title 2: Administration

The following is § 20108.50. National Change of Address Processing in Division 7. Secretary of State, Chapter 2. Statewide Voter Registration Database.

Except during the 90 days prior to a Federal election, the Secretary of State shall conduct monthly voter registration list maintenance using a change of address service or services based on the United States Postal Service National Change of Address (NCOA) database to identify address changes for registered voters. For records showing a change of address, the Secretary of State shall automatically transmit a change of address notice to the elections official in the county from or within which a voter has moved. Within five (5) business days of receipt of a change of address notice from

the Secretary of State the elections official shall process the change of address notice pursuant to California Elections Code Section 2225 and Section 2226 and submit any changes in the registration record to Calvoter in accordance with Section 20108.15 and Section 20108.40.

B.7   United States Postal Services NCOALink

Privacy Act Statement.   The following is the privacy act statement that accompanies the web-based USPS change of address as of June 30, 2018. The emphasis is added by the author.

> Your information will be used to provide you with mail forwarding and change of address services. Collection is authorized by 39 U.S.C. 401, 403, and 404. Providing the information is voluntary, but if not provided we will not be able to process your request. **We do not disclose your information to third parties without your consent, except to facilitate the transaction, to act on your behalf or request, or as legally required. This includes the following limited circumstances**: to a congressional office on your behalf; to financial entities regarding financial transaction issues; to a U.S. Postal Service (USPS) auditor; to entities, including law enforcement, as required by law or in legal proceedings; to contractors and other entities aiding us to fulfill the service (service providers); to federal, state, local or foreign government agencies regarding personnel matters or for the performance of its duties; for the service of legal process; **for voter registration purposes**; for jury service duties; to a disaster relief organization if the address has been impacted by a disaster or manmade hazard; to individuals or companies already in possession of your name and old mailing address, as an address correction service. Information will also be provided to licensed service providers of the USPS to perform mailing list correction service of lists containing your name and old address. A list of these licensed service providers can be obtained at the following URL: https: //postalpro.usps.com/mailing-and-shipping-services/NCOALink. For more information regarding our privacy policies visit www.usps.com/privacypolicy.

Appendix C   Validating Movers

The NCOA data enables the classification of movers, as the Registrar performed NCOA processing up to movers of November 2018, as illustrated in the main text. The only undetected movers would be those who did not voluntarily inform the Registrar, the DMV, nor the USPS, *and* did not vote in either the primary or general election with the updated address. While this is theoretically possible, I limit my sample of movers to those *who requested a change of address with the USPS*, independent of informing the Registrar. The reason is that, otherwise, moving cannot be verified.

This subsetting is a validation measure that ensures that the measured mobility is not a correction of incorrect data entries/typos. Suppose that a voter has lived at 110 N. California Boulevard and the address changes to 1100 N. California Boulevard in the voter data. Alternatively, suppose that I see a voter's record change from 200 S. Main Street to 200 N. Main Street. Is this a real change in physical residences or a modification in data with no entailing real-world change? By itself, it is difficult to discern. However, even when the old and new addresses look similar, if I see that in the USPS data that the voter has requested a change of address, I can be assured that

there is a true change in residences.

In addition, I am able to get an accurate measure of when a voter has moved, which is something not available in the voter database. For instance, if a voter voluntarily reports a new address to the Registrar in October 2018 but does not have any record in the NCOA database, it is incorrect to impute her moving date to October 2018 because it would be confounded by the fact that closer to the election, voters will remember to re-register more. As this paper's interest is in the dynamic effect of moving, ascertaining the timing of the move is vital.

While these two points are strong pros in limiting the sample of movers to those who officially requested the change of address, one point should be noted. There is no study to my knowledge about who chooses to request the change of address as opposed to those who do not. Therefore, it is unclear whether and if so, how inference will be affected by the decision to limit the analysis to validated movers. The data itself is certainly popular—for example, the Census Bureau has used NCOA data to supplement the tracking of migrations (Hogan, 2008). The younger electorate, such as teenagers, may be underrepresented, as they are likely to have little mail in their name. Not many more educated guesses are possible.[4]

The OCROV used a USPS-licensed vendor to provide me with the augmented data. Some 2 out of 3 movers that I had classified could be matched to the NCOA dataset, with the same set of old and new addresses as can be found in the voter file. In the end, I have around 100,000 voters.

Appendix D   Data Wrangling

D.1   Re-processing the Database with NCOA

While the classification of movers can be performed by just monitoring the changes to the voter data, I have re-processed the database with NCOA with the help of Orange County election officials.[5] This is to detect the moving dates of the first class of voters, who disclosed their new address prior to having detected via NCOA. This final step augments the USPS records to the voter file and determines movers' residential stability—that is, the months spent at the new residence.

D.2   Data Filtering

A couple of caveats should be noted. I have excluded voters whose age was observed to be more than 100. This decision accounts for the fact that for some voters, the date of birth is either entered wrongly (e.g., January 1, 1900), or the dead voters have not been fully accounted for.

D.3   Data Imputation

R package gender (Mullen, 2018; Blevins and Mullen, 2015) of rOpenSci project helps infer gender by first names and the Social Security Administration's yearly dataset. If there is an entered gender or a prefix (e.g., 'Mr.'), it overrides the inferred gender. 3.8% of voters have an ambiguous

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[4]Comparison within the available voter file is not a valid comparison, since the baseline population will be then those who voluntarily report to the Registrar or those who vote without the change of address requests.

[5]The NCOA processing is formally named the NCOALink Product. According to the Postal Service, the NCOALink Product is only provided to a selection of companies licensed by the Service. The OCROV processed the data through a vendor of their choice at my request.

gender that cannot be inferred from the first name. In these cases, these are treated as unknown and as a baseline group instead of dropping them from the sample.

For race/ethnicity, R package `wru` uses surname and geolocation to infer race (Khanna et al., 2017; Imai and Khanna, 2016) using Bayesian updating. The inference is primarily performed on the census block level. If information cannot be found on the census block level, the census tract is used, then the county-level data.

D.4 Demographics of Movers vs. Stayers

Within the Orange County registrants, movers and stayers are different demographically. Table 1 shows their comparison by some key variables.

Variable	Mean (Movers)	Std. Dev. (Movers)	Mean (Stayers)	Std. Dev. (Stayers)
Age	44.78	16.52	49.61	19.00
Male	0.46	0.50	0.46	0.50
White	0.58	0.49	0.58	0.49
Hispanic	0.16	0.37	0.19	0.39
Asian	0.11	0.32	0.14	0.34
Imputed Income	90.14	25.93	87.33	25.79
Dem	0.33	0.47	0.33	0.47
Rep	0.33	0.47	0.35	0.48
Pri. 2014	0.12	0.32	0.19	0.40
Gen. 2014	0.26	0.44	0.37	0.48
Pri. 2016	0.35	0.48	0.40	0.49
Gen. 2016	0.77	0.42	0.72	0.45
Pri. 2018	0.32	0.47	0.41	0.49
Gen. 2018	0.64	0.48	0.70	0.46

Table 1: Comparison of Movers and Stayers, Orange County Registrants 2016–2018

The income is again in 1,000 USD units, and for movers, their old home is used.

Due to the sheer size of the data, most t-test results are significant. But substantively, movers are, on average, younger and more peripheral voters. Unexpectedly, movers tend to live in slightly higher-income neighborhoods.

Appendix E   Full Regression Results

E.1 Linear Regressions

The simple linear regressions results in full for Figures 2 and 3 are displayed here.

Table 2 shows the main results for the full sample. Table 3–5 show results for registered Democrats, Republicans, and others.

E.2 Logistic Regressions

The logistic regression results are almost identical. Table 6 is the logistic regression version of Table 2. The treatment variable has an odds ratio of 1.32 and the calculated average marginal effects is identical.

	Dependent variable:		
	Gen. 2018	Gen. 2016	Pri. 2016
ARR treatment	0.058***	−0.004	−0.001
	(0.013)	(0.011)	(0.015)
Same precincts	0.023	−0.004	0.015
	(0.042)	(0.041)	(0.053)
Same subdistricts	−0.001	0.052	0.054
	(0.039)	(0.038)	(0.049)
Same cong. dist.	−0.030	0.033	0.022
	(0.034)	(0.033)	(0.042)
Diff. cong. dist.	−0.041	0.010	0.016
	(0.036)	(0.035)	(0.045)
Distance moved	−0.003*	0.001	0.001
	(0.001)	(0.001)	(0.002)
Gen. 2016 turnout	0.271***		
	(0.015)		
Times moved	−0.056***	−0.072***	−0.065***
	(0.015)	(0.014)	(0.016)
Distance to poll	0.004	−0.005	−0.013
	(0.014)	(0.012)	(0.017)
Permanent absentee	0.056***	0.053***	0.078***
	(0.013)	(0.012)	(0.015)
Age	0.002***	0.003***	0.005***
	(0.0004)	(0.0003)	(0.0005)
Female	0.013	−0.010	−0.026
	(0.035)	(0.033)	(0.042)
Male	0.061	−0.031	−0.006
	(0.034)	(0.033)	(0.042)
Black	0.272***	0.123*	0.189*
	(0.057)	(0.062)	(0.086)
Hispanic	−0.025	0.073**	0.042
	(0.026)	(0.026)	(0.031)
Others	0.005	0.081**	0.028
	(0.026)	(0.026)	(0.031)
White	0.050*	0.099***	0.046
	(0.022)	(0.022)	(0.026)
Third-party/no party	−0.019	−0.059***	−0.085***
	(0.016)	(0.014)	(0.018)
Democrat	0.102***	0.020	0.143***
	(0.015)	(0.013)	(0.018)
Imputed income (old home)	0.001**	0.0003	−0.001
	(0.0003)	(0.0002)	(0.0003)
Born abroad	−0.045**	−0.020	−0.056**
	(0.016)	(0.015)	(0.020)
39th cong. dist.	0.118	0.229	0.115
	(0.129)	(0.148)	(0.134)
45th cong. dist.	0.162	0.250	0.138
	(0.129)	(0.147)	(0.133)
46th cong. dist.	0.117	0.238	0.139
	(0.129)	(0.148)	(0.134)
47th cong. dist.	0.131	0.204	0.153
	(0.131)	(0.150)	(0.136)
48th cong. dist.	0.163	0.238	0.134
	(0.129)	(0.148)	(0.133)
49th cong. dist.	0.153	0.245	0.051
	(0.130)	(0.148)	(0.134)
Imputed income (new home)	0.001*	0.0005	0.0002
	(0.0003)	(0.0003)	(0.0004)
Observations	5,585	5,069	4,371
R^2	0.131	0.049	0.088
Adjusted R^2	0.127	0.044	0.082
F Statistic	29.890***	9.610***	15.440***

Note:	*p<0.05; **p<0.01; ***p<0.001

Table 2: Full Sample, Main and Placebo Results, Linear Regressions

	Dependent variable:		
	Gen. 2018	Gen. 2016	Pri. 2016
ARR treatment	0.019	−0.024	−0.047
	(0.021)	(0.019)	(0.027)
Same precincts	−0.084	−0.056	−0.013
	(0.066)	(0.068)	(0.097)
Same subdistricts	−0.094	0.010	0.092
	(0.062)	(0.061)	(0.091)
Same cong. dist.	−0.120*	0.009	−0.031
	(0.051)	(0.052)	(0.080)
Diff. cong. dist.	−0.145*	−0.010	0.004
	(0.056)	(0.056)	(0.085)
Distance moved	−0.001	0.001	0.004
	(0.003)	(0.002)	(0.003)
Gen. 2016 turnout	0.276***		
	(0.026)		
Times moved	−0.042	−0.077**	−0.062*
	(0.026)	(0.024)	(0.031)
Distance to poll	0.002	−0.011	0.023
	(0.024)	(0.021)	(0.032)
Permanent absentee	0.037	0.010	0.081**
	(0.023)	(0.021)	(0.029)
Age	0.001	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Female	−0.011	−0.004	0.002
	(0.053)	(0.049)	(0.068)
Male	0.021	−0.038	0.037
	(0.053)	(0.049)	(0.068)
Black	0.319***	0.119	0.120
	(0.056)	(0.077)	(0.132)
Hispanic	−0.043	0.018	0.100
	(0.041)	(0.038)	(0.051)
Others	−0.024	−0.019	0.068
	(0.044)	(0.042)	(0.055)
White	0.059	0.045	0.088
	(0.037)	(0.034)	(0.047)
Third-party/no party	0.001**	0.0001	−0.001
	(0.0005)	(0.0005)	(0.001)
Democrat	−0.040	−0.032	−0.059
	(0.025)	(0.022)	(0.033)
Imputed income (old home)	0.568***	0.296	0.471***
	(0.095)	(0.307)	(0.070)
Born abroad	0.586***	0.314	0.517***
	(0.090)	(0.306)	(0.062)
39th cong. dist.	0.544***	0.358	0.501***
	(0.093)	(0.307)	(0.067)
45th cong. dist.	0.526***	0.286	0.514***
	(0.102)	(0.309)	(0.082)
46th cong. dist.	0.635***	0.279	0.503***
	(0.090)	(0.306)	(0.061)
47th cong. dist.	0.640***	0.275	0.307***
	(0.097)	(0.308)	(0.077)
48th cong. dist.	0.0004	0.001**	0.001
	(0.0005)	(0.0004)	(0.001)
Observations	1,813	1,631	1,408
R^2	0.128	0.045	0.044
Adjusted R^2	0.115	0.031	0.026
F Statistic	10.060***	3.057***	2.522***

Note: *p<0.05; **p<0.01; ***p<0.001

Table 3: Democrats, Main and Placebo Results, Linear Regressions

| | Dependent variable: | | |
	Gen. 2018	Gen. 2016	Pri. 2016
ARR treatment	0.081***	−0.006	0.036
	(0.022)	(0.018)	(0.025)
Same precincts	0.098	0.058	0.073
	(0.075)	(0.057)	(0.091)
Same subdistricts	0.042	0.063	0.016
	(0.071)	(0.055)	(0.084)
Same cong. dist.	0.033	0.001	0.044
	(0.061)	(0.050)	(0.074)
Diff. cong. dist.	0.019	−0.069	0.029
	(0.066)	(0.053)	(0.079)
Distance moved	−0.005*	0.003	0.001
	(0.003)	(0.002)	(0.003)
Gen. 2016 turnout	0.267***		
	(0.029)		
Times moved	−0.023	−0.043	−0.039
	(0.026)	(0.023)	(0.029)
Distance to poll	−0.014	−0.009	−0.045
	(0.026)	(0.019)	(0.027)
Permanent absentee	0.047*	0.042*	0.115***
	(0.023)	(0.020)	(0.025)
Age	0.004***	0.002***	0.008***
	(0.001)	(0.001)	(0.001)
Female	−0.027	0.126	0.062
	(0.090)	(0.085)	(0.101)
Male	0.030	0.091	0.064
	(0.090)	(0.085)	(0.101)
Black	0.136	0.257	0.280
	(0.179)	(0.157)	(0.220)
Hispanic	0.035	0.192***	0.132
	(0.060)	(0.055)	(0.067)
Others	0.023	0.170***	0.032
	(0.053)	(0.050)	(0.059)
White	0.061	0.150***	0.070
	(0.046)	(0.046)	(0.053)
Third-party/no party	0.001	0.0003	−0.001
	(0.0005)	(0.0004)	(0.001)
Democrat	−0.032	−0.039	−0.067
	(0.032)	(0.027)	(0.038)
Imputed income (old home)	−0.375***	−0.004	−0.125
	(0.106)	(0.236)	(0.268)
Born abroad	−0.301**	0.032	−0.117
	(0.102)	(0.235)	(0.267)
39th cong. dist.	−0.401***	−0.017	−0.114
	(0.107)	(0.238)	(0.269)
45th cong. dist.	−0.298**	−0.030	−0.062
	(0.113)	(0.240)	(0.274)
46th cong. dist.	−0.359***	0.007	−0.149
	(0.103)	(0.235)	(0.267)
47th cong. dist.	−0.326**	0.024	−0.163
	(0.106)	(0.236)	(0.269)
48th cong. dist.	0.001	0.001	0.001*
	(0.001)	(0.0004)	(0.001)
Observations	1,829	1,724	1,578
R^2	0.121	0.062	0.100
Adjusted R^2	0.109	0.048	0.086
F Statistic	9.559***	4.468***	6.934***

Note: *p<0.05; **p<0.01; ***p<0.001

Table 4: Republicans, Main and Placebo Results, Linear Regressions

	Dependent variable:		
	Gen. 2018	Gen. 2016	Pri. 2016
ARR treatment	0.074***	0.011	0.004
	(0.022)	(0.022)	(0.025)
Same precincts	0.096	−0.034	−0.025
	(0.083)	(0.091)	(0.089)
Same subdistricts	0.078	0.086	0.087
	(0.074)	(0.079)	(0.080)
Same cong. dist.	0.028	0.091	0.074
	(0.065)	(0.071)	(0.068)
Diff. cong. dist.	0.029	0.113	0.022
	(0.069)	(0.074)	(0.072)
Distance moved	−0.002	0.0003	0.001
	(0.002)	(0.002)	(0.003)
Gen. 2016 turnout	0.267***		
	(0.023)		
Times moved	−0.086***	−0.090***	−0.087***
	(0.024)	(0.025)	(0.025)
Distance to poll	0.024	0.001	−0.020
	(0.024)	(0.023)	(0.028)
Permanent absentee	0.082***	0.096***	0.024
	(0.022)	(0.023)	(0.025)
Age	0.003***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)
Female	0.040	−0.071	−0.074
	(0.054)	(0.050)	(0.065)
Male	0.095	−0.055	−0.045
	(0.054)	(0.049)	(0.065)
Black	0.246*	0.036	0.190
	(0.112)	(0.121)	(0.144)
Hispanic	−0.033	0.048	−0.084
	(0.042)	(0.044)	(0.047)
Others	0.027	0.100*	0.002
	(0.042)	(0.042)	(0.048)
White	0.049	0.128***	0.014
	(0.035)	(0.037)	(0.041)
Third-party/no party	0.0004	0.0003	−0.0005
	(0.001)	(0.0005)	(0.001)
Democrat	−0.054*	0.010	−0.030
	(0.026)	(0.026)	(0.033)
Imputed income (old home)	0.216***	0.642***	0.217*
	(0.050)	(0.048)	(0.095)
Born abroad	0.248***	0.652***	0.212*
	(0.044)	(0.042)	(0.090)
39th cong. dist.	0.261***	0.604***	0.216*
	(0.051)	(0.049)	(0.095)
45th cong. dist.	0.220***	0.597***	0.219*
	(0.061)	(0.061)	(0.102)
46th cong. dist.	0.262***	0.666***	0.255**
	(0.045)	(0.042)	(0.090)
47th cong. dist.	0.212***	0.663***	0.165
	(0.055)	(0.051)	(0.096)
48th cong. dist.	0.001	−0.0004	−0.002**
	(0.001)	(0.001)	(0.001)
Observations	1,943	1,714	1,385
R^2	0.131	0.055	0.056
Adjusted R^2	0.119	0.041	0.039
F Statistic	11.130***	3.895***	3.226***

Note: *$p<0.05$; **$p<0.01$; ***$p<0.001$

Table 5: Third-party/No Partisan Preference Voters, Main and Placebo Results, Linear Regressions

| | *Dependent variable:* | | |
	Gen. 2018	Gen. 2016	Pri. 2016
ARR treatment	0.280***	−0.029	−0.002
	(0.061)	(0.075)	(0.066)
Same precincts	0.125	−0.055	0.076
	(0.216)	(0.255)	(0.242)
Same subdistricts	0.012	0.322	0.252
	(0.198)	(0.240)	(0.223)
Same cong. dist.	−0.140	0.195	0.112
	(0.167)	(0.200)	(0.195)
Diff. cong. dist.	−0.190	0.045	0.083
	(0.179)	(0.212)	(0.208)
Distance moved	−0.014*	0.009	0.006
	(0.007)	(0.009)	(0.007)
Gen. 2016 turnout	1.187***		
	(0.067)		
Times moved	−0.268***	−0.426***	−0.298***
	(0.069)	(0.079)	(0.077)
Distance to poll	0.023	−0.038	−0.059
	(0.070)	(0.081)	(0.075)
Permanent absentee	0.267***	0.338***	0.355***
	(0.062)	(0.075)	(0.070)
Age	0.012***	0.019***	0.023***
	(0.002)	(0.003)	(0.002)
Female	0.063	−0.037	−0.119
	(0.163)	(0.210)	(0.187)
Male	0.295	−0.180	−0.027
	(0.163)	(0.209)	(0.187)
Black	1.472***	0.699	0.838*
	(0.389)	(0.383)	(0.388)
Hispanic	−0.113	0.413**	0.194
	(0.121)	(0.138)	(0.141)
Others	0.021	0.457**	0.126
	(0.122)	(0.142)	(0.141)
White	0.238*	0.577***	0.209
	(0.105)	(0.120)	(0.122)
Third-party/no party	−0.076	−0.362***	−0.396***
	(0.074)	(0.089)	(0.082)
Democrat	0.513***	0.133	0.608***
	(0.079)	(0.098)	(0.080)
Imputed income (old home)	0.004**	0.002	−0.003
	(0.001)	(0.002)	(0.002)
Born abroad	−0.222**	−0.147	−0.251**
	(0.074)	(0.090)	(0.090)
39th cong. dist.	0.598	1.105	0.543
	(0.652)	(0.639)	(0.684)
45th cong. dist.	0.804	1.235	0.646
	(0.648)	(0.634)	(0.679)
46th cong. dist.	0.597	1.169	0.655
	(0.651)	(0.640)	(0.684)
47th cong. dist.	0.666	0.976	0.717
	(0.659)	(0.649)	(0.692)
48th cong. dist.	0.807	1.154	0.630
	(0.648)	(0.635)	(0.680)
49th cong. dist.	0.760	1.198	0.247
	(0.654)	(0.645)	(0.687)
Imputed income (new home)	0.003*	0.003	0.001
	(0.001)	(0.002)	(0.002)
Observations	5,585	5,069	4,371
Log Likelihood	−3,341.000	−2,421.000	−2,779.000
Akaike Inf. Crit.	6,741.000	4,898.000	5,614.000

Note: *p$<$0.05; **p$<$0.01; ***p$<$0.001

Table 6: Full Sample, Main and Placebo Results, Logistic Regressions

E.3 What If We Widen the Bandwidth?

Since we can identify movers in May of 2018 as well as July of 2018, we can add the May movers to the treated group and the July movers to the control group—i.e., widening the bandwidth of comparison from two weeks to approximately six weeks.

This setting will add 3,835 treated May movers and 5,729 July movers. Although it is less convincing in terms of the independence assumption, I provide the estimates for a comparison.

Figure 1 shows the result for the subset with a larger bandwidth. The estimated treatment effect in this case is 8.9 percentage points (95% CI: $[0.07366, 0.10346]$).
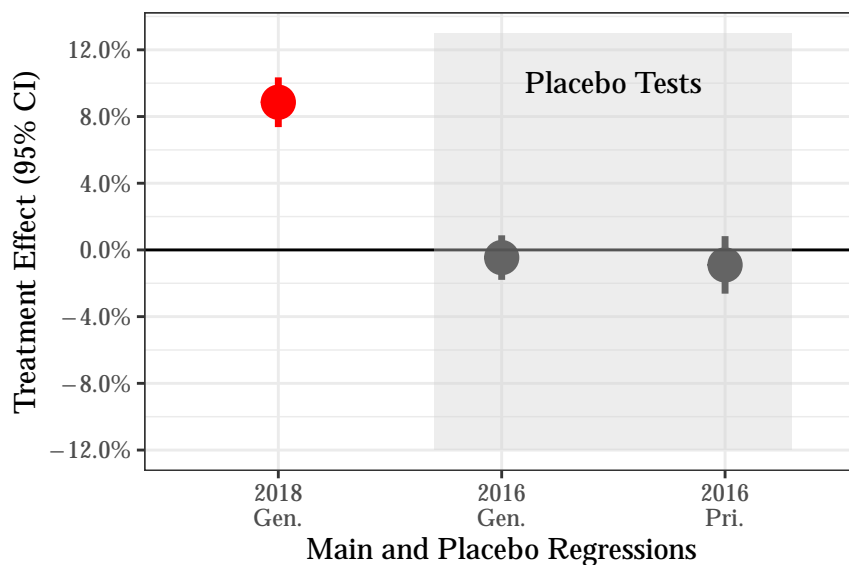

Figure 1: The Effect of Automatic Re-registration and Placebo Tests

The average turnout for the treated group is 63.0% while for the control group it is 54.5%.

Appendix F   Kolmogorov-Smirnoff Tests

To show the balance between the treatment and the control group, here I provide the two-sample Kolmogorov-Smirnoff balance test results, where the alternative hypotheses are two-sided. Note that the household income variables are in 1,000 USD units and are imputed at the neighborhood-level—specifically, the census-block level average inferred from geocoded addresses. Table 7 is the same table as in the main body of the paper.

Except for the permanent absentee status variable, previous residence's neighborhood-level household income, and distance to the polls, the two groups are well balanced on key variables. The treatment group has a lower adoption rate of permanent absentee status (61% vs. 72%), slightly lower distance to the polling place (average of 0.45 mile vs. 0.48 mile), and a slightly higher neighborhood income from the previous residence (average of 91,951 USD vs. 89,667 USD; difference of 2,284 USD).

First of all, being a permanent absentee is actually associated with a significantly higher like-

| | Treatment Group | | Control Group | | | |
	Mean	Std.	Mean	Std.	Statistic	p-value
Demographics						
— Age	43.68	16.14	44.20	16.65	0.0227	0.4909
— Male	0.47	0.50	0.47	0.50	0.0056	1.0000
— White	0.59	0.49	0.59	0.49	0.0026	1.0000
— Hispanic	0.16	0.37	0.14	0.34	0.0223	0.5111
— Asian	0.10	0.30	0.11	0.32	0.0155	0.9029
— Imputed Household Income (Previous Residence)	91.95	25.80	89.67	24.93	0.0442	0.0103
— Imputed Household Income (New Residence)	93.15	25.62	91.99	25.91	0.0271	0.2757
— Born Abroad	0.23	0.42	0.27	0.44	0.0317	0.1318
Political Variables						
— Democrat	0.32	0.47	0.33	0.47	0.0054	1.0000
— Republican	0.34	0.47	0.32	0.46	0.0209	0.5953
— 39th Congressional District	0.12	0.32	0.11	0.32	0.0060	1.0000
— 45th Congressional District	0.34	0.47	0.35	0.48	0.0066	1.0000
— 46th Congressional District	0.12	0.33	0.12	0.32	0.0068	1.0000
— 47th Congressional District	0.05	0.21	0.05	0.21	0.0002	1.0000
— 49th Congressional District	0.09	0.29	0.09	0.28	0.0064	1.0000
Turnout History						
— Gen. 2016 Turnout	0.73	0.44	0.72	0.45	0.0166	0.8522
— Pri. 2016 Turnout	0.33	0.47	0.33	0.47	0.0008	1.0000
— Gen. 2014 Turnout	0.24	0.43	0.25	0.43	0.0055	1.0000
— Pri. 2014 Turnout	0.10	0.30	0.11	0.32	0.0157	0.8932
— Gen. 2012 Turnout	0.47	0.50	0.45	0.50	0.0188	0.7235
— Pri. 2012 Turnout	0.12	0.33	0.14	0.35	0.0169	0.8371
Other Variables						
— Permanent Absentee Voter	0.61	0.49	0.72	0.45	0.1010	0.0000
— Times Moved	1.19	0.40	1.24	0.46	0.0335	0.0961
— Distance to the Polls	0.45	0.44	0.48	0.44	0.0573	0.0003

Table 7: Covariate Summary Statistics and Kolmogorov-Smirnoff Tests

lihood to vote. Among stayers in the Orange County dataset, 73.5% of permanent absentee registrants voted, while only 63.4% of those who are not permanent absentee voted in the 2018 general election. For primary of 2018, similarly, permanent absentee voters voted at higher rates (44.5%) than those who are not (33.4%). Therefore, because permanent absentee voters are more likely to vote, this balance test result—that the control group has higher adoption of permanent absentee status—strengthens any results in this paper.

While being closer to the polling place and having higher income should increase turnout, the substantial differences between the two groups are very small, making it unlikely to be the driving force behind the treatment effect. For example, when stayers' 2018 general turnout is regressed on the neighborhood-level household income in a simple linear regression, the linear slope is 0.001967 (95% CI: [0.001937, 0.001997] per increase in 1,000 USD. When turnout is regressed on the distance to the polling place (unit in miles), the linear slope is 0.002037 (95% CI: [0.000378, 0.003696], which is again statistically significant but very small in substantial importance. Finally, note that the main regression controls for all factors mentioned, assuming exchangeability after controlling for these variables.

The following are similar tables for party subgroups. The conclusions are similar.

| | Treatment Group | | Control Group | | | |
	Mean	Std.	Mean	Std.	Statistic	p-value
Demographics						
— Age	42.23	16.07	43.60	16.56	0.0533	0.1649
— Male	0.40	0.49	0.42	0.49	0.0196	0.9958
— White	0.50	0.50	0.51	0.50	0.0102	1.0000
— Hispanic	0.23	0.42	0.21	0.41	0.0214	0.9877
— Asian	0.11	0.31	0.11	0.31	0.0028	1.0000
— Imputed Household Income (Previous Residence)	87.20	25.93	87.12	24.73	0.0349	0.6586
— Imputed Household Income (New Residence)	89.80	25.23	89.82	24.56	0.0136	1.0000
— Born Abroad	0.26	0.44	0.29	0.46	0.0321	0.7547
Political Variables						
— 39th Congressional District	0.12	0.33	0.09	0.28	0.0368	0.5905
— 45th Congressional District	0.35	0.48	0.38	0.48	0.0237	0.9655
— 46th Congressional District	0.16	0.37	0.14	0.34	0.0267	0.9126
— 47th Congressional District	0.05	0.22	0.05	0.21	0.0010	1.0000
— 49th Congressional District	0.05	0.22	0.06	0.24	0.0095	1.0000
Turnout History						
— Gen. 2016 Turnout	0.75	0.43	0.74	0.44	0.0096	1.0000
— Pri. 2016 Turnout	0.41	0.49	0.45	0.50	0.0410	0.4499
— Gen. 2014 Turnout	0.21	0.41	0.25	0.44	0.0462	0.3040
— Pri. 2014 Turnout	0.08	0.28	0.12	0.32	0.0351	0.6506
— Gen. 2012 Turnout	0.44	0.50	0.42	0.49	0.0163	0.9998
— Pri. 2012 Turnout	0.10	0.30	0.13	0.33	0.0271	0.9037
Other Variables						
— Permanent Absentee Voter	0.66	0.47	0.75	0.43	0.0928	0.0010
— Times Moved	1.19	0.40	1.21	0.43	0.0097	1.0000
— Distance to the Polls	0.44	0.43	0.47	0.44	0.0550	0.1401

Table 8: Covariate Summary Statistics and Kolmogorov-Smirnoff Tests, Third-Party/No Partisan Preferences

	Treatment Group		Control Group			
	Mean	Std.	Mean	Std.	Statistic	p-value
Demographics						
— Age	47.99	17.14	48.63	17.64	0.0402	0.4803
— Male	0.51	0.50	0.49	0.50	0.0141	1.0000
— White	0.71	0.45	0.70	0.46	0.0115	1.0000
— Hispanic	0.08	0.26	0.07	0.25	0.0080	1.0000
— Asian	0.06	0.24	0.08	0.28	0.0213	0.9891
— Imputed Household Income (Previous Residence)	97.56	25.64	93.05	25.08	0.0790	0.0086
— Imputed Household Income (New Residence)	96.83	26.32	94.78	27.28	0.0484	0.2576
— Born Abroad	0.17	0.37	0.18	0.39	0.0162	0.9998
Political Variables						
— 39th Congressional District	0.12	0.32	0.15	0.36	0.0299	0.8307
— 45th Congressional District	0.32	0.47	0.32	0.47	0.0044	1.0000
— 46th Congressional District	0.09	0.28	0.08	0.28	0.0027	1.0000
— 47th Congressional District	0.04	0.20	0.05	0.21	0.0032	1.0000
— 49th Congressional District	0.13	0.34	0.10	0.30	0.0285	0.8701
Turnout History						
— Gen. 2016 Turnout	0.79	0.41	0.79	0.41	0.0003	1.0000
— Pri. 2016 Turnout	0.38	0.49	0.35	0.48	0.0230	0.9746
— Gen. 2014 Turnout	0.35	0.48	0.37	0.48	0.0179	0.9990
— Pri. 2014 Turnout	0.15	0.36	0.17	0.38	0.0227	0.9780
— Gen. 2012 Turnout	0.59	0.49	0.61	0.49	0.0145	1.0000
— Pri. 2012 Turnout	0.19	0.40	0.23	0.42	0.0329	0.7305
Other Variables						
— Permanent Absentee Voter	0.61	0.49	0.70	0.46	0.0938	0.0009
— Times Moved	1.18	0.38	1.24	0.45	0.0506	0.2136
— Distance to the Polls	0.45	0.44	0.49	0.42	0.0772	0.0110

Table 9: Covariate Summary Statistics and Kolmogorov-Smirnoff Tests, Republicans

	Treatment Group		Control Group			
	Mean	Std.	Mean	Std.	Statistic	p-value
Demographics						
— Age	40.81	14.22	40.83	14.88	0.0255	0.9182
— Male	0.49	0.50	0.50	0.50	0.0127	1.0000
— White	0.55	0.50	0.56	0.50	0.0181	0.9977
— Hispanic	0.17	0.38	0.13	0.33	0.0423	0.3648
— Asian	0.12	0.33	0.14	0.35	0.0188	0.9961
— Imputed Household Income (Previous Residence)	90.91	24.80	89.02	24.69	0.0570	0.0925
— Imputed Household Income (New Residence)	92.68	24.84	91.53	25.70	0.0306	0.7657
— Born Abroad	0.28	0.45	0.32	0.46	0.0390	0.4686
Political Variables						
— 39th Congressional District	0.11	0.32	0.10	0.30	0.0093	1.0000
— 45th Congressional District	0.35	0.48	0.35	0.48	0.0009	1.0000
— 46th Congressional District	0.12	0.32	0.12	0.33	0.0052	1.0000
— 47th Congressional District	0.05	0.21	0.05	0.21	0.0028	1.0000
— 49th Congressional District	0.09	0.29	0.09	0.29	0.0014	1.0000
Turnout History						
— Gen. 2016 Turnout	0.67	0.47	0.63	0.48	0.0322	0.7102
— Pri. 2016 Turnout	0.22	0.41	0.21	0.41	0.0085	1.0000
— Gen. 2014 Turnout	0.18	0.38	0.14	0.35	0.0333	0.6697
— Pri. 2014 Turnout	0.06	0.24	0.06	0.24	0.0035	1.0000
— Gen. 2012 Turnout	0.38	0.48	0.34	0.47	0.0389	0.4697
— Pri. 2012 Turnout	0.07	0.26	0.07	0.26	0.0001	1.0000
Other Variables						
— Permanent Absentee Voter	0.58	0.49	0.70	0.46	0.1152	0.0000
— Times Moved	1.20	0.40	1.26	0.48	0.0479	0.2264
— Distance to the Polls	0.45	0.44	0.49	0.46	0.0678	0.0258

Table 10: Covariate Summary Statistics and Kolmogorov-Smirnoff Tests, Third-Party/No Partisan Preferences

Appendix G Additional Subgroup Analyses

G.1 By Changes in Political Environments

Figure 2 shows ARR effects by changes in political environments. The results show that within these subgroups, the main effect is driven by those with some degree of disruption to the political environment, but not if the mover crosses congressional district lines.
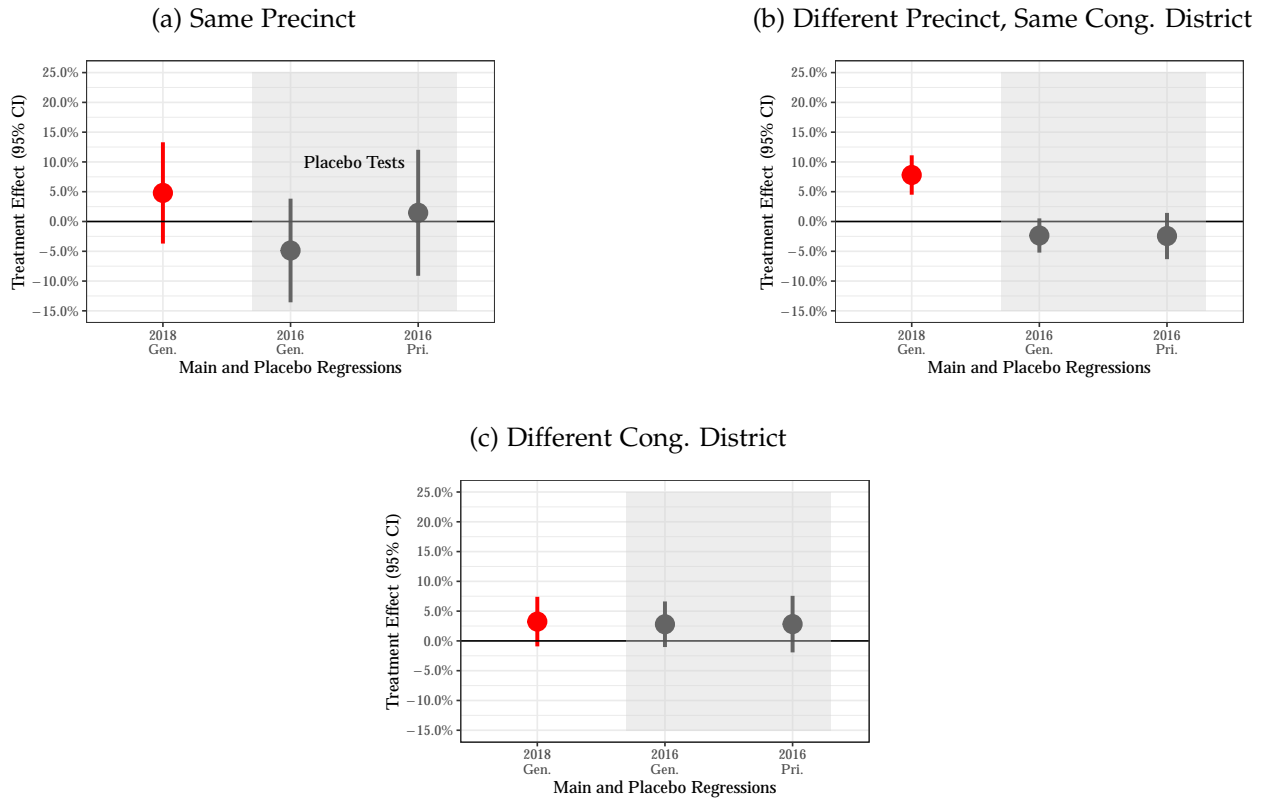
(a) Same Precinct

(b) Different Precinct, Same Cong. District

(c) Different Cong. District

Figure 2: ARR Effects by Changes in Political Environments

G.2 By Permanent Absentee Status

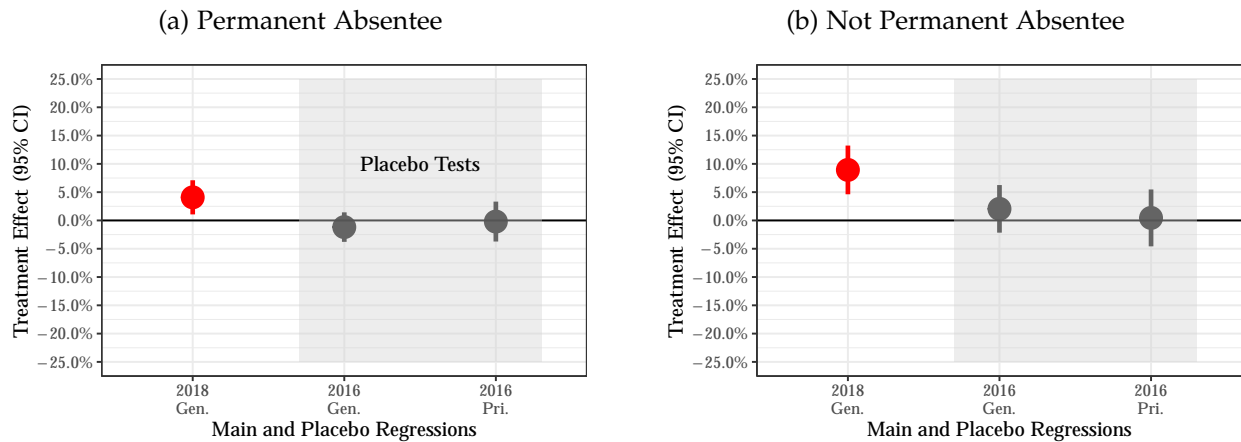Figure 3 shows ARR effects by permanent absentee status.

(a) Permanent Absentee   (b) Not Permanent Absentee

Figure 3: ARR Effects by Permanent Absentee Voter Status

G.3   By Race

Another question of substantive interest is how different racial groups react to the ARR treatment. The results are in Figure 4. Compared to White voters (6.6 percentage points increase), Hispanic voters show a slightly larger effect size (7.1 percentage points increase). What is interesting is that the Asian voters are extremely responsive (13.7 percentage points increase), with almost twice the coefficient of White voters. Other races category[6] has a negative but not statistically significant coefficient. All placebo tests pass.

While these should be interpreted with caution since treatment was not blocked by subgroups, the results are striking. The ambiguity of the 'other races' category still looms (14.7% of the sample).[7] But Hispanic/Latino and Asian voters seem to be benefiting from the ARR more than White voters. Both categories are low-turnout groups compared to White voters, and ARR seems to have the potential to close this gap.

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[6]I do not analyze Black voters separately because there are too few classified such; only 57 voters (1%), consistent with the Census results.

[7]It is not entirely clear why the 'Others' category displays such low ARR results. The category includes Black, mixed-race, and all other voters that are not clearly classified into the other categories. For a full description, see Imai and Khanna (2016).
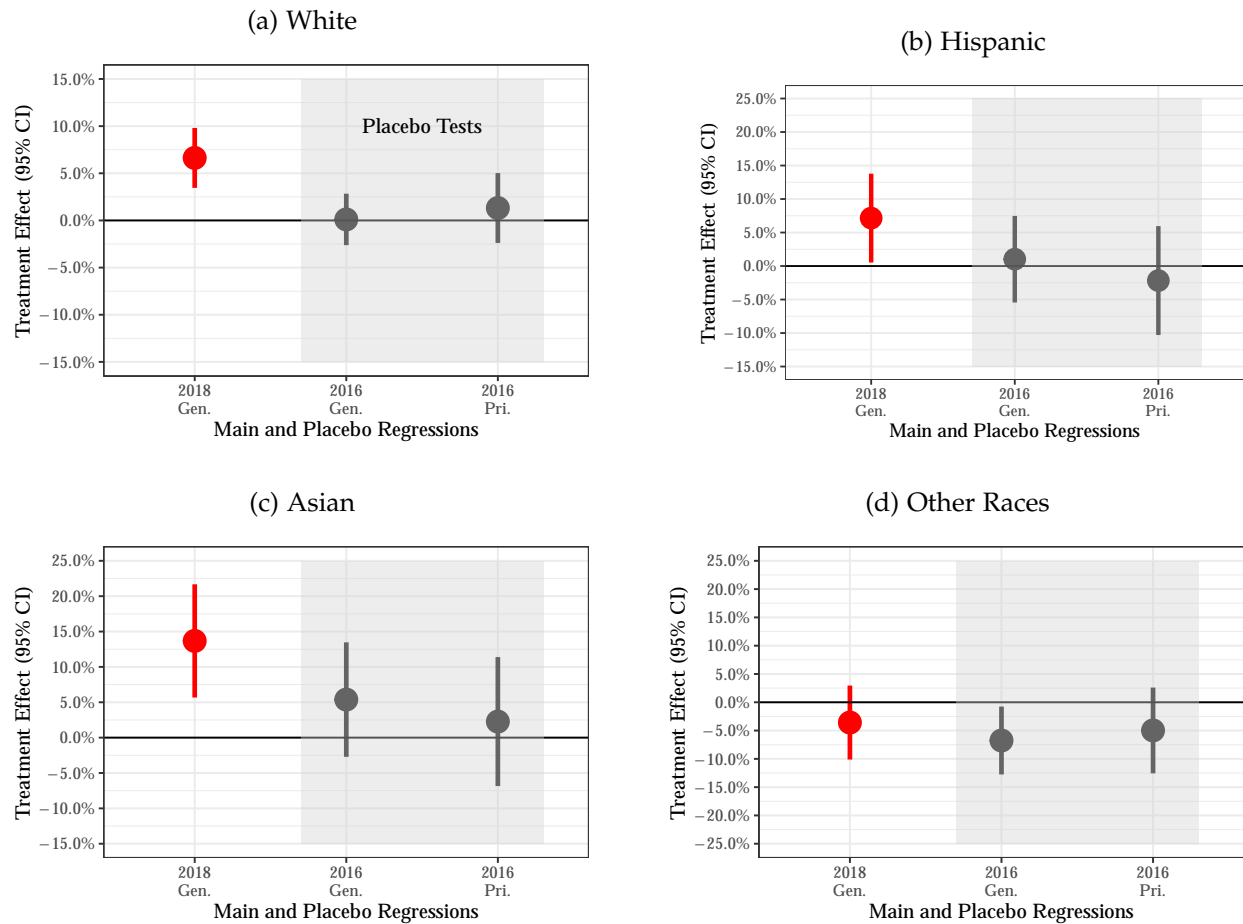
(a) White

(b) Hispanic

(c) Asian

(d) Other Races

Figure 4: ARR Effects by Race

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