Anomalies and Frauds in the Korea 2020 Parliamentary Election, SMD and PR Voting*

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*Thanks to Hun Chung for highlighting the concerns with the election (as did several others) and for pointing to the dataset originally used in the analysis. Thanks to Won-ho Park for identifying a problem in previous versions of the data in which many Independent candidates were omitted, and thanks to `freedomfighter2022@protonmail.com` for correcting this issue in the data.

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The 2020 parliamentary election in Korea is controversial, with fraud allegations. I examine data from the election using `eforensics`, tests from the Election Forensics Toolkit and the spikes test. This paper improves on a previous version ("Frauds in the Korea 2020 Parliamentary Election," April 29, 2020) by using updated complete data and by adding Election Forensics Toolkit and spikes test results. This paper improves on a previous version ("Anomalies and Frauds in the Korea 2020 Parliamentary Election," May 9, 2020) by using a corrected dataset that includes 50 previously omitted independent candidates (May 13, 2020). The current version adds analysis of proportional representation data. The estimates and tests all exhibit anomalies that suggest the election data were fraudulently manipulated, although the suggestion is stronger for single-member district voting than for proportional representation voting.

1 `eforensics`

The statistical model implemented in `eforensics`[1] offers evidence that fraudulent votes occurred in the election that may have changed some election outcomes. The statistical model operationalizes the idea that "frauds" occur when one party gains votes by a combination of manufacturing votes from abstentions and stealing votes from opposing parties. The Bayesian specification[2] allows posterior means and credible intervals for counts of "fraudulent" votes to be determined both for the entire election and for observed individual aggregation units.

It is important to keep in mind that "frauds" according to the `eforensics` model may or may not be results of malfeasance and bad actions. How much estimated "frauds" may be produced by normal political activity, and in particular by strategic behavior, is an open question that is the focus of current research. Statistical findings such as are reported here should be followed up with additional information and further investigation into what

[1] `https://github.com/UMeforensics/eforensics_public`

[2] Ferrari, McAlister and Mebane (2018) and `http://www.umich.edu/~wmebane/efslides.pdf`

happened. The statistical findings alone cannot stand as definitive evidence about what happened in an election.

Figure 1 shows the distribution of turnout and vote proportions across aggregation units for single-member district (SMD) voting.[3] Each turnout proportion is (Number Valid)/(Number Eligible), and each vote proportion is (Number Voting for Party)/(Number Eligible).[4] The data include counts for $n = 19131$ units. 329 "abroad_office" observations have zero eligible voters but often a small number of votes—the largest number is 23—and are omitted from the plots. One "prevote_in" unit with zero voters and zero votes is also omitted. Figure 1(a) uses vote proportions defined based on Democratic Party votes, and Figure 1(b) uses vote proportions defined based on the votes received by the party with the most votes in each constituency. Fraud allegations have focused on the Democratic Party, but a principled way to analyze the SMD election data is to consider that frauds potentially benefited the leading candidate in each constituency. In the figure differences between the two distributions are apparent, but both share a distinctive multimodal pattern. There appear to be clusters of observations that share distinctive levels of turnout and votes, some with low, medium, high and very high turnout. The diagonal edge feature in the plots results from using Number Eligible as the denominator for both proportions: when the party receives nearly all the valid votes, then the observation is near that diagonal.

Figures 2 and 3 show that the different clusters in Figure 1 correspond to observations

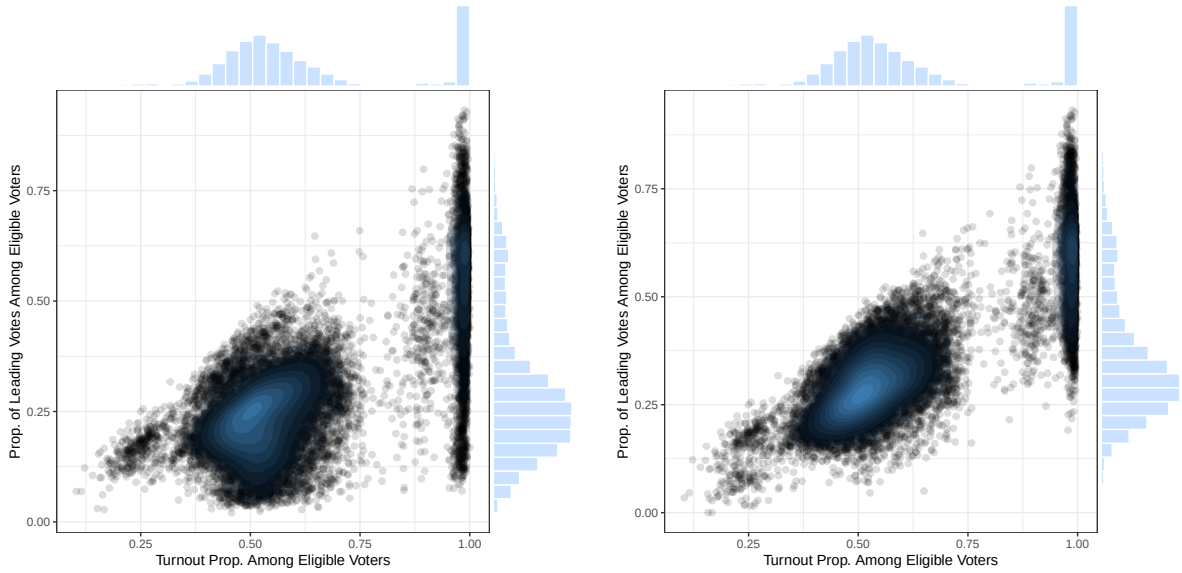
[3] Vote and eligible voter count data come from the file `korea_election_regional_21_eng.sqlite` at `https://github.com/freedomfighter2022/koreaelection2020`, downloaded May 11, 2020 19:48. "The source data (Excel files) of the 21st general election of Korea was pulled from `https://www.nec.go.kr/portal/bbs/view/B0000338/40935.do?menuNo=200185`" (freedomfighter2022@protonmail.com 2020*a*). I determined constituency information using the tables of "Electoral District and *Eupmyeon-dong*" at `http://info.nec.go.kr/main/showDocument.xhtml?electionId=0020200415&topMenuId=BI&secondMenuId=BIGI05` and the lists of winners at `http://info.nec.go.kr/main/showDocument.xhtml?electionId=0020200415&topMenuId=EP&secondMenuId=EPEI01`. Google Translate helped me by translating the Korean sources into English in my Chrome browser.

[4] "Number Valid" is the number voting for any candidate, and "Number Eligible" is `sum_people` in `korea_election_regional_21_eng.sqlite`. Candidates are mapped from the `candidate` table of `korea_election_regional_21_eng.sqlite` to parties (there are 187 of them, including each independent candidate as a separate party), then votes for any of the parties are summed for each aggregation unit observation to produce "Number Valid" for that unit.

Figure 1: Korea 2020 Parliamentary Election Data Plots

(a) Democratic Party

(b) Constituency leaders

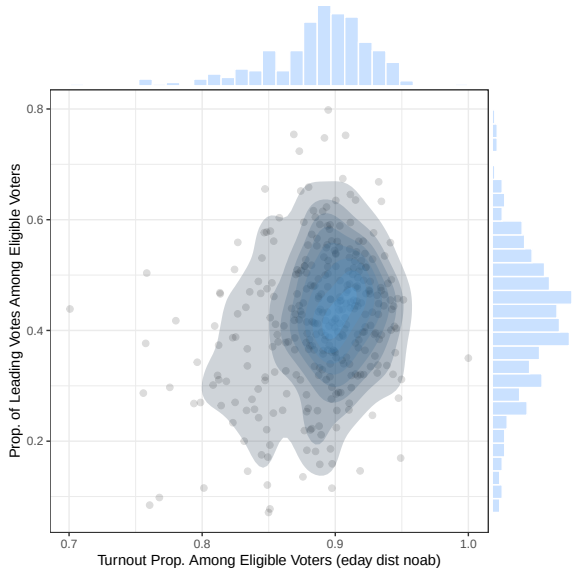


Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for party/number eligible) for (a) the Democratic Party or (b) the party the most votes in each constituency in aggregation units in the Korea 2020 parliamentary election. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

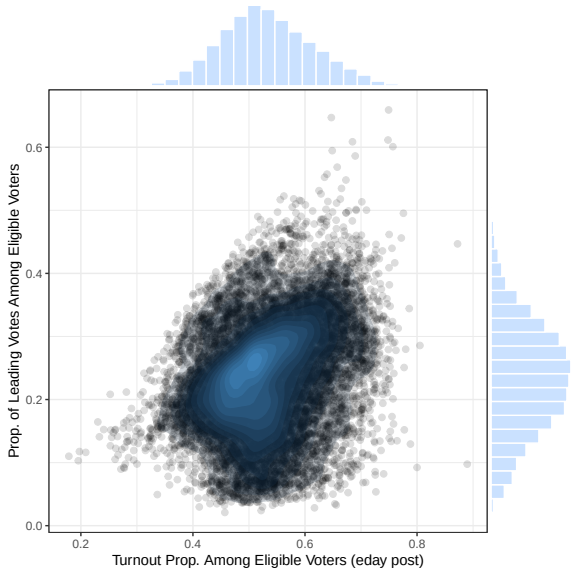
that are administratively distinctive. Figure 2 displays data for Democratic Party votes, and Figure 3 shows data for constituency leader votes. The four sets of units that have distinctive distributions are district-level, election-day units that are not abroad (Figures 2(a) and 3(a)), voting post, election-day units (Figures 2(b) and 3(b)), abroad units (Figures 2(c) and 3(c)) and pre-vote units (Figures 2(d) and 3(d)). Each subset of units (a), (b) and (d) has a mostly unimodal distribution: the marginal histograms are mostly near symmetric. But exceptional points are evident in each of these subsets. The pre-vote vote distributions are noticeably skewed. Abroad units are more distinctively bimodal when constituency leaders are considered than when the Democratic Party is in focus.

Figure 2: Korea 2020 Parliamentary Election Data Plots, Democratic Party

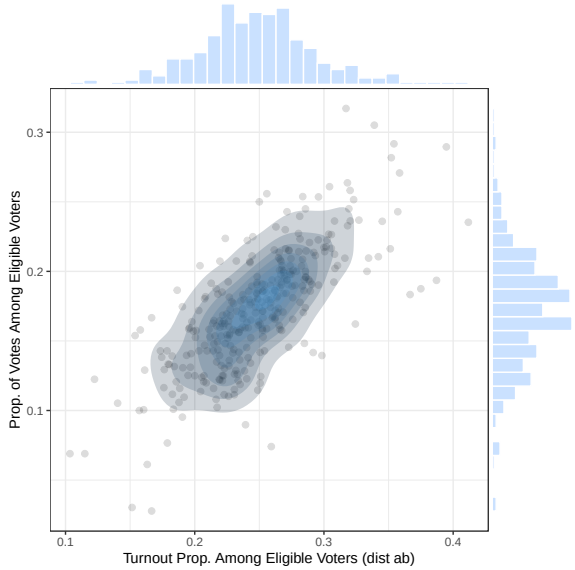
(a) district, election-day, not abroad



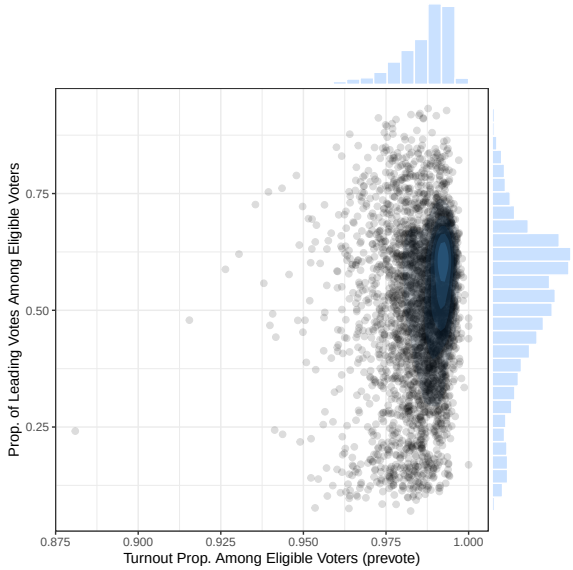
(b) voting post, election-day



(c) abroad



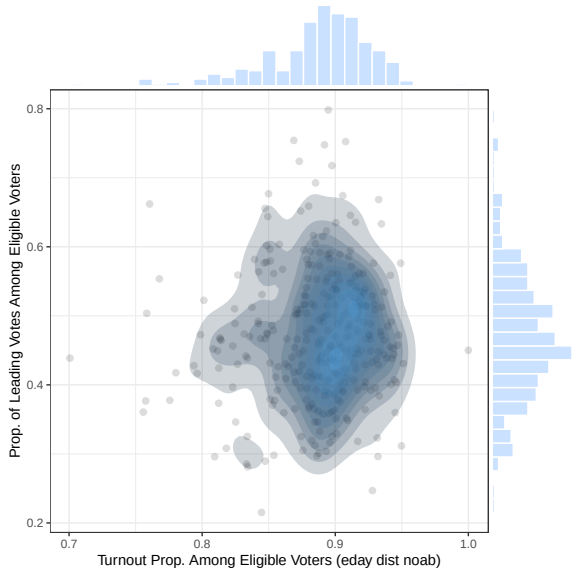
(d) pre-vote



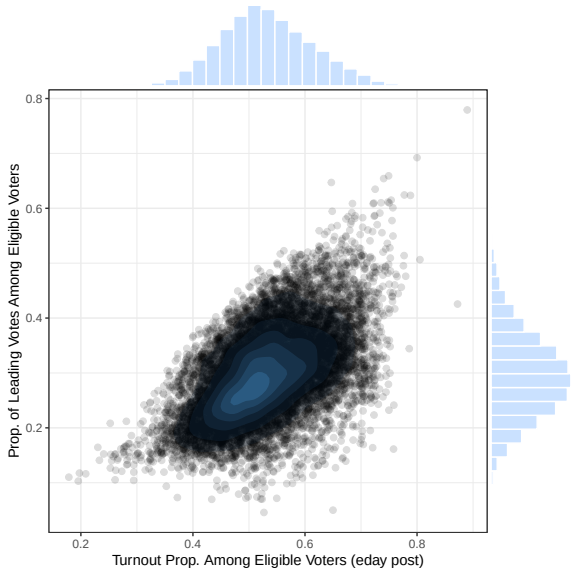
Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Democratic party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad; (b) voting post election-day; (c) abroad; (d) pre-vote. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

Figure 3: Korea 2020 Parliamentary Election Data Plots, Constituency Leaders

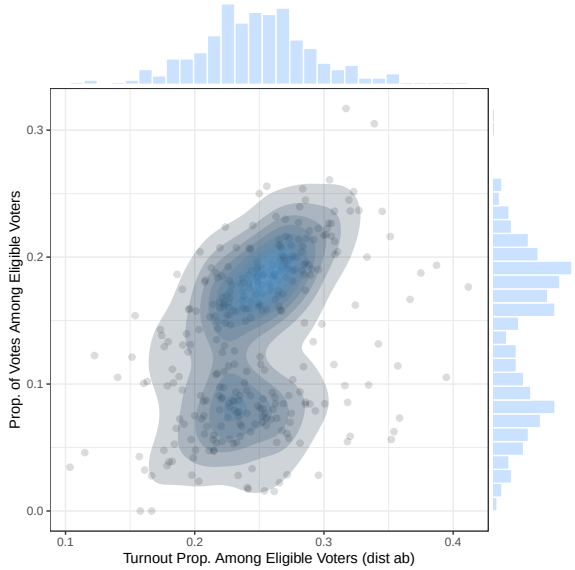
(a) district, election-day, not abroad



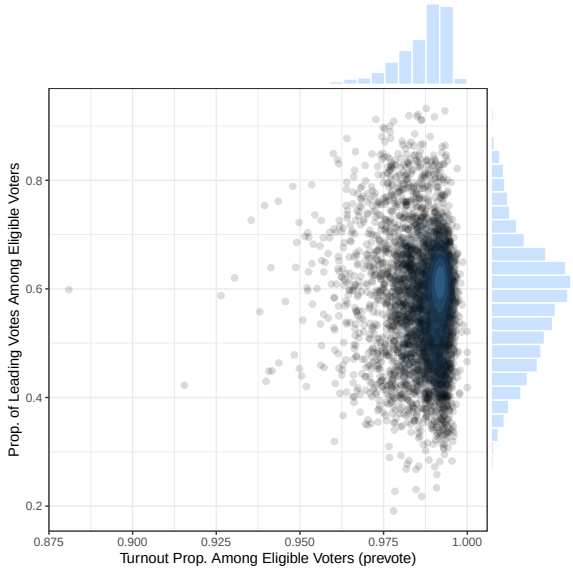
(b) voting post, election-day



(c) abroad



(d) pre-vote



Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for constituency-leading party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad; (b) voting post election-day; (c) abroad; (d) pre-vote. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

I estimate the `eforensics` model separately for the two definitions of leading party votes.[5] Covariates for turnout and vote choice include indicators for pre-vote, voting post, abroad and disabled-ship status and fixed effects for the 253 constituencies included in the data. The two specifications agree that 446 aggregation units are fraudulent, but 761 additional units are fraudulent in the Democratic party specification and 807 additional units are fraudulent in the constituency-leading party specification. As Table 1 shows, some parameter estimates differ between the models. Parameters for the probabilities of incremental and extreme frauds (π_2, π_3) are about the same in the two specifications. The coefficients for expected pre-vote turnout ($\gamma_0 + \gamma_1$) are similar between specifications,[6] and other coefficients in the turnout equation (γ_2–γ_4) are similar. Coefficients for vote choice (β_0–β_4) differ, reflecting the differences in vote proportions being modeled.[7]

Figure 4 uses plots by subset of Democratic party focused observations to illustrate which observations are fraudulent according to the `eforensics` model with the Democratic party focused specification. Nonfraudulent observations are plotted in blue and fraudulent observations appear in red. The frequencies of fraudulent and not fraudulent units appear in the note at the bottom of the figure. Visually and by the numbers, frauds occur most frequently for pre-vote units (28.7% are fraudulent), next most frequently for district-level, election-day, not abroad units (2.43% are fraudulent) then next most frequently for voting post election day units (.67% are fraudulent) then abroad units (.61% are fraudulent).

[5]Parameter estimates reported in Table 1 and in the Appendix are based on four parallel MCMC chains. Due to RAM limitations, observation frauds computations use only the first chain. Parameter estimates do not vary that much over chains.

[6]Notice that the relatively large coefficients for pre-vote in the turnout equations match the high turnout that is observed due to the definition of pre-vote "eligible voters" as those who cast ballots using the pre-vote method. For instance, in the constituency leader specification, expected turnout for pre-vote in constituency Busan 1, which is the reference constituency for the constituency fixed effects, is $1/(1 + \exp(-(.757 + 1.11))) = .866$. In contrast expected turnout in non-prevote voting post units in the same constituency is $1/(1 + \exp(-(.757 - .0403))) = .672$. "Manufactured" fraudulent votes would add apparent turnout to such baselines.

[7]Constituency fixed effects for the Democratic-Party-focused specification, reported in the Appendix, exemplify how these fixed effects reflect local political variations. The fixed effects in the vote equation for Democratic Party strongholds Jeollabuk and Jeollanam-do (freedomfighter2022@protonmail.com 2020*b*) are almost all positive (beta.nu[181]–beta.nu[200]), while the fixed effects for Future Integration Party strongholds Gyeongsangbuk-do and Gyeongsangnam-do (freedomfighter2022@protonmail.com 2020*b*) (beta.nu[136]–beta.nu[164]) are almost all negative.

Figure 5 uses plots by subset of constituency-leader focused observations to illustrate which observations are fraudulent according to the `eforensics` model with the constituency-leader focused specification. Nonfraudulent observations are plotted in blue and fraudulent observations appear in red. The frequencies of fraudulent and not fraudulent units appear in the note at the bottom of the figure. Visually and by the numbers, frauds occur most frequently for pre-vote units (25.0% are fraudulent), next most frequently for voting post election day units (2.04% are fraudulent) then next most frequently for district-level, election-day, not abroad units (1.52% are fraudulent). None of the abroad units are fraudulent.

Table 1: Korea 2020 Parliamentary `eforensics` Estimates

(a) Democratic Party specification

Parm.	Covariate	Mean	HPD.lo[a]	HPD.up[b]
π_1	No Fraud	.933	.929	.937
π_2	Incremental Fraud	.0615	.0574	.0654
π_3	Extreme Fraud	.00512	.00399	.00621
γ_0	(Intercept)	.766	.723	.813
γ_1	pre-vote	1.10	1.00	1.24
γ_2	voting post	−.0398	−.0708	−.0155
γ_3	abroad	−.0869	−.125	−.0528
γ_4	disabled-ship	.0366	.00614	.0818
β_0	(Intercept)	−.139	−.160	−.0941
β_1	pre-vote	.0399	.0222	.0606
β_2	voting post	−.117	−.157	−.0930
β_3	abroad	.195	.135	.241
β_4	disabled-ship	−.00406	−.0484	.0247

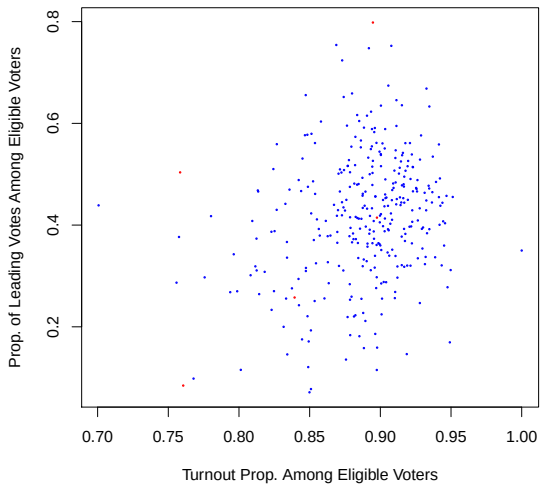
(b) constituency leader specification

Parm.	Covariate	Mean	HPD.lo[a]	HPD.up[b]
π_1	No Fraud	.927	.919	.933
π_2	Incremental Fraud	.0651	.0588	.0725
π_3	Extreme Fraud	.00783	.00650	.00905
γ_0	(Intercept)	.757	.687	.827
γ_1	pre-vote	1.11	.963	1.24
γ_2	voting post	−.0403	−.0826	.0275
γ_3	abroad	−.0711	−.111	−.00294
γ_4	disabled-ship	.0382	.000400	.0713
β_0	(Intercept)	.168	.133	.216
β_1	pre-vote	−.0857	−.110	−.0656
β_2	voting post	.0724	.0352	.102
β_3	abroad	.0435	−.00614	.0734
β_4	disabled-ship	−.0315	−.0631	−.0155

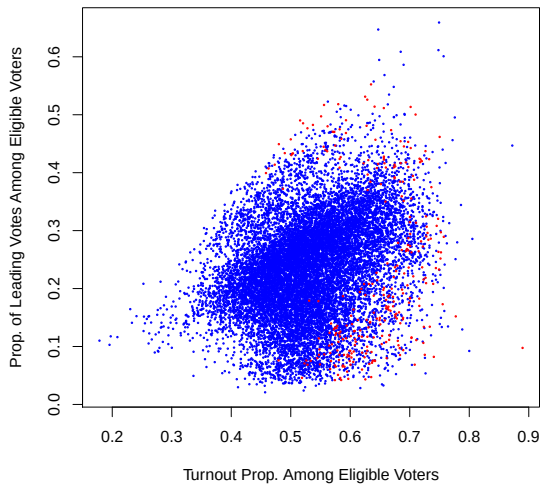
Note: selected `eforensics` model parameter estimates (posterior means and highest posterior density credible intervals). All coefficients including constituency fixed effects are reported in the Appendix. For parameter notation see `http://www.umich.edu/~wmebane/efslides.pdf`. $n = 18801$.
[a] 95% highest posterior density credible interval lower bound. [b] 95% highest posterior density credible interval upper bound.

Figure 4: Korea 2020 Fraud Plots , Democratic Party

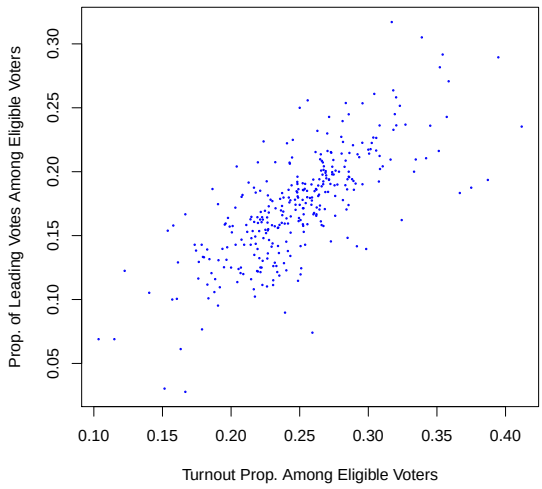
(a) district, election-day, not abroad



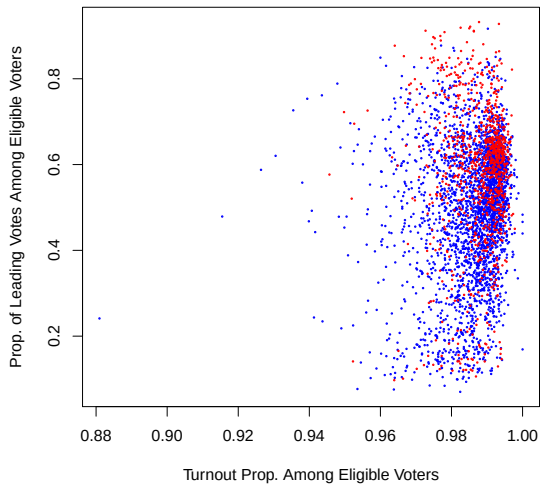
(b) voting post, election-day



(c) abroad



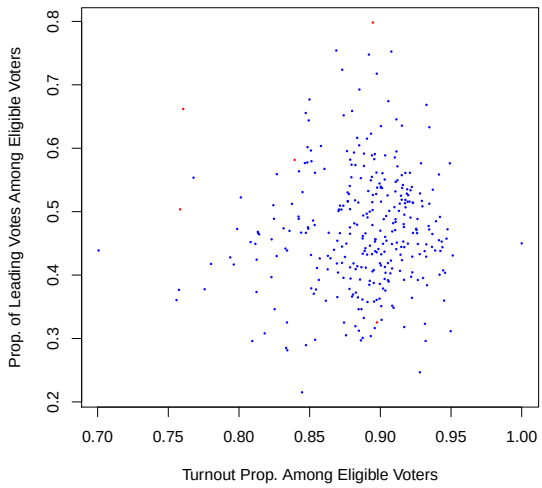
(d) pre-vote



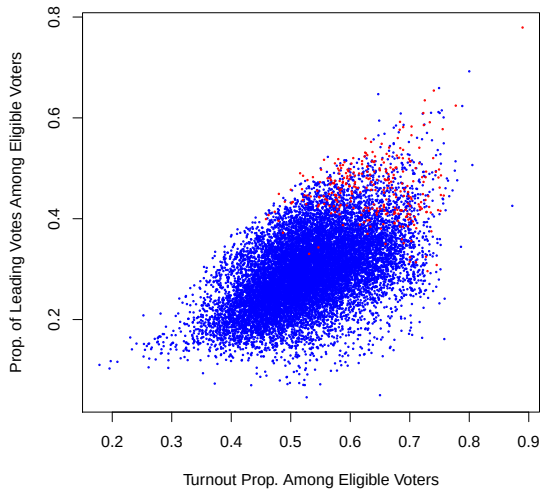
Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Democratic Party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad (8 fraudulent, 321 not); (b) voting post election-day (101 fraudulent, 14877 not); (c) abroad (2 fraudulent, 327 not); (d) pre-vote (1096 fraudulent, 2717 not). Plots show scatterplots with nonfraudulent observations in blue and fraudulent observations in red. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

Figure 5: Korea 2020 Fraud Plots , Constituency Leaders

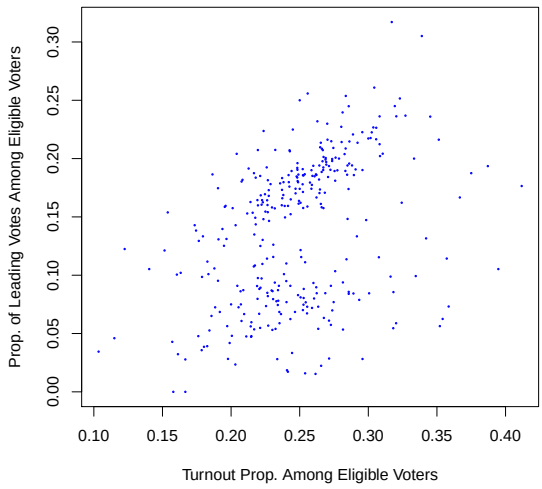
(a) district, election-day, not abroad



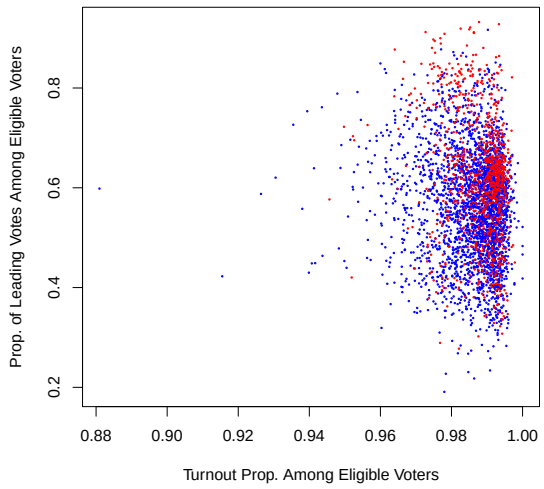
(b) voting post, election-day



(c) abroad



(d) pre-vote



Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for constituency-leading party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad (5 fraudulent, 324 not); (b) voting post election-day (293 fraudulent, 14037 not); (c) abroad (0 fraudulent, 329 not); (d) pre-vote (955 fraudulent, 2858 not). Plots show scatterplots with nonfraudulent observations in blue and fraudulent observations in red. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

I use a counterfactual method to calculate how many votes are fraudulent.[8] Table 2 reports the observed counts of eligible voters, valid votes and votes for the (a) Democratic party and (b) constituency-leading party totaled over all units in the analysis, along with fraudulent vote count totals. The total of "manufactured" votes is reported separately from the total number of fraudulent votes: manufactured votes are votes that the model estimates should have been abstentions but instead were observed as votes for the (a) Democratic Party or (b) constituency-leading party. Both posterior means and 95% and 99.5% credible intervals are reported. The results show that for the Democratic-Party-focused specification over all about 1,418,079 votes are fraudulent, and of the fraudulent votes about 1,056,462 are manufactured (the remaining 361,617 are stolen—counted for the Democratic Party when they should have been counted for a different party). Overall, according to the `eforensics` model, about 9.9% of the votes for Democratic Party candidates are fraudulent. The results show that for the constituency-leading-focused specification over all about 1,234,217 votes are fraudulent, and of the fraudulent votes about 961,296 are manufactured (the remaining 272,921 are stolen—counted for the constituency-leading party when they should have been counted for a different party). Overall, according to the `eforensics` model, about 7.7% of the votes for constituency-leading candidates are fraudulent.

Fraudulent vote occurrence varies over constituencies. Counts of frauds by aggregation unit appear in a supplemental file[9], but I use the unit-specific fraudulent vote counts from the constituency-leader focused specification to assess whether the number of fraudulent votes is ever large enough apparently to change the winner of a constituency contest. For 231 constituencies it is not, but for 22 constituencies the number of fraudulent votes is large enough apparently to change the winner of the constituency contest. In 15 instances the apparently fraudulently winning party is the "Democratic Party," and in 7 instances it

[8]For a description of the method see "approach two" described at `http://www.umich.edu/~wmebane/efslides.pdf`.

[9]See the original **R** output files `wrkef4_1_Korea2020dAC_1d.Rout` and `wrkef4_1_Korea2020daAC_1d.Rout` in `Korea2020ef2.zip` for the numbers of fraudulent votes at each aggregation unit.

Table 2: Korea 2020 `eforensics` Estimated Fraudulent Vote Counts

(a) Democratic Party specification fraudulent counts

Observed Counts

Voters	Valid	Votes
43961157	28738468	14343693

	95% interval		99.5% interval	
Manufactured	lo	up	lo	up
1056461.9	1026145.6	1095485.7	539139.1	1106749.6

	95% interval		99.5% interval	
Total	lo	up	lo	up
1418079.2	1384391.2	1454150.3	1070337.2	1467822.7

(b) constituency leader specification fraudulent counts

Observed Counts

Voters	Valid	Votes
43961157	28738468	16125511

	95% interval		99.5% interval	
Manufactured	lo	up	lo	up
961296.2	925904.3	996418.2	497655.7	1009922.4

	95% interval		99.5% interval	
Total	lo	up	lo	up
1234217.0	1188138.2	1268770.5	929474.9	1278893.6

Note: observed counts and total fraud posterior means and credible intervals based on `eforensics` model estimates. $n = 18801$.

is the "Future Integration Party."[10]

[10]The particular constituencies that have these conditions can be identified by matching constituencies sequentially in "list of winners" tables available from `http://info.nec.go.kr/main/showDocument.xhtml?electionId=0020200415&topMenuId=EP&secondMenuId=EPEI01` (as of May 9, 2020 17:12 EST). Province constituency-sequence-number (party posterior mean fraudulent): Busan 7 (DP 2466.0899 fraudulent), Busan 12 (DP 1779.2709 fraudulent), Busan 15 (FIP 4884.7443 fraudulent), Chung-cheong bukdo 8 (DP 5645.5870 fraudulent), Chung-cheong bukdo 2 (DP 4749.2379 fraudulent), Chungcheongnam-do 5 (FIP 3319.3754 fraudulent), Chungcheongnam-do 1 (DP 1568.9601 fraudulent), Gyeonggi-do 36 (DP 4885.5827 fraudulent), Gyeonggi-do 8 (FIP 4660.3408 fraudulent), Gyeonggi-do 9 (DP 7990.4613 fraudulent), Gyeonggi-do 27 (DP 5717.1240 fraudulent), Gyeonggi-do 52 (DP 7072.9549 fraudulent), Gyeongsangnam-do 15 (DP 2251.0704 fraudulent), Gyeongsangnam-do 5 (FIP 2961.5911 fraudulent), Incheon Metropolitan City 5 (DP 8599.4068 fraudulent), Seoul 48 (DP 8687.1952 fraudulent), Seoul 6 (DP 4397.1784 fraudulent), Seoul 45 (FIP 5855.9778 fraudulent), Seoul 46 (FIP 9355.8661 fraudulent), Seoul 35 (DP 6209.7094 fraudulent), Seoul 4 (FIP 2849.0302 fraudulent), Ulsan Metropolitan City 5 (DP 7624.0325 fraudulent). In the "list of winners" tables, as translated by Google Translate, the constituency winner is designated as associated with ("Party Name") "Democratic Party" (DP) or "Future Integration Party" (FIP).

Given two specifications, which one is better? Probably neither model is correct, strictly speaking, even beyond the generality that no model is ever correct, but some are useful. If frauds only ever benefit the Democratic Party, then those frauds may have induced apparent frauds when we constrain frauds to benefit only constituency-leading candidates, because many of these do not affiliate with the Democratic Party. Similarly if only constituency-leading candidates benefit from frauds, then `eforensics` may be producing misleading results when we constrain frauds to benefit only the Democratic Party. Or perhaps other candidates—or several in each constituency—benefit from frauds and both specifications are producing misleading results. Possibly, of course, there are no frauds and something else is going on.

Caveats are many. The most basic caution is to keep in mind that "frauds" according to the `eforensics` model may or may not be results of malfeasance and bad actions. If some normal political situation makes the apparently fraudulent aggregation units appear fraudulent to the `eforensics` model and estimation procedure, then the frauds estimates may be signaling that "frauds" occur where in fact something else is happening. In particular there maybe something benign that leads many of the pre-vote units to have a turnout and vote choice distribution that differs so much especially from the distribution for election-day voting post units, the latter comprising the bulk of the data. Likewise something benign may distinguish the election-day voting post units that the `eforensics` model identifies as fraudulent. Beyond that general caution, there may something about the particular data used for the analysis that triggers the "fraud" findings. And there may be something about the model specification that should be improved that would produce different results.

2 Election Forensics Toolkit and Spikes

I use the Election Forensics Toolkit (EFT, a website developed as part of a USAID-funded project) (Hicken and Mebane 2015; Mebane 2015) to look at features of the SMD data. The EFT results add to the impression that the election results are manipulated.

Results for five tests (see Hicken and Mebane 2015 for explanations of the tests) computed using the entire set of aggregation units all together appear in Table 3. The `DipT` statistics for Turnout shows there is significant multimodality, a result that matches what can be seen visually in Figure 1. The `P05s` statistic for Turnout is significantly below the expected value of .2: this does not match the excessively high value of `P05s` that occurs in the case of signalling in Russia (Kalinin and Mebane 2011; Kalinin 2017), but it is difficult to think of natural processes that would produce frequencies of percentages that end in 0 or 5 that are too low. The `2BL` statistics differ significantly from the expected value of 4.187, but the values that occur for the candidates' votes match what I observe given strategic turnout and voting with multiparty competition (Mebane 2013*a*), so these `2BL` statistics do not support a diagnosis that there are frauds.

Table 3: Distribution and Digit Tests, Korea 2020

Name	`2BL`	`LastC`	`P05s`	`C05s`	`DipT`	Obs
Turnout	4.113	4.496	.173	.204	0	18801
	(4.074, 4.151)	(4.453, 4.536)	(.167, .178)	(.199, .210)	−−	
Democratic Party	4.129	4.473	.199	.200	.994	18801
	(4.085, 4.172)	(4.432, 4.473)	(.193, .205)	(.194, .205)	−−	
Constituency Leader	4.101	4.513	.199	.202	.997	18801
	(4.056, 4.142)	(4.471, 4.553)	(.193, .204)	(.196, .208)	−−	

Note: statistics and tests based on aggregation unit observations. "2BL," second-digit mean; "LastC," last-digit mean; "P05s," mean of variable indicating whether the last digit of the rounded percentage of votes for the referent party or candidate is zero or five; "C05s," mean of variable incicating whether the last digit of the vote count is zero or five; "DipT," p-value from test of unimodality; "Obs," number of aggregation unit observations. Values in parentheses are 95% nonparametric bootstrap confidence intervals. Point estimates in red differ significantly from the values expected if there are no anomalies.

Given the SMD election rules, an approach that potentially produces sharper insights

regarding the constituency contests is to compute the EFT statistics separately for each constituency. The counterbalancing concern is statistical power: overall there are $n = 18801$ aggregation unit observations, but the median size of constituencies is 66 aggregation units with sizes ranging from a minimum of 38 units to a maximum of 183 units. In most cases with such sample sizes bootstrap confidence intervals for the EFT statistics (Hicken and Mebane 2015; Mebane 2015) are too wide to support finding significant differences from the values of the statistics that are expected if there are no anomalies.

Nonetheless Figure 6 shows that many constituencies have significantly anomalous values for the `2BL`, `LastC` and `P05s` statistics.[11] The plots of the `2BL` statistic show several values that are either too big or too small to explain as results of electors' strategic behavior (Mebane 2013*a*). The `LastC` statistics, motivated by Beber and Scacco (2012), show many too-large or too-small values.[12] The `P05s` statistics show a few constituencies with excessively high values, in line with the usual understanding of how the percentages are often used to signal, but many more have significantly small values. Moreover both Turnout and the votes for the candidates exhibit many significantly anomalous `P05s` statistics. The many significant `P05s` statistics suggest the data are artificial (cf. Mebane 2013*b*).

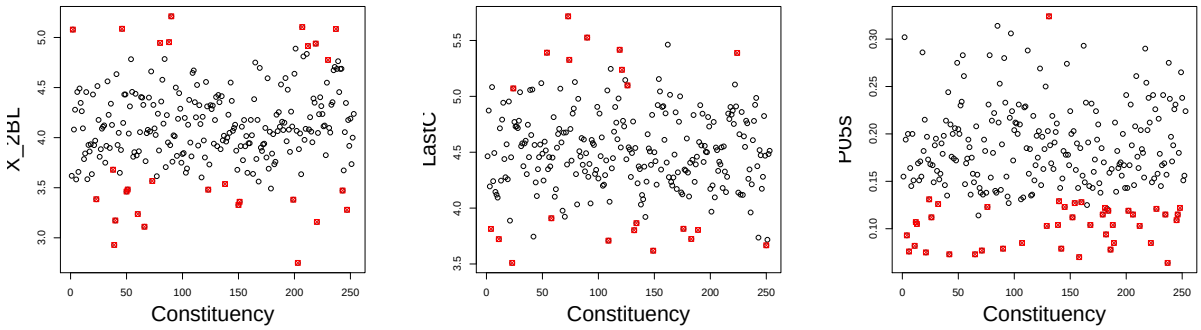
[11] The `C05s` statistics, not shown, exhibit similar frequencies of significant anomalies. The significance test results used to color points in Figure 6 are obtained by checking whether the nonanomalous expected values are contained in 95% confidence intervals obtained using bootstrap methods. The EFT software is not designed to support finding exact p-values that might be used to implement adjustments for multiple testing.

[12] A qualification to note is that `LastC` does not exclude aggregation units that have counts less than 100. Beber and Scacco (2012) advocate excluding such counts. In the Democratic-Party-focused data, 1463 units have fewer than 100 votes for the Democratic Party candidate, with a median of one such unit per constituency (max 83). For the constituency-leader-focused data, 601 units have fewer than 100 votes for the constituency leading candidate, with a median of one such unit per constituency (max 22).

Figure 6: Korea 2020 Election Forensics Toolkit by Constituency Plots

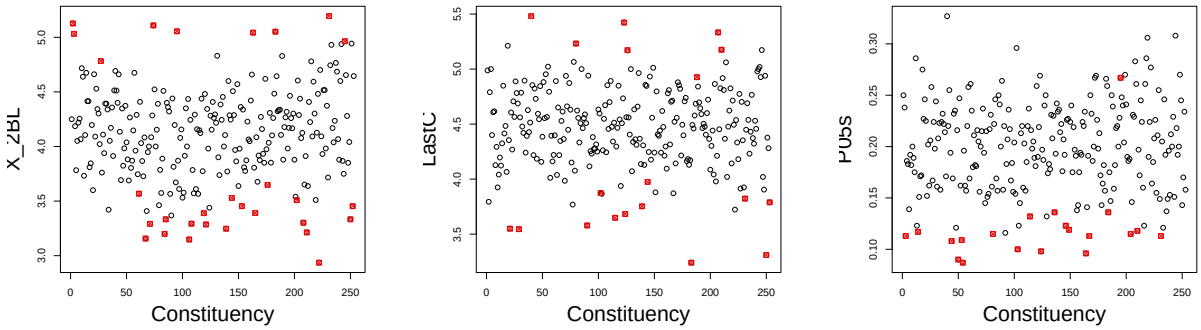
Turnout

(a) 2BL (b) LastC (c) P05s



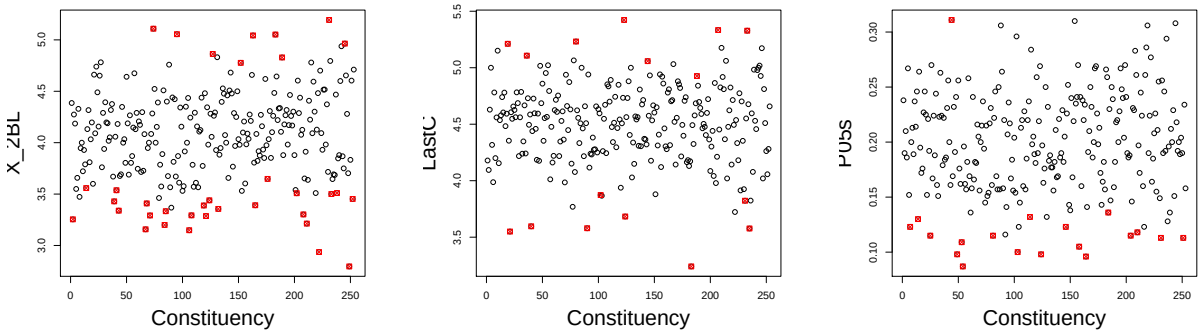
Democratic Party Votes

(d) 2BL (e) LastC (f) P05s



Constituency Leader Votes

(g) 2BL (h) LastC (i) P05s

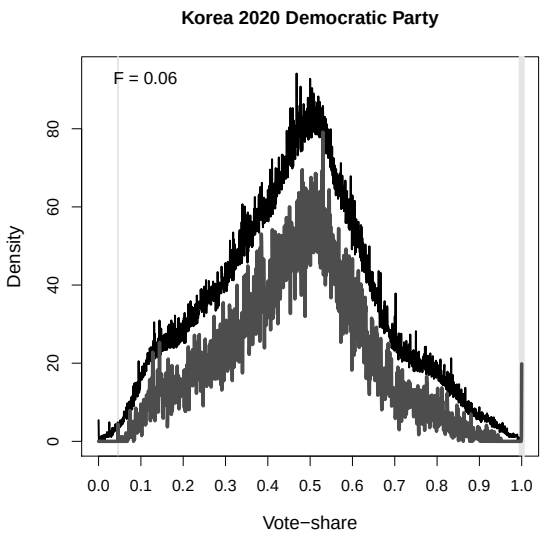


Note: statistics and tests based on aggregation unit observations, analyzed by constituency. Constituencies are matched to numbers in the Appendix. "2BL," second-digit mean; "LastC," last-digit mean; "P05s," mean of variable indicating whether the last digit of the rounded percentage of votes for the referent party or candidate is zero or five. Red points differ significantly at level $\alpha = .05$ from the values expected if there are no anomalies.

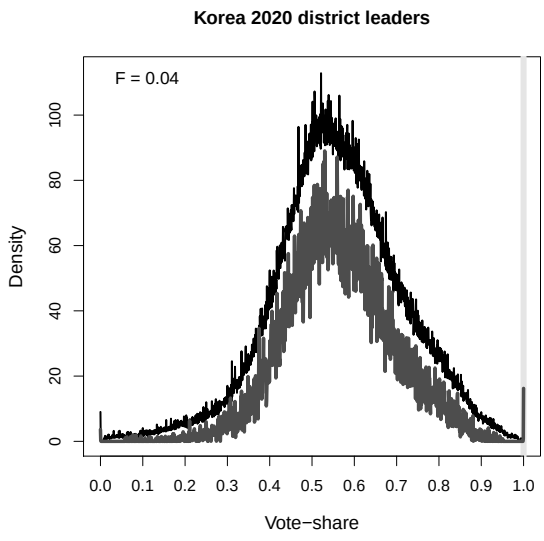
The spikes model tests for deviations in the proportions of votes for candidates in a more general way than does the P05s test, relative to a flexible and empirically grounded null distribution (Rozenas 2017). Figure 7 shows graphics that identify the ranges of polling stations the model estimates are fraudulent. Vertical gray bars in the graph indicate which aggregation units have suspicious votes: the aggregation units with vote proportions for (a) the Democratic Party or (b) the constituency leader that match the highlighted vote shares are suspicious. The results reinforce the findings for `P05s` in Table 3 and Figure 6 in that Figure 7(a) shows an excess of proportions near .05. The spikes at 1.0 in Figure 7 matches the significantly high values of `P05s` in Figure 6(f) and 6(i). The spikes test in this case appears to be more sensitive, in that the `P05s` test is restricted to reporting only a single average value while the spikes test assesses an entire distribution with reference to an empirically grounded null distribution.

Figure 7: Korea 2020 Spikes Tests Plots

(a) Democratic Party



(b) Constituency Leader



Note: vote shares are the proportion of valid votes for all (a) Democratic Party or (b) constituency leading cabdidates in each aggregation unit. $n = 18801$.

3 Proportional Representation Voting

At the same time voting occurred for SMD seats, each elector could cast a second ballot for proportional representation (PR) seats. The identities of the parties differed between the two ballots (Wikipedia 2020). Figure 8 shows the distribution of turnout and vote proportions across aggregation units for PR voting.[13] The data include counts for $n = 19064$ units. 250 "abroad_office" observations and 250 voting post observations that have a blank `name` have zero eligible voters but often a small number of votes and are omitted from the plots.[14]

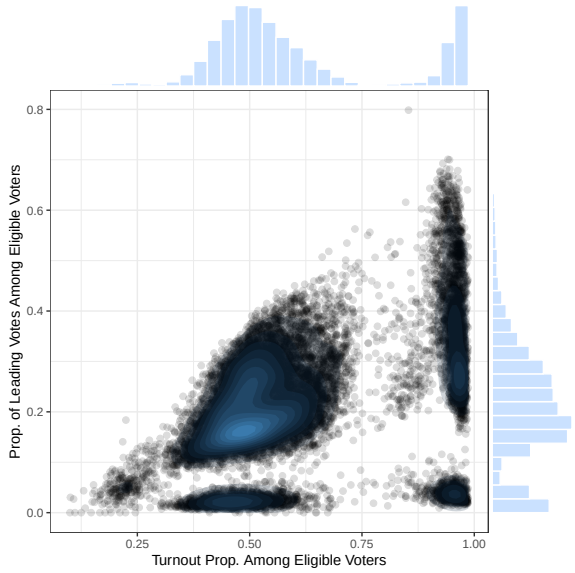
The differences between Figure 8 for PR voting and Figure 1 for SMD voting exemplify the effects strategic behavior can have on voting. The same electors voted at the same time for seats in the same body of parliament, except the rules used to go from vote counts to seats differed. The difference between the figures is first a story of coalition strategies and second a story of wasted vote strategies. An immediate symptom of coalition considerations is that the candidates decided to use distinctive party labels for the SMD and PR contests. Two parties received more than one million votes in SMD voting but five parties did so in PR voting, and the two largest SMD parties each had more than two million votes fewer in PR voting than in SMD voting (Wikipedia 2020): in the data I am analyzing the differences are 11914740 SMD to 9441520 PR votes (Future Integration Party to Future Korea Party) and 14344512 SMD to 9307112 PR votes (Democratic Party to Platform Party). The coalition dynamics plus wasted vote calculations caused the two largest SMD parties to receive more votes than did the corresponding parties in the PR contest. Strategic behavior explains why in Figure 8 noticeable vertical gaps are apparent between clusters for PR votes but not in Figure 1 for SMD votes: voters that selected the same party targets given SMD selected different party targets given PR.

[13] Vote and eligible voter count data come from the file `korea_election_proportional_21_eng.sqlite` at `https://github.com/freedomfighter2022/koreaelection2020`, downloaded May 11, 2020 19:48.

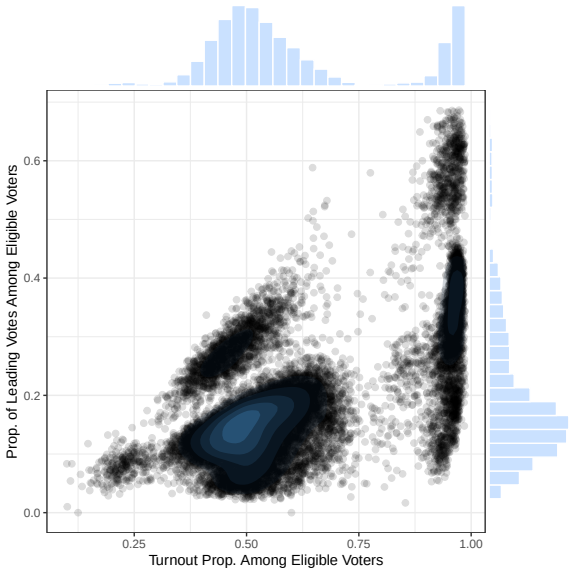
[14] The largest number of valid votes for such an "abroad_office" observation is 1406 in election district "jongrogu"—all the rest have zero valid votes. Among the nameless voting post observations that have zero eligible voters the largest number of valid votes is 73 in election district "nowueongu."

Figure 8: Korea 2020 Parliamentary Election PR Data Plots

(a) Future Korea Party



(b) Platform Party



Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for party/number eligible) for (a) the Future Korea Party or (b) the in aggregation units in the Platform Party 2020 parliamentary election. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

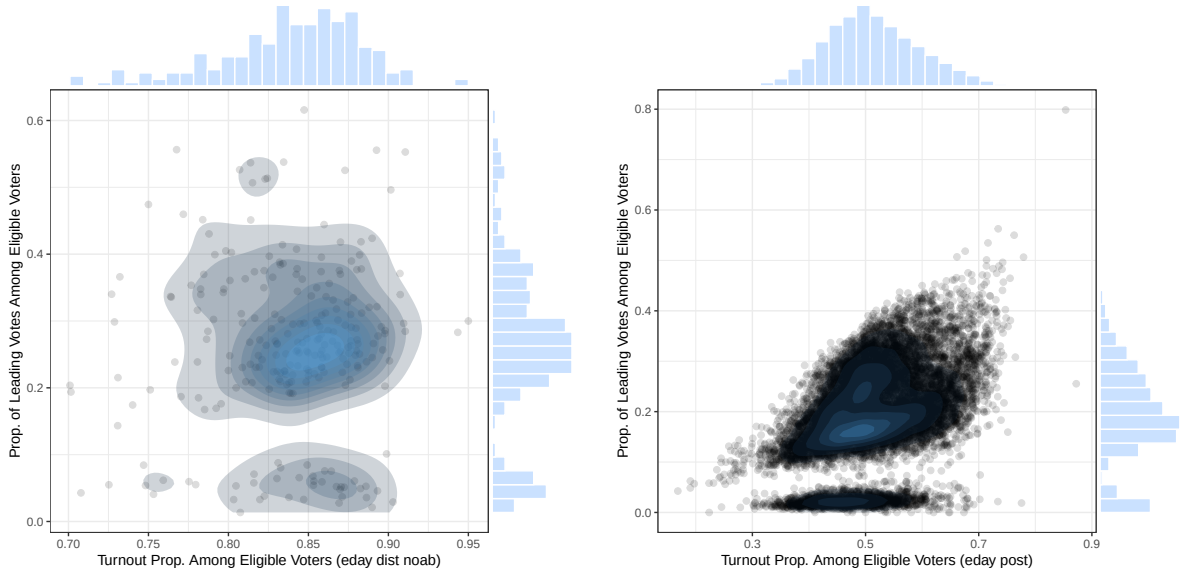
As much as strategic behavior causes such visable differences in vote distributions, strategic behavior can also produce significant apparent anomalies and `eforensics` frauds. The reason for this is a subject of active research, but the basic idea is that because strategic behavior is defined by individual electors acting based partly on their accurate anticipations of what the collection of other electors will do, strategic behavior induces dependencies between electors' actions. For example, electors coordinate their actions for or against one another's choices. My working hypothesis is that, for various technical reasons, such dependencies can trigger test results that look like anomalies or frauds when in fact nothing is wrong. Strategic behavior, of course, is of the essence in normal politics.

Figures 9 and 10 show that, similar to Figures 2 and 3 for SMD votes, the different clusters in Figure 8 correspond to observations that are administratively distinctive.

Figure 9: Korea 2020 Parliamentary Election PR Data Plots, Future Korea Party

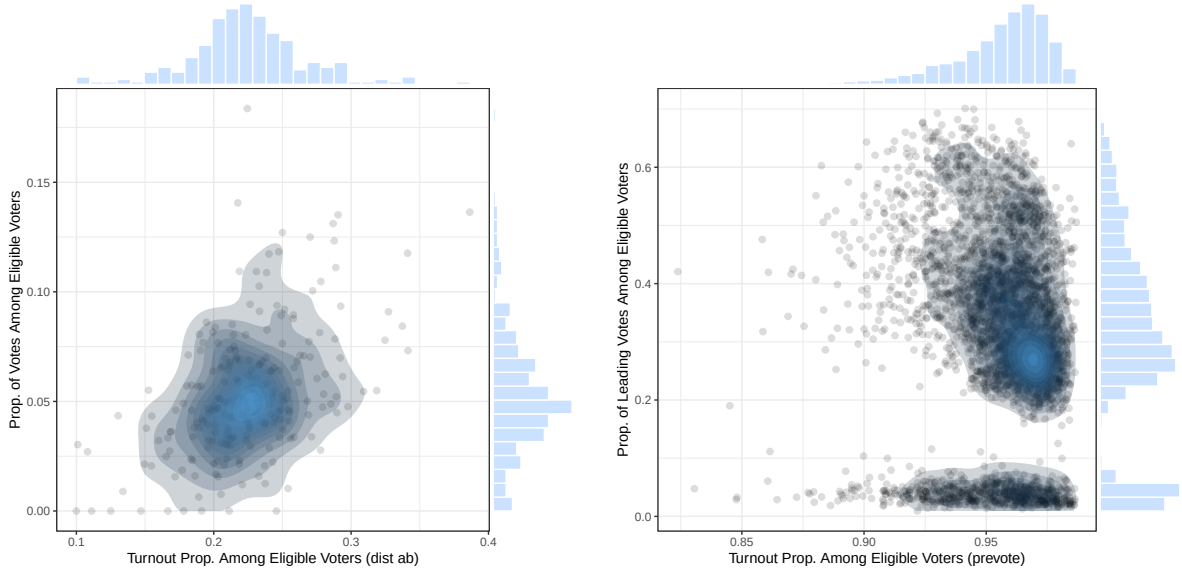
(a) district, election-day, not abroad

(b) voting post, election-day



(c) abroad

(d) pre-vote

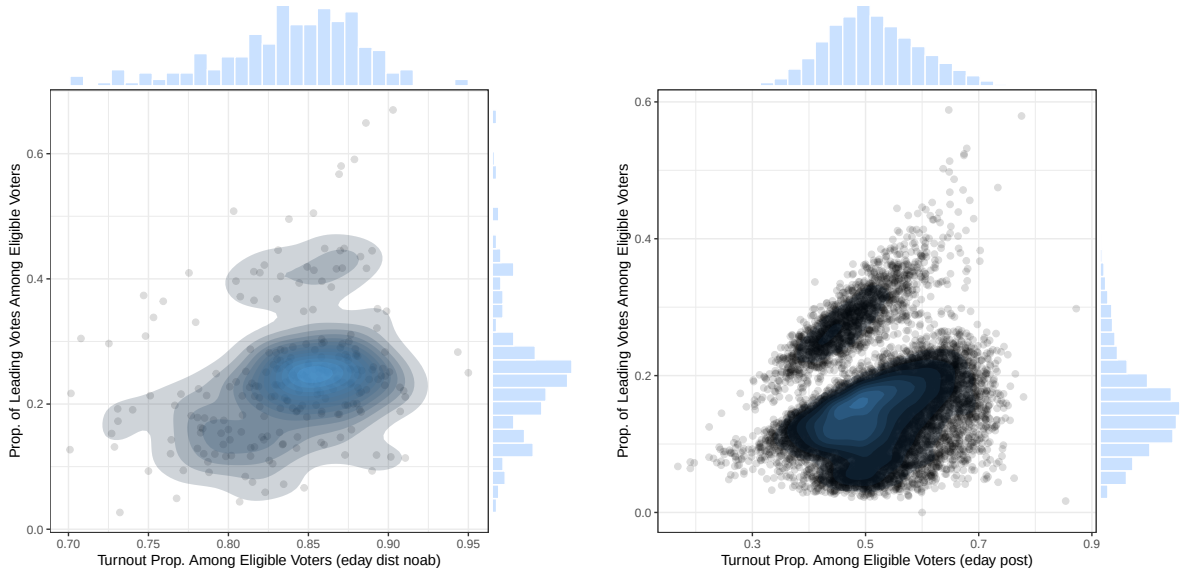


Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Future Korea Party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad; (b) voting post election-day; (c) abroad; (d) pre-vote. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

Figure 10: Korea 2020 Parliamentary Election PR Data Plots, Platform Party

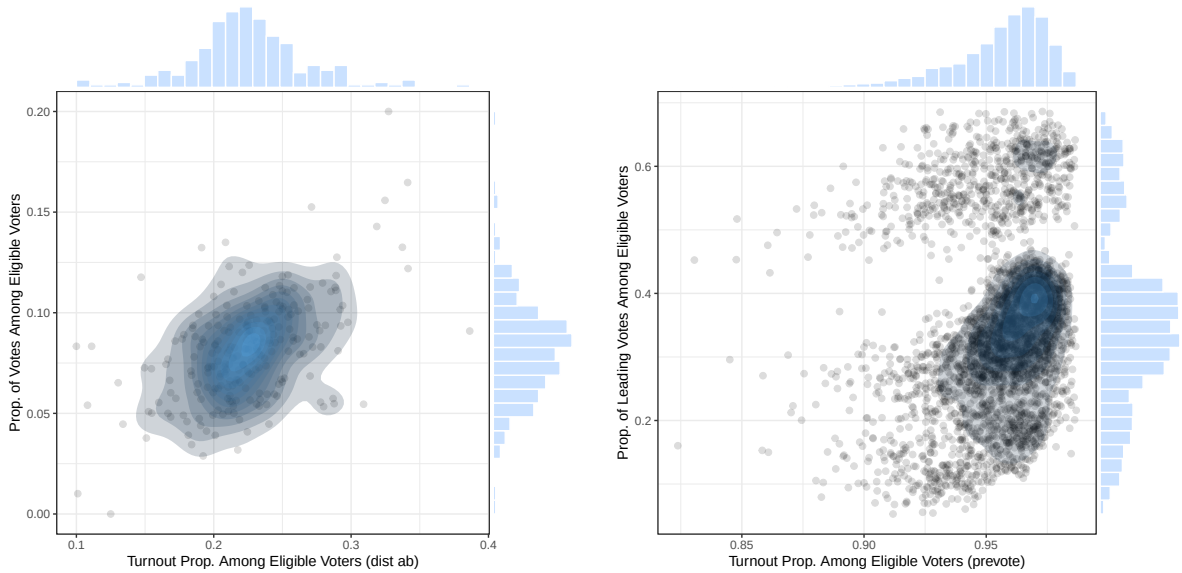
(a) district, election-day, not abroad

(b) voting post, election-day



(c) abroad

(d) pre-vote



Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Platform Party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad; (b) voting post election-day; (c) abroad; (d) pre-vote. Plots show scatterplots with estimated bivariate densities overlaid, with histograms along the axes. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

I estimate the `eforensics` model separately for two definitions of leading party votes: one specification uses votes for the Forward Korea Party, which received the most PR votes, and the other specification uses votes for the Protect Party, which has the second-most PR votes. Covariates for turnout and vote choice include indicators for pre-vote, voting post, abroad and disabled-ship status. The two specifications agree that 148 aggregation units are fraudulent, but 661 additional units are fraudulent in the Future Korea Party specification and 534 additional units are fraudulent in the Platform Party specification. As Table 4 shows, some parameter estimates differ between the models. Parameters for the probabilities of incremental and extreme frauds (π_2, π_3) are about the same in the two specifications.

Figures 11 and 12 use plots by subset of Forward Korea Party or Platform Party focused observations to illustrate which observations are fraudulent according to the `eforensics` model with each specification. Nonfraudulent observations are plotted in blue and fraudulent observations appear in red. The frequencies of fraudulent and not fraudulent units appear in the note at the bottom of the figure. Visually and by the numbers, for the Forward Korea Party votes frauds occur most frequently for pre-vote units (16.6% are fraudulent), next most frequently for district-level, election-day, not abroad units (11.6% are fraudulent) then next most frequently for abroad units (.40% are fraudulent) then voting post election day units (.24% are fraudulent). For the Platform Party votes frauds occur most frequently for district-level, election-day, not abroad units (26.0% are fraudulent), next most frequently for pre-vote units (18.7% are fraudulent) then next most frequently for voting post election day units (.32% are fraudulent), and none of the abroad units are fraudulent.

With pre-vote units not having the highest proportion of frauds for the Platform Party votes and having a frauds proportion not much greater than that for district-level, election-day, not abroad units for Future Korea Party votes, the distribution of frauds in the PR votes differ from the distribution in the SMD votes. Such results may be a clue

that the `eforensics` frauds for PR votes are less likely to result from malfeasant behavior and more likely from strategic behavior—normal politics—than are the frauds estimated for the SMD votes. In any case both the district-level, election-day, not abroad units and the pre-vote units are special in the PR data.

I use a counterfactual method to calculate how many votes are fraudulent. Table 5 reports the observed counts of eligible voters, valid votes and votes for the (a) Future Korea Party and (b) Platform Party totaled over all units in the analysis, along with fraudulent vote count totals. The results show that for the Future-Korea-Party-focused specification over all about 636,694 votes are fraudulent, and of the fraudulent votes about 448,143 are manufactured (the remaining 188,551 are stolen). Overall, according to the `eforensics` model, about 6.7% of the votes for Future Korea Party candidates are fraudulent. The results show that for the Platform-Party-focused specification over all about 571,665 votes are fraudulent, and of the fraudulent votes about 366,390 are manufactured (the remaining 205,275 are stolen). Overall, according to the `eforensics` model, about 6.1% of the votes for constituency-leading candidates are fraudulent.

Table 4: Korea 2020 PR Parliamentary `eforensics` Estimates

(a) Future Korea Party specification

Parm.	Covariate	Mean	HPD.lo[a]	HPD.up[b]
π_1	No Fraud	.955	.952	.958
π_2	Incremental Fraud	.0444	.0412	.0471
π_3	Extreme Fraud	.000212	.0000408	.000419
γ_0	(Intercept)	.127	.119	.136
γ_1	pre-vote	3.00	3.00	3.01
γ_2	voting post	−.0642	−.0720	−.0550
γ_3	abroad	−.680	−.730	−.637
γ_4	disabled-ship	.585	.507	.648
β_0	(Intercept)	−.850	−.866	−.831
β_1	pre-vote	−.474	−.484	−.464
β_2	voting post	.175	.167	.188
β_3	abroad	−.103	−.115	−.0952
β_4	disabled-ship	−.125	−.130	−.120

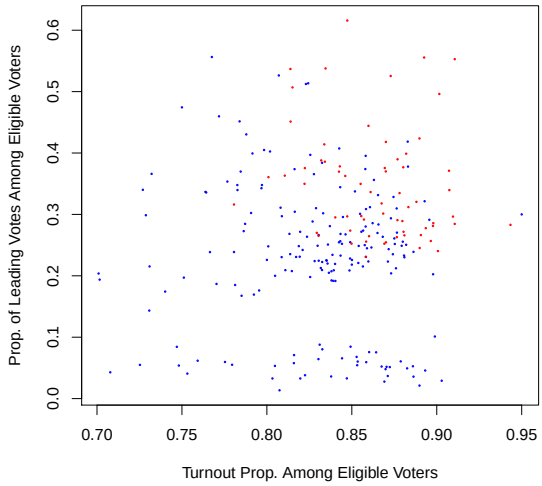
(b) Platform Party specification

Parm.	Covariate	Mean	HPD.lo[a]	HPD.up[b]
π_1	No Fraud	.962	.959	.965
π_2	Incremental Fraud	.0382	.0349	.0416
π_3	Extreme Fraud	.0000582	7.10e-08	.000182
γ_0	(Intercept)	−.116	−.141	−.0929
γ_1	pre-vote	3.00	2.97	3.04
γ_2	voting post	.255	.240	.274
γ_3	abroad	.565	.500	.639
γ_4	disabled-ship	.954	.924	.980
β_0	(Intercept)	−.863	−.877	−.851
β_1	pre-vote	.122	.114	.129
β_2	voting post	−.00579	−.0208	.00299
β_3	abroad	.127	.116	.144
β_4	disabled-ship	−.0542	−.0735	−.0387

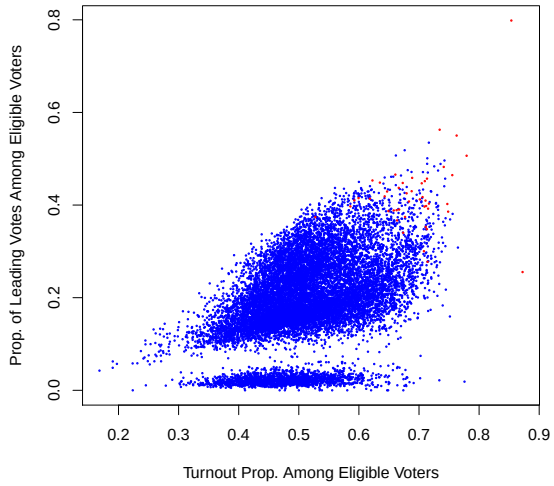
Note: selected `eforensics` model parameter estimates (posterior means and highest posterior density credible intervals). All coefficients are reported in the Appendix. For parameter notation see `http://www.umich.edu/~wmebane/efslides.pdf`. $n = 18564$. [a] 95% highest posterior density credible interval lower bound. [b] 95% highest posterior density credible interval upper bound.

Figure 11: Korea 2020 PR Fraud Plots, Forward Korea Party

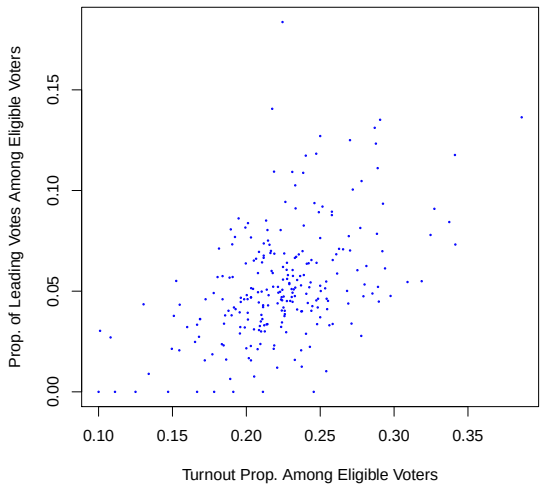
(a) district, election-day, not abroad



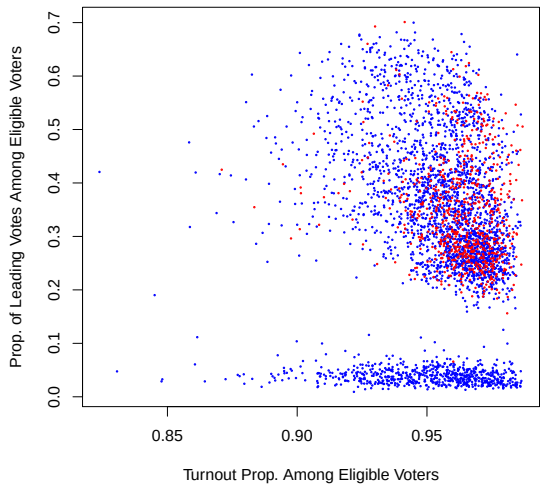
(b) voting post, election-day



(c) abroad



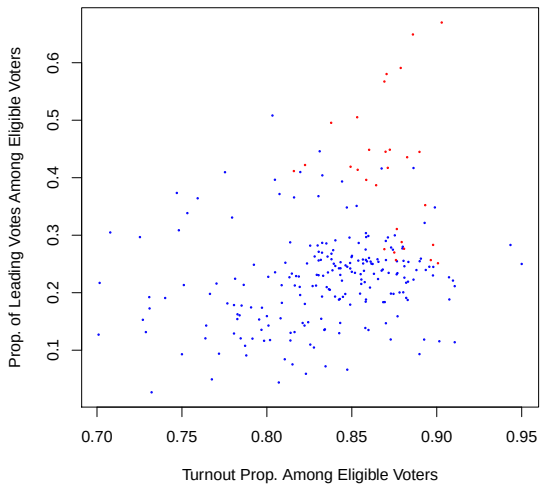
(d) pre-vote



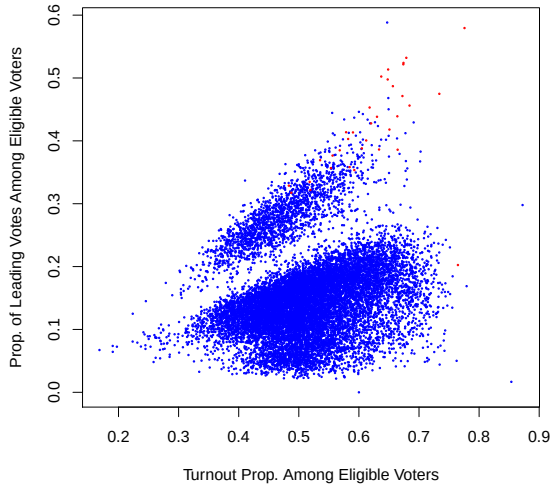
Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Forward Korea Party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad (29 fraudulent, 221 not); (b) voting post election-day (34 fraudulent, 14296 not); (c) abroad (1 fraudulent, 249 not); (d) pre-vote (618 fraudulent, 3116 not). Plots show scatterplots with nonfraudulent observations in blue and fraudulent observations in red. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

Figure 12: Korea 2020 PR Fraud Plots, Platform Party

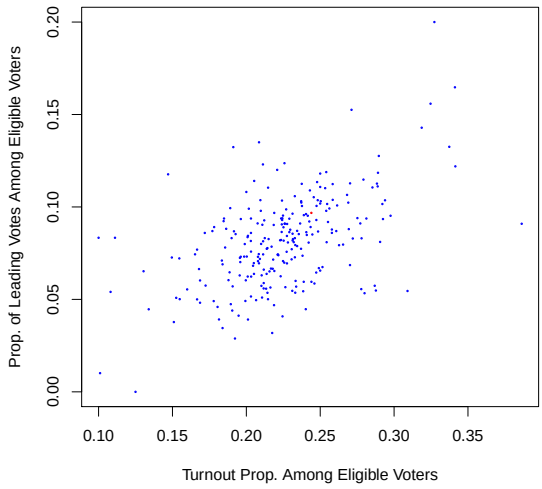
(a) district, election-day, not abroad



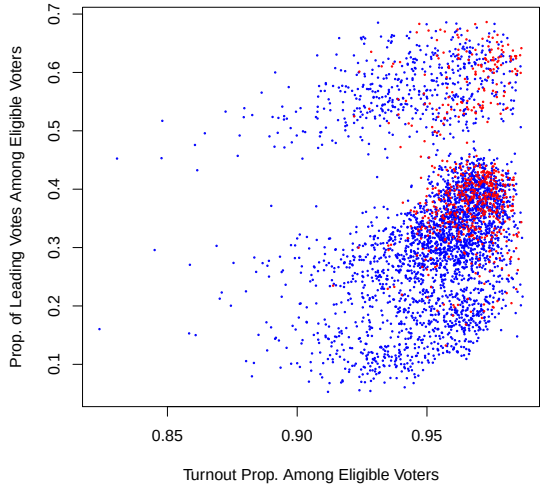
(b) voting post, election-day



(c) abroad



(d) pre-vote



Note: plots show turnout (number voting/number eligible) and vote proportions (number voting for Platform Party/number eligible) for four subsets of observations: (a) district-level, election-day, not abroad (65 fraudulent, 185 not); (b) voting post election-day (46 fraudulent, 14284 not); (c) abroad (0 fraudulent, 250 not); (d) pre-vote (698 fraudulent, 3036 not). Plots show scatterplots with nonfraudulent observations in blue and fraudulent observations in red. 329 "abroad_office" observations reported with zero eligible voters but often with a positive number of votes are omitted. One "prevote" unit with zero voters and zero votes is also omitted.

Table 5: Korea 2020 PR `eforensics` Estimated Fraudulent Vote Counts

(a) Future Korea Party specification fraudulent counts

Observed Counts

Voters	Valid	Votes
43994247	27897883	9440964

	95% interval		99.5% interval	
Manufactured	lo	up	lo	up
448143.13	51260.84	728715.25	50979.23	732786.55

	95% interval		99.5% interval	
Total	lo	up	lo	up
636693.97	369756.91	825662.78	368113.53	828706.72

(b) Platform Party specification fraudulent counts

Observed Counts

Voters	Valid	Votes
43994247	27897883	9306483

	95% interval		99.5% interval	
Manufactured	lo	up	lo	up
366390.0	50416.5	593768.1	48935.9	597613.0

	95% interval		99.5% interval	
Total	lo	up	lo	up
571664.8	315921.6	789796.8	314168.5	794197.6

Note: observed counts and total fraud posterior means and credible intervals based on `eforensics` model estimates. $n = 18564$.

Results for five EFT tests computed using the entire set of PR voting aggregation units all together appear in Table 6. The `DipT` statistics for Turnout shows there is significant multimodality, a result that matches what can be seen visually in Figure 1. The `P05s` statistic for Turnout is significantly below the expected value of .2, but the upper bound of the 95% confidence interval for `P05s` is .196. If `P05s` differs from .2, it does so by only a little. The `2BL` statistics differ significantly from the expected value of 4.187, but unlike the results for SMD voting `2BL` is now greater than than 4.187. Such `2BL` values are similar to values I observe given strategic voting (Mebane 2013*a*), although I have not simulated precisely the kinds of coalition dynamics and PR voting used in Korea, so these `2BL`

statistics do not support a diagnosis that there are frauds. There is also a significantly large `LastC` statistic for Platform Party votes, but the lower bound of the 95% confidence interval is 4.503, only slightly larger than 4.5. If `LastC` differs from 4.5, it does so by only a little.

Table 6: Distribution and Digit Tests, Korea 2020 Proportional Reprentation

Name	`2BL`	`LastC`	`P05s`	`C05s`	`DipT`	Obs
Turnout	4.078	4.488	.191	.201	0	18564
	(4.038, 4.117)	(4.447, 4.528)	(.185, .196)	(.195, .207)	−−	
Future Korea Party	4.281	4.511	.199	.200	0	18564
	(4.237, 4.319)	(4.469, 4.555)	(.194, .205)	(.194, .206)	−−	
Platform Party	4.317	4.542	.203	.198	0	18564
	(4.273, 4.355)	(4.503, 4.579)	(.197, .209)	(.192, .204)	−−	

Note: statistics and tests based on aggregation unit observations. "2BL," second-digit mean; "LastC," last-digit mean; "P05s," mean of variable indicating whether the last digit of the rounded percentage of votes for the referent party or candidate is zero or five; "C05s," mean of variable incicating whether the last digit of the vote count is zero or five; "DipT," p-value from test of unimodality; "Obs," number of aggregation unit observations. Values in parentheses are 95% nonparametric bootstrap confidence intervals. Point estimates in red differ significantly from the values expected if there are no anomalies.

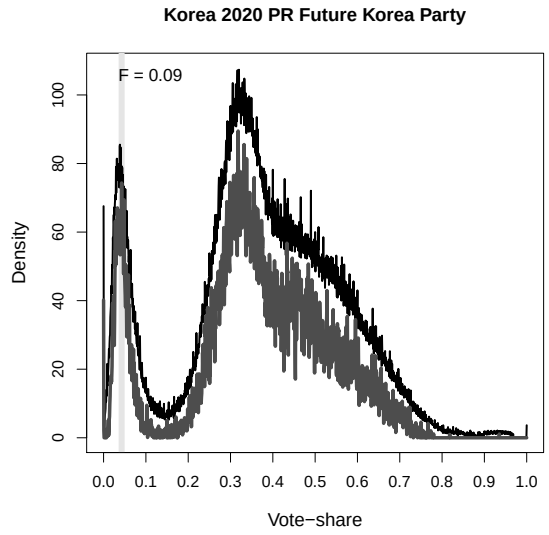
All together the EFT results do not present a strong signal that the PR data have been manipulated.[15]

Figure 13 shows PR data spikes test results. Vertical gray bars in the graph indicate which aggregation units have suspicious votes: the aggregation units with vote proportions for (a) the Future Korea Party or (b) the Platform Party that match the highlighted vote shares are suspicious. The results differ from the findings for `P05s` for the parties in Table 6 in that Figure 13(a) shows an excess of proportions near .05 and Figure 13(b) shows an excess of proportions near .08. As for SMD, the spikes test in this case appears to be more sensitive.

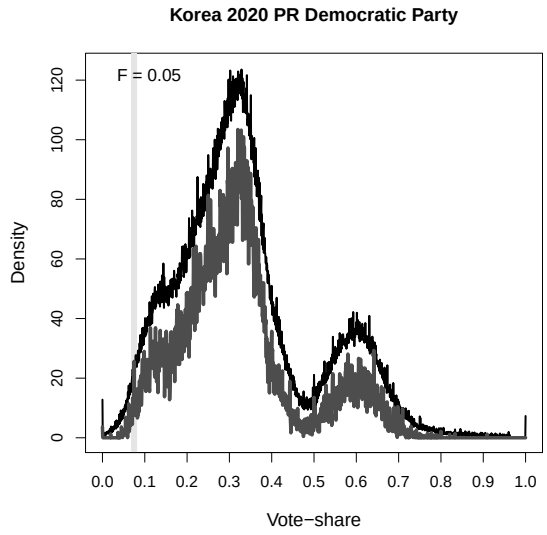
[15]Replicating Figure 6 with a constituency breakdown for PR data is not well motivated for PR voting because the PR votes are tabulated nationally to determine seats.

Figure 13: Korea 2020 PR Spikes Tests Plots

(a) Future Korea Party



(b) Platform Party



Note: vote shares are the proportion of valid votes for all (a) Democratic Party or (b) constituency leading cabdidates in each aggregation unit. $n = 18564$.

4 Korea `eforensics` Results in a Broader Context

The number and proportion of `eforensics` fraudulent votes are smaller for PR voting than for the SMD contests, but it may be helpful to view both in a broader context. Compared to a set of 401 other elections to which I have applied `eforensics`, 79 percent of those 401 elections have a fraudulent vote percentage smaller than PR voting's fraudulent vote percentage of 6.1% and 81 percent have a percentage smaller than 6.7%, and 82 percent of the set of 401 elections have a fraudulent vote percentage smaller than the SMD contests' fraudulent vote percentage of 7.7% and 88 percent have a percentage smaller than 9.9%. The comparison set includes elections from around the world over the past twenty years. The Korean elections rank high compared to that set in terms of `eforensics` fraudulent votes.

But not only for Korea but for the other elections the extent to which `eforensics`

fraudulent votes are produced by bad acts versus normal politics remains an open question. For several of the elections in the comparison set it is clear that frauds as described by the `eforensics` model did not occur, yet nonzero numbers of `eforensics` fraudulent votes are estimated. For instance, for 2000 U.S. Presidential election voting in Florida `eforensics` estimates that 2.5% of the votes for George Bush are fraudulent even though it's well established that the types of frauds `eforensics` considers—where votes are added to a leading candidate—did not occur in that election; instead in Florida votes lost to Al Gore (which were not lost due to normal politics but due to administrative failures and voter suppression) trigger the `eforensics` fraudulent votes estimates for Bush. The Korean `eforensics` fraudulent vote percentages are larger than any other election I've examined for which I have extremely strong evidence that vote-adding fraud did not occur, but it remains to be determined whether the kinds of coalition dynamics and other strategic behavior that occurred in the Korean election can produce such `eforensics` fraudulent vote percentages. Many of the elections I've looked at are notorious for frauds—bad acts—and `eforensics` identifies those. So the statistical analysis of the 2020 Korean election does not by itself settle the matter.

5 Conclusion

Taken together the `eforensics` estimates and EFT and spikes tests exhibit anomalies that strongly suggest the Korea 2020 legislative election SMD data were fraudulently manipulated. Such suggestions regarding the PR data are weaker although not absent. "Such conclusions are always subject to the caveat that apparent frauds may really be consequences of strategic behavior, but that ambiguity can sometimes be mitigated by exploiting a multiplicity of statistics.... An election fraud will not necessarily trigger all of the statistics and tests, but we think a genuine fraud will in general set off many of them" (Hicken and Mebane 2015, 39).

Statistical findings such as are reported here should be followed up with additional information and further investigation into what happened. Most important, and in principle perhaps simplest to do, is to validate the paper ballots, and once they have been validated to count the paper ballots manually. The statistical findings alone cannot stand as definitive evidence about what happened in the election.

6 Appendix

List of constituencies:[16] 1, Busan 1; 2, Busan 10; 3, Busan 11; 4, Busan 12; 5, Busan 13; 6, Busan 14; 7, Busan 15; 8, Busan 16; 9, Busan 17; 10, Busan 18; 11, Busan 2; 12, Busan 3; 13, Busan 4; 14, Busan 5; 15, Busan 6; 16, Busan 7; 17, Busan 8; 18, Busan 9; 19, Chung-cheong bukdo 1; 20, Chung-cheong bukdo 2; 21, Chung-cheong bukdo 3; 22, Chung-cheong bukdo 4; 23, Chung-cheong bukdo 5; 24, Chung-cheong bukdo 6; 25, Chung-cheong bukdo 7; 26, Chung-cheong bukdo 8; 27, Chungcheongnam-do 1; 28, Chungcheongnam-do 10; 29, Chungcheongnam-do 11; 30, Chungcheongnam-do 2; 31, Chungcheongnam-do 3; 32, Chungcheongnam-do 4; 33, Chungcheongnam-do 5; 34, Chungcheongnam-do 6; 35, Chungcheongnam-do 7; 36, Chungcheongnam-do 8; 37, Chungcheongnam-do 9; 38, Daegu Metropolitan City 1; 39, Daegu Metropolitan City 10; 40, Daegu Metropolitan City 11; 41, Daegu Metropolitan City 12; 42, Daegu Metropolitan City 2; 43, Daegu Metropolitan City 3; 44, Daegu Metropolitan City 4; 45, Daegu Metropolitan City 5; 46, Daegu Metropolitan City 6; 47, Daegu Metropolitan City 7; 48, Daegu Metropolitan City 8; 49, Daegu Metropolitan City 9; 50, Daejeon 1; 51, Daejeon 2; 52, Daejeon 3; 53, Daejeon 4; 54, Daejeon 5; 55, Daejeon 6; 56, Daejeon 7; 57, Gangwon-do 1; 58, Gangwon-do 2; 59, Gangwon-do 3; 60, Gangwon-do 4; 61, Gangwon-do 5; 62, Gangwon-do 6; 63, Gangwon-do 7; 64, Gangwon-do 8; 65, Gwangju 1; 66, Gwangju 2; 67, Gwangju 3; 68, Gwangju 4; 69, Gwangju 5; 70, Gwangju 6; 71, Gwangju 7; 72, Gwangju 8; 73, Gyeonggi-do 1; 74, Gyeonggi-do 10; 75, Gyeonggi-do 11; 76, Gyeonggi-do 12; 77, Gyeonggi-do 13; 78, Gyeonggi-do 14; 79, Gyeonggi-do 15; 80, Gyeonggi-do 16; 81, Gyeonggi-do 17; 82, Gyeonggi-do 18; 83, Gyeonggi-do 19; 84, Gyeonggi-do 2; 85, Gyeonggi-do 20; 86, Gyeonggi-do 21; 87, Gyeonggi-do 22; 88, Gyeonggi-do 23; 89, Gyeonggi-do 24; 90, Gyeonggi-do 25; 91, Gyeonggi-do 26; 92, Gyeonggi-do 27; 93, Gyeonggi-do 28; 94, Gyeonggi-do 29; 95, Gyeonggi-do 3; 96, Gyeonggi-do 30; 97,

[16] Constituencies can be identified fully by matching constituencies sequentially using "list of winners" tables available from `http://info.nec.go.kr/main/showDocument.xhtml?electionId=0020200415&topMenuId=EP&secondMenuId=EPEI01`.

Gyeonggi-do 31; 98, Gyeonggi-do 32; 99, Gyeonggi-do 33; 100, Gyeonggi-do 34; 101, Gyeonggi-do 35; 102, Gyeonggi-do 36; 103, Gyeonggi-do 37; 104, Gyeonggi-do 38; 105, Gyeonggi-do 39; 106, Gyeonggi-do 4; 107, Gyeonggi-do 40; 108, Gyeonggi-do 41; 109, Gyeonggi-do 42; 110, Gyeonggi-do 43; 111, Gyeonggi-do 44; 112, Gyeonggi-do 45; 113, Gyeonggi-do 46; 114, Gyeonggi-do 47; 115, Gyeonggi-do 48; 116, Gyeonggi-do 49; 117, Gyeonggi-do 5; 118, Gyeonggi-do 50; 119, Gyeonggi-do 51; 120, Gyeonggi-do 52; 121, Gyeonggi-do 53; 122, Gyeonggi-do 54; 123, Gyeonggi-do 55; 124, Gyeonggi-do 56; 125, Gyeonggi-do 57; 126, Gyeonggi-do 58; 127, Gyeonggi-do 59; 128, Gyeonggi-do 6; 129, Gyeonggi-do 7; 130, Gyeonggi-do 8; 131, Gyeonggi-do 9; 132, Gyeongsangbuk-do 1; 133, Gyeongsangbuk-do 10; 134, Gyeongsangbuk-do 11; 135, Gyeongsangbuk-do 12; 136, Gyeongsangbuk-do 13; 137, Gyeongsangbuk-do 2; 138, Gyeongsangbuk-do 3; 139, Gyeongsangbuk-do 4; 140, Gyeongsangbuk-do 5; 141, Gyeongsangbuk-do 6; 142, Gyeongsangbuk-do 7; 143, Gyeongsangbuk-do 8; 144, Gyeongsangbuk-do 9; 145, Gyeongsangnam-do 1; 146, Gyeongsangnam-do 10; 147, Gyeongsangnam-do 11; 148, Gyeongsangnam-do 12; 149, Gyeongsangnam-do 13; 150, Gyeongsangnam-do 14; 151, Gyeongsangnam-do 15; 152, Gyeongsangnam-do 16; 153, Gyeongsangnam-do 2; 154, Gyeongsangnam-do 3; 155, Gyeongsangnam-do 4; 156, Gyeongsangnam-do 5; 157, Gyeongsangnam-do 6; 158, Gyeongsangnam-do 7; 159, Gyeongsangnam-do 8; 160, Gyeongsangnam-do 9; 161, Incheon Metropolitan City 1; 162, Incheon Metropolitan City 10; 163, Incheon Metropolitan City 11; 164, Incheon Metropolitan City 12; 165, Incheon Metropolitan City 13; 166, Incheon Metropolitan City 2; 167, Incheon Metropolitan City 3; 168, Incheon Metropolitan City 4; 169, Incheon Metropolitan City 5; 170, Incheon Metropolitan City 6; 171, Incheon Metropolitan City 7; 172, Incheon Metropolitan City 8; 173, Incheon Metropolitan City 9; 174, Jeju Special Self-Governing Province 1; 175, Jeju Special Self-Governing Province 2; 176, Jeju Special Self-Governing Province 3; 177, Jeollabuk do 1; 178, Jeollabuk do 10; 179, Jeollabuk do 2; 180, Jeollabuk do 3; 181, Jeollabuk do 4; 182, Jeollabuk do 5; 183, Jeollabuk do 6; 184, Jeollabuk do 7; 185,

Jeollabuk do 8; 186, Jeollabuk do 9; 187, Jeollanam-do 1; 188, Jeollanam-do 10; 189, Jeollanam-do 2; 190, Jeollanam-do 3; 191, Jeollanam-do 4; 192, Jeollanam-do 5; 193, Jeollanam-do 6; 194, Jeollanam-do 7; 195, Jeollanam-do 8; 196, Jeollanam-do 9; 197, Sejong Special Self-governing City 1; 198, Sejong Special Self-governing City 2; 199, Seoul 1; 200, Seoul 10; 201, Seoul 11; 202, Seoul 12; 203, Seoul 13; 204, Seoul 14; 205, Seoul 15; 206, Seoul 16; 207, Seoul 17; 208, Seoul 18; 209, Seoul 19; 210, Seoul 2; 211, Seoul 20; 212, Seoul 21; 213, Seoul 22; 214, Seoul 23; 215, Seoul 24; 216, Seoul 25; 217, Seoul 26; 218, Seoul 27; 219, Seoul 28; 220, Seoul 29; 221, Seoul 3; 222, Seoul 30; 223, Seoul 31; 224, Seoul 32; 225, Seoul 33; 226, Seoul 34; 227, Seoul 35; 228, Seoul 36; 229, Seoul 37; 230, Seoul 38; 231, Seoul 39; 232, Seoul 4; 233, Seoul 40; 234, Seoul 41; 235, Seoul 42; 236, Seoul 43; 237, Seoul 44; 238, Seoul 45; 239, Seoul 46; 240, Seoul 47; 241, Seoul 48; 242, Seoul 49; 243, Seoul 5; 244, Seoul 6; 245, Seoul 7; 246, Seoul 8; 247, Seoul 9; 248, Ulsan Metropolitan City 1; 249, Ulsan Metropolitan City 2; 250, Ulsan Metropolitan City 3; 251, Ulsan Metropolitan City 4; 252, Ulsan Metropolitan City 5; 253, Ulsan Metropolitan City 6.

`eforensics` Parameter Posterior Means and 95% HPD Intervals, Democratic Party Specification:

	Parameter	Covariate	Mean	HPD.lower	HPD.upper
1	pi[1]	No Fraud	9.334174e-01	9.28972e-01	0.937325000
2	pi[2]	Incremental Fraud	6.146220e-02	5.74330e-02	0.065445500
3	pi[3]	Extreme Fraud	5.120406e-03	3.99158e-03	0.006212070
4	beta.tau[1]	(Intercept)	7.657118e-01	7.23005e-01	0.813216000
5	beta.tau[2]	isprevoteTRUE	1.102963e+00	1.00074e+00	1.243470000
6	beta.tau[3]	typep	-3.984513e-02	-7.08209e-02	-0.015460700
7	beta.tau[4]	isabroadTRUE	-8.685810e-02	-1.24995e-01	-0.052778200
8	beta.tau[5]	isdisabTRUE	3.661882e-02	6.13867e-03	0.081809000
9	beta.tau[6]	constitBusan_10	-2.490826e-02	-1.10768e-01	0.047370000
10	beta.tau[7]	constitBusan_11	4.758777e-03	-1.96166e-02	0.039620300
11	beta.tau[8]	constitBusan_12	7.793986e-03	-2.99791e-02	0.054374400
12	beta.tau[9]	constitBusan_13	2.046349e-02	-2.47747e-02	0.068248700
13	beta.tau[10]	constitBusan_14	-8.984234e-03	-4.32889e-02	0.025318200
14	beta.tau[11]	constitBusan_15	-1.083961e-02	-7.11953e-02	0.023176500
15	beta.tau[12]	constitBusan_16	-8.934980e-03	-3.23189e-02	0.008175250
16	beta.tau[13]	constitBusan_17	-7.690011e-03	-4.63372e-02	0.032388400
17	beta.tau[14]	constitBusan_18	-1.616151e-02	-4.46721e-02	0.014440400
18	beta.tau[15]	constitBusan_2	1.459468e-02	-1.37764e-02	0.030927900
19	beta.tau[16]	constitBusan_3	-3.834894e-03	-5.63037e-02	0.039518500
20	beta.tau[17]	constitBusan_4	7.439973e-04	-5.21283e-02	0.025082600
21	beta.tau[18]	constitBusan_5	-8.020135e-04	-1.75037e-02	0.015561200
22	beta.tau[19]	constitBusan_6	-1.232057e-02	-4.66536e-02	0.032623200
23	beta.tau[20]	constitBusan_7	-8.384244e-03	-4.33880e-02	0.048554200
24	beta.tau[21]	constitBusan_8	4.370813e-03	-5.30703e-03	0.013064300
25	beta.tau[22]	constitBusan_9	1.206130e-02	-2.59489e-02	0.075402000
26	beta.tau[23]	constitChung-cheong bukdo_1	-2.290752e-03	-4.29807e-02	0.047947900

27	beta.tau[24]	constitChung-cheong bukdo_2	1.881560e-02	-4.06746e-02	0.079822600
28	beta.tau[25]	constitChung-cheong bukdo_3	2.473892e-02	-1.09711e-02	0.056640200
29	beta.tau[26]	constitChung-cheong bukdo_4	3.092233e-03	-1.36276e-02	0.019649700
30	beta.tau[27]	constitChung-cheong bukdo_5	-1.642587e-02	-3.59188e-02	0.018820000
31	beta.tau[28]	constitChung-cheong bukdo_6	7.046252e-04	-2.37114e-02	0.027874900
32	beta.tau[29]	constitChung-cheong bukdo_7	9.707407e-03	-8.29183e-03	0.036830100
33	beta.tau[30]	constitChung-cheong bukdo_8	9.567694e-03	-3.90821e-02	0.032447100
34	beta.tau[31]	constitChungcheongnam-do_1	-1.591910e-02	-4.25184e-02	0.009754640
35	beta.tau[32]	constitChungcheongnam-do_10	-1.392417e-03	-4.57796e-02	0.033715700
36	beta.tau[33]	constitChungcheongnam-do_11	-8.037374e-03	-4.79574e-02	0.028738800
37	beta.tau[34]	constitChungcheongnam-do_2	-1.488603e-02	-2.72973e-02	0.001446620
38	beta.tau[35]	constitChungcheongnam-do_3	-1.313697e-02	-3.07375e-02	0.004393400
39	beta.tau[36]	constitChungcheongnam-do_4	5.077459e-03	-2.44029e-02	0.052558500
40	beta.tau[37]	constitChungcheongnam-do_5	2.516465e-02	-1.96108e-02	0.072950700
41	beta.tau[38]	constitChungcheongnam-do_6	1.339019e-02	-2.25803e-02	0.052540800
42	beta.tau[39]	constitChungcheongnam-do_7	-9.369723e-03	-5.27990e-02	0.024857100
43	beta.tau[40]	constitChungcheongnam-do_8	1.840900e-02	-2.71193e-02	0.082187400
44	beta.tau[41]	constitChungcheongnam-do_9	3.266685e-02	-1.29361e-02	0.062314000
45	beta.tau[42]	constitDaegu Metropolitan City_1	2.130631e-02	-4.28509e-03	0.050792800
46	beta.tau[43]	constitDaegu Metropolitan City_10	-3.505113e-03	-2.24180e-02	0.018876800
47	beta.tau[44]	constitDaegu Metropolitan City_11	-3.109487e-03	-5.85382e-02	0.038349500
48	beta.tau[45]	constitDaegu Metropolitan City_12	3.674500e-03	-4.34302e-02	0.044733700
49	beta.tau[46]	constitDaegu Metropolitan City_2	2.258313e-02	-3.02282e-02	0.067008700
50	beta.tau[47]	constitDaegu Metropolitan City_3	-1.801539e-02	-5.21261e-02	0.035965900
51	beta.tau[48]	constitDaegu Metropolitan City_4	-4.557127e-03	-2.71066e-02	0.008658270
52	beta.tau[49]	constitDaegu Metropolitan City_5	3.293443e-02	8.26135e-03	0.063955900
53	beta.tau[50]	constitDaegu Metropolitan City_6	-3.848999e-03	-2.64156e-02	0.019143500
54	beta.tau[51]	constitDaegu Metropolitan City_7	1.568119e-02	-2.57898e-02	0.042287300
55	beta.tau[52]	constitDaegu Metropolitan City_8	-1.538827e-02	-6.26832e-02	0.021421000
56	beta.tau[53]	constitDaegu Metropolitan City_9	-7.826120e-04	-1.55626e-02	0.015214500
57	beta.tau[54]	constitDaejeon_1	-6.570512e-03	-1.92152e-02	0.006038450
58	beta.tau[55]	constitDaejeon_2	-1.923171e-02	-4.00517e-02	0.002197710
59	beta.tau[56]	constitDaejeon_3	-1.248399e-02	-3.17053e-02	0.005527960
60	beta.tau[57]	constitDaejeon_4	1.059562e-02	-2.35518e-02	0.036576400
61	beta.tau[58]	constitDaejeon_5	1.175370e-02	-2.05266e-02	0.036851500
62	beta.tau[59]	constitDaejeon_6	-6.388179e-03	-4.72156e-02	0.028319800
63	beta.tau[60]	constitDaejeon_7	-1.170862e-02	-3.06207e-02	-0.000337944
64	beta.tau[61]	constitGangwon-do_1	1.565297e-02	-1.88731e-02	0.047111800
65	beta.tau[62]	constitGangwon-do_2	-1.279803e-02	-4.92507e-02	0.047793700
66	beta.tau[63]	constitGangwon-do_3	-3.191431e-03	-4.32403e-02	0.034314900
67	beta.tau[64]	constitGangwon-do_4	2.113934e-02	-8.33543e-03	0.042558200
68	beta.tau[65]	constitGangwon-do_5	4.349605e-03	-2.77497e-02	0.025682400
69	beta.tau[66]	constitGangwon-do_6	-5.559136e-03	-3.95537e-02	0.035441900
70	beta.tau[67]	constitGangwon-do_7	-8.884572e-04	-5.22099e-02	0.089577000
71	beta.tau[68]	constitGangwon-do_8	-5.539408e-03	-3.19181e-02	0.026776200
72	beta.tau[69]	constitGwangju_1	-2.000743e-02	-6.99227e-02	0.010307000
73	beta.tau[70]	constitGwangju_2	9.326260e-03	-3.17892e-02	0.072152600
74	beta.tau[71]	constitGwangju_3	-6.234781e-03	-6.45978e-02	0.076465000
75	beta.tau[72]	constitGwangju_4	1.570045e-02	1.92908e-03	0.034046700
76	beta.tau[73]	constitGwangju_5	-7.997496e-03	-4.99121e-02	0.019440200
77	beta.tau[74]	constitGwangju_6	-7.094260e-03	-4.09668e-02	0.038956800
78	beta.tau[75]	constitGwangju_7	-1.339699e-02	-4.66952e-02	0.028393200
79	beta.tau[76]	constitGwangju_8	-1.736118e-02	-5.90333e-02	0.024726500
80	beta.tau[77]	constitGyeonggi-do_1	4.138106e-03	-3.56468e-02	0.038418100
81	beta.tau[78]	constitGyeonggi-do_10	1.680852e-02	-8.12178e-04	0.033262500
82	beta.tau[79]	constitGyeonggi-do_11	2.516637e-02	1.26606e-02	0.036980900
83	beta.tau[80]	constitGyeonggi-do_12	-7.564284e-03	-3.36414e-02	0.036112900
84	beta.tau[81]	constitGyeonggi-do_13	1.804407e-03	-8.28855e-03	0.010751100
85	beta.tau[82]	constitGyeonggi-do_14	1.436499e-02	-2.57479e-02	0.047626400
86	beta.tau[83]	constitGyeonggi-do_15	-2.558908e-02	-7.24469e-02	0.010137500
87	beta.tau[84]	constitGyeonggi-do_16	4.922766e-03	-2.83147e-02	0.042199800
88	beta.tau[85]	constitGyeonggi-do_17	-5.960784e-03	-3.09868e-02	0.016720800
89	beta.tau[86]	constitGyeonggi-do_18	-3.404241e-03	-3.07183e-02	0.011139800
90	beta.tau[87]	constitGyeonggi-do_19	7.127631e-03	-3.93471e-02	0.042943400
91	beta.tau[88]	constitGyeonggi-do_2	1.150081e-02	-1.21961e-02	0.047078300
92	beta.tau[89]	constitGyeonggi-do_20	-7.520636e-03	-4.80605e-02	0.032747300
93	beta.tau[90]	constitGyeonggi-do_21	9.338456e-04	-3.74002e-02	0.031414400
94	beta.tau[91]	constitGyeonggi-do_22	-1.053825e-02	-4.91715e-02	0.020957600

95	beta.tau[92]	constitGyeonggi-do_23	2.008157e-02	-4.65046e-02	0.089167200
96	beta.tau[93]	constitGyeonggi-do_24	1.195041e-02	-6.38376e-02	0.077617100
97	beta.tau[94]	constitGyeonggi-do_25	2.857034e-02	-7.60116e-03	0.098649300
98	beta.tau[95]	constitGyeonggi-do_26	-2.900446e-02	-5.70296e-02	0.005063980
99	beta.tau[96]	constitGyeonggi-do_27	1.414388e-02	-1.76356e-03	0.034280200
100	beta.tau[97]	constitGyeonggi-do_28	-1.999502e-02	-3.63369e-02	0.006304710
101	beta.tau[98]	constitGyeonggi-do_29	2.929897e-02	-1.48730e-03	0.048060000
102	beta.tau[99]	constitGyeonggi-do_3	1.294162e-02	-1.08661e-02	0.040042900
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105	beta.tau[102]	constitGyeonggi-do_32	6.918103e-03	-9.18472e-03	0.024329300
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128	beta.tau[125]	constitGyeonggi-do_53	3.516463e-04	-3.62477e-02	0.030546900
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286	beta.nu[26]	constitChung-cheong bukdo_4	-1.567360e-02	-5.15484e-02	0.025018600
287	beta.nu[27]	constitChung-cheong bukdo_5	-2.556069e-02	-1.00549e-01	0.011822100
288	beta.nu[28]	constitChung-cheong bukdo_6	-1.180163e-02	-2.99759e-02	0.025719100
289	beta.nu[29]	constitChung-cheong bukdo_7	-2.121383e-02	-7.42707e-02	0.010985600
290	beta.nu[30]	constitChung-cheong bukdo_8	7.427703e-03	-2.85794e-02	0.073751100
291	beta.nu[31]	constitChungcheongnam-do_1	2.827267e-02	-3.09264e-03	0.079500300
292	beta.nu[32]	constitChungcheongnam-do_10	-2.783369e-02	-6.24646e-02	0.009777190
293	beta.nu[33]	constitChungcheongnam-do_11	-1.988135e-02	-5.77783e-02	0.025692300
294	beta.nu[34]	constitChungcheongnam-do_2	1.388000e-02	-2.32215e-02	0.053610800
295	beta.nu[35]	constitChungcheongnam-do_3	-1.686492e-02	-6.03868e-02	0.019409100
296	beta.nu[36]	constitChungcheongnam-do_4	-4.348343e-02	-7.67160e-02	-0.003029260
297	beta.nu[37]	constitChungcheongnam-do_5	2.378152e-02	-1.09110e-02	0.065455200
298	beta.nu[38]	constitChungcheongnam-do_6	-3.556063e-02	-6.58824e-02	0.003076000

299	beta.nu[39]	constitChungcheongnam-do_7	6.459469e-02	2.82509e-02	0.093267700
300	beta.nu[40]	constitChungcheongnam-do_8	-2.016506e-02	-9.27264e-02	0.027971200
301	beta.nu[41]	constitChungcheongnam-do_9	1.165095e-02	-1.44614e-02	0.038711900
302	beta.nu[42]	constitDaegu Metropolitan City_1	-9.497267e-02	-1.33786e-01	-0.058065300
303	beta.nu[43]	constitDaegu Metropolitan City_10	-3.994219e-02	-7.28868e-02	0.020194600
304	beta.nu[44]	constitDaegu Metropolitan City_11	-3.185379e-02	-9.74931e-02	0.007954690
305	beta.nu[45]	constitDaegu Metropolitan City_12	-8.171600e-02	-1.15590e-01	-0.014737000
306	beta.nu[46]	constitDaegu Metropolitan City_2	-1.709376e-02	-5.69937e-02	0.016660900
307	beta.nu[47]	constitDaegu Metropolitan City_3	-5.252669e-02	-7.58346e-02	-0.035788300
308	beta.nu[48]	constitDaegu Metropolitan City_4	-1.021789e-01	-1.23592e-01	-0.085909900
309	beta.nu[49]	constitDaegu Metropolitan City_5	-5.671582e-02	-8.54843e-02	-0.033678600
310	beta.nu[50]	constitDaegu Metropolitan City_6	-2.809544e-02	-6.21058e-02	0.030030200
311	beta.nu[51]	constitDaegu Metropolitan City_7	-1.701409e-02	-1.30916e-01	0.058897700
312	beta.nu[52]	constitDaegu Metropolitan City_8	-3.784507e-02	-9.92307e-02	0.037877000
313	beta.nu[53]	constitDaegu Metropolitan City_9	-4.497600e-02	-6.15756e-02	-0.024241300
314	beta.nu[54]	constitDaejeon_1	-1.141505e-02	-6.82308e-02	0.031500500
315	beta.nu[55]	constitDaejeon_2	2.926666e-02	-1.11562e-02	0.061211500
316	beta.nu[56]	constitDaejeon_3	2.264070e-02	-2.83885e-03	0.048831800
317	beta.nu[57]	constitDaejeon_4	-7.223300e-03	-4.86748e-02	0.029650900
318	beta.nu[58]	constitDaejeon_5	3.186484e-02	-1.29964e-02	0.092715600
319	beta.nu[59]	constitDaejeon_6	-9.107268e-03	-4.30984e-02	0.030415900
320	beta.nu[60]	constitDaejeon_7	8.331922e-03	-1.12055e-02	0.034938100
321	beta.nu[61]	constitGangwon-do_1	-8.085247e-03	-2.81035e-02	0.026429500
322	beta.nu[62]	constitGangwon-do_2	-3.226631e-02	-7.22661e-02	0.001843920
323	beta.nu[63]	constitGangwon-do_3	-2.644392e-02	-6.84672e-02	0.010157900
324	beta.nu[64]	constitGangwon-do_4	8.057034e-04	-2.32297e-02	0.017848500
325	beta.nu[65]	constitGangwon-do_5	-4.801712e-02	-6.88171e-02	-0.034983000
326	beta.nu[66]	constitGangwon-do_6	-3.441637e-02	-1.07129e-01	0.011081400
327	beta.nu[67]	constitGangwon-do_7	-5.575952e-03	-4.38521e-02	0.012327400
328	beta.nu[68]	constitGangwon-do_8	-6.529924e-02	-9.65781e-02	-0.020207000
329	beta.nu[69]	constitGwangju_1	4.559616e-02	-9.75185e-03	0.125017000
330	beta.nu[70]	constitGwangju_2	4.755439e-02	-8.84942e-03	0.093620400
331	beta.nu[71]	constitGwangju_3	6.127028e-02	2.34897e-02	0.082849500
332	beta.nu[72]	constitGwangju_4	3.907446e-02	-2.50495e-03	0.078114300
333	beta.nu[73]	constitGwangju_5	-3.398958e-03	-1.48270e-02	0.010088100
334	beta.nu[74]	constitGwangju_6	4.774467e-02	2.35357e-02	0.097760800
335	beta.nu[75]	constitGwangju_7	6.040816e-02	2.89310e-02	0.086306200
336	beta.nu[76]	constitGwangju_8	5.272259e-02	6.07034e-03	0.098049500
337	beta.nu[77]	constitGyeonggi-do_1	5.139544e-03	-2.87662e-02	0.031060800
338	beta.nu[78]	constitGyeonggi-do_10	2.381917e-03	-5.22682e-02	0.052622100
339	beta.nu[79]	constitGyeonggi-do_11	-2.275719e-03	-4.14138e-02	0.060851000
340	beta.nu[80]	constitGyeonggi-do_12	1.686936e-02	-2.01494e-02	0.050796800
341	beta.nu[81]	constitGyeonggi-do_13	3.317595e-02	-3.60568e-02	0.080321400
342	beta.nu[82]	constitGyeonggi-do_14	6.560083e-03	-1.50111e-02	0.038754600
343	beta.nu[83]	constitGyeonggi-do_15	1.602272e-02	-3.29942e-02	0.062105000
344	beta.nu[84]	constitGyeonggi-do_16	3.756044e-03	-4.96788e-02	0.052635100
345	beta.nu[85]	constitGyeonggi-do_17	4.223174e-02	1.04449e-02	0.065956700
346	beta.nu[86]	constitGyeonggi-do_18	5.055655e-03	-2.74568e-02	0.056173600
347	beta.nu[87]	constitGyeonggi-do_19	-3.090386e-03	-4.75426e-02	0.054741100
348	beta.nu[88]	constitGyeonggi-do_2	5.094466e-02	9.98520e-03	0.116748000
349	beta.nu[89]	constitGyeonggi-do_20	3.579959e-03	-2.19838e-02	0.047111400
350	beta.nu[90]	constitGyeonggi-do_21	5.448367e-03	-3.02520e-02	0.033361100
351	beta.nu[91]	constitGyeonggi-do_22	3.827635e-03	-1.59135e-02	0.032992900
352	beta.nu[92]	constitGyeonggi-do_23	-2.019367e-02	-7.58505e-02	0.029197000
353	beta.nu[93]	constitGyeonggi-do_24	9.614338e-03	-7.57140e-03	0.045007300
354	beta.nu[94]	constitGyeonggi-do_25	1.942442e-02	-2.64888e-03	0.040806800
355	beta.nu[95]	constitGyeonggi-do_26	-7.399023e-03	-4.01391e-02	0.017614300
356	beta.nu[96]	constitGyeonggi-do_27	2.492146e-03	-2.21987e-02	0.027355700
357	beta.nu[97]	constitGyeonggi-do_28	-3.646202e-02	-8.45377e-02	0.007266820
358	beta.nu[98]	constitGyeonggi-do_29	3.426315e-03	-3.65836e-02	0.050307500
359	beta.nu[99]	constitGyeonggi-do_3	1.529054e-02	-1.37775e-03	0.033808600
360	beta.nu[100]	constitGyeonggi-do_30	1.392598e-02	-4.93022e-03	0.028339900
361	beta.nu[101]	constitGyeonggi-do_31	1.582700e-03	-4.19324e-02	0.038998000
362	beta.nu[102]	constitGyeonggi-do_32	-1.803697e-02	-3.99038e-02	0.005968040
363	beta.nu[103]	constitGyeonggi-do_33	1.092497e-02	-8.19036e-03	0.036502400
364	beta.nu[104]	constitGyeonggi-do_34	1.689111e-02	-3.81957e-02	0.048961600
365	beta.nu[105]	constitGyeonggi-do_35	2.826528e-03	-3.09690e-02	0.058679200
366	beta.nu[106]	constitGyeonggi-do_36	-8.983242e-04	-2.59568e-02	0.022624100

367	beta.nu[107]	constitGyeonggi-do_37	3.157923e-02	-2.37092e-03	0.059984200
368	beta.nu[108]	constitGyeonggi-do_38	1.201451e-02	-1.96231e-02	0.028925600
369	beta.nu[109]	constitGyeonggi-do_39	3.595676e-02	1.00197e-02	0.061293500
370	beta.nu[110]	constitGyeonggi-do_4	5.122321e-02	-1.60646e-04	0.094222200
371	beta.nu[111]	constitGyeonggi-do_40	3.417469e-02	9.04188e-03	0.053337500
372	beta.nu[112]	constitGyeonggi-do_41	-1.468867e-02	-4.96725e-02	0.019483200
373	beta.nu[113]	constitGyeonggi-do_42	-3.202764e-03	-6.99502e-02	0.034136000
374	beta.nu[114]	constitGyeonggi-do_43	3.373678e-02	7.04676e-03	0.084860700
375	beta.nu[115]	constitGyeonggi-do_44	1.199048e-02	-1.61294e-02	0.044832600
376	beta.nu[116]	constitGyeonggi-do_45	1.490202e-02	-2.08067e-02	0.032565700
377	beta.nu[117]	constitGyeonggi-do_46	4.601422e-02	1.24185e-02	0.079114000
378	beta.nu[118]	constitGyeonggi-do_47	1.478202e-02	-2.04274e-02	0.054983100
379	beta.nu[119]	constitGyeonggi-do_48	-1.480379e-03	-4.14769e-02	0.043791800
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381	beta.nu[121]	constitGyeonggi-do_5	3.569289e-03	-4.43824e-02	0.060672600
382	beta.nu[122]	constitGyeonggi-do_50	4.495987e-03	-5.18175e-02	0.052172000
383	beta.nu[123]	constitGyeonggi-do_51	1.273976e-02	-2.29634e-02	0.047217200
384	beta.nu[124]	constitGyeonggi-do_52	-7.660167e-03	-5.72537e-02	0.027754400
385	beta.nu[125]	constitGyeonggi-do_53	1.223730e-02	-7.80026e-03	0.025145300
386	beta.nu[126]	constitGyeonggi-do_54	4.175679e-02	9.97039e-03	0.086634100
387	beta.nu[127]	constitGyeonggi-do_55	1.665972e-02	-5.52364e-02	0.067910400
388	beta.nu[128]	constitGyeonggi-do_56	1.256101e-02	-1.03423e-02	0.039716900
389	beta.nu[129]	constitGyeonggi-do_57	3.481517e-02	-2.21462e-03	0.071247400
390	beta.nu[130]	constitGyeonggi-do_58	6.148690e-03	-3.57994e-02	0.045898000
391	beta.nu[131]	constitGyeonggi-do_59	-3.882570e-02	-8.26645e-02	0.000518154
392	beta.nu[132]	constitGyeonggi-do_6	1.526464e-02	-1.67364e-02	0.068717000
393	beta.nu[133]	constitGyeonggi-do_7	2.067839e-02	-1.49383e-02	0.063750400
394	beta.nu[134]	constitGyeonggi-do_8	-1.135210e-03	-2.03763e-02	0.019918500
395	beta.nu[135]	constitGyeonggi-do_9	-5.466908e-03	-3.69987e-02	0.034985800
396	beta.nu[136]	constitGyeongsangbuk-do_1	-4.511183e-02	-9.49172e-02	0.003773300
397	beta.nu[137]	constitGyeongsangbuk-do_10	-1.648393e-01	-2.08726e-01	-0.120049000
398	beta.nu[138]	constitGyeongsangbuk-do_11	-7.123100e-02	-1.19772e-01	-0.033303500
399	beta.nu[139]	constitGyeongsangbuk-do_12	-1.264529e-01	-1.42563e-01	-0.109562000
400	beta.nu[140]	constitGyeongsangbuk-do_13	-1.145388e-01	-1.55131e-01	-0.082646400
401	beta.nu[141]	constitGyeongsangbuk-do_2	-6.566048e-02	-1.04968e-01	-0.036622700
402	beta.nu[142]	constitGyeongsangbuk-do_3	-1.306058e-01	-1.62615e-01	-0.096974600
403	beta.nu[143]	constitGyeongsangbuk-do_4	-1.179407e-01	-1.55511e-01	-0.088444800
404	beta.nu[144]	constitGyeongsangbuk-do_5	-1.368821e-01	-1.94742e-01	-0.088170800
405	beta.nu[145]	constitGyeongsangbuk-do_6	-4.429770e-02	-9.27151e-02	-0.011667600
406	beta.nu[146]	constitGyeongsangbuk-do_7	-3.890825e-02	-6.51108e-02	-0.023188100
407	beta.nu[147]	constitGyeongsangbuk-do_8	-1.312220e-01	-1.70050e-01	-0.086746300
408	beta.nu[148]	constitGyeongsangbuk-do_9	-1.345534e-01	-1.58907e-01	-0.107488000
409	beta.nu[149]	constitGyeongsangnam-do_1	-1.623827e-02	-7.46289e-02	0.067244700
410	beta.nu[150]	constitGyeongsangnam-do_10	-2.210032e-04	-2.61725e-02	0.034309600
411	beta.nu[151]	constitGyeongsangnam-do_11	1.715109e-03	-3.49656e-02	0.048475600
412	beta.nu[152]	constitGyeongsangnam-do_12	-9.209428e-02	-1.22765e-01	-0.055984500
413	beta.nu[153]	constitGyeongsangnam-do_13	-4.817255e-02	-7.44185e-02	-0.017359100
414	beta.nu[154]	constitGyeongsangnam-do_14	-3.366192e-02	-7.22256e-02	0.008924030
415	beta.nu[155]	constitGyeongsangnam-do_15	4.340542e-03	-2.08294e-02	0.034124200
416	beta.nu[156]	constitGyeongsangnam-do_16	-1.726094e-01	-1.92081e-01	-0.132313000
417	beta.nu[157]	constitGyeongsangnam-do_2	-7.916252e-02	-1.34087e-01	-0.042251900
418	beta.nu[158]	constitGyeongsangnam-do_3	-2.745438e-02	-5.55536e-02	0.007556320
419	beta.nu[159]	constitGyeongsangnam-do_4	-2.143503e-02	-5.04984e-02	0.002303660
420	beta.nu[160]	constitGyeongsangnam-do_5	8.360083e-03	-1.29891e-02	0.032523300
421	beta.nu[161]	constitGyeongsangnam-do_6	-3.198232e-02	-5.29903e-02	-0.007503070
422	beta.nu[162]	constitGyeongsangnam-do_7	-3.545879e-02	-8.22399e-02	-0.000508799
423	beta.nu[163]	constitGyeongsangnam-do_8	-3.274956e-02	-6.94991e-02	0.005908400
424	beta.nu[164]	constitGyeongsangnam-do_9	-5.930907e-02	-7.51198e-02	-0.039163600
425	beta.nu[165]	constitIncheon Metropolitan City_1	-3.846063e-02	-6.80477e-02	-0.005112530
426	beta.nu[166]	constitIncheon Metropolitan City_10	2.246646e-02	-1.89099e-02	0.052131300
427	beta.nu[167]	constitIncheon Metropolitan City_11	2.462554e-02	-3.91584e-02	0.126415000
428	beta.nu[168]	constitIncheon Metropolitan City_12	2.024345e-02	6.97428e-03	0.032261200
429	beta.nu[169]	constitIncheon Metropolitan City_13	1.632624e-02	-2.41264e-02	0.050887100
430	beta.nu[170]	constitIncheon Metropolitan City_2	-1.209341e-02	-3.88931e-02	0.012867100
431	beta.nu[171]	constitIncheon Metropolitan City_3	2.436053e-03	-4.08623e-02	0.044849300
432	beta.nu[172]	constitIncheon Metropolitan City_4	2.136421e-02	-1.32677e-02	0.040780600
433	beta.nu[173]	constitIncheon Metropolitan City_5	8.284714e-03	-9.99209e-03	0.021508500
434	beta.nu[174]	constitIncheon Metropolitan City_6	4.696951e-02	7.12229e-03	0.077645800

435	beta.nu[175]	constitIncheon Metropolitan City_7	7.950318e-03	-6.78884e-02	0.075359800
436	beta.nu[176]	constitIncheon Metropolitan City_8	3.620810e-02	1.02643e-02	0.051147300
437	beta.nu[177]	constitIncheon Metropolitan City_9	2.093957e-02	-1.32757e-02	0.048101000
438	beta.nu[178]	constitJeju Special Self-Governing Province_1	1.109966e-02	-4.10915e-02	0.069275700
439	beta.nu[179]	constitJeju Special Self-Governing Province_2	2.160756e-02	-1.33943e-02	0.047448200
440	beta.nu[180]	constitJeju Special Self-Governing Province_3	1.132546e-02	-9.60364e-03	0.039722900
441	beta.nu[181]	constitJeollabuk do_1	4.715731e-02	1.75541e-02	0.074192000
442	beta.nu[182]	constitJeollabuk do_10	4.618689e-02	-1.45098e-02	0.099162800
443	beta.nu[183]	constitJeollabuk do_2	8.612420e-03	-7.84122e-03	0.026735100
444	beta.nu[184]	constitJeollabuk do_3	2.970241e-02	-3.46461e-02	0.060227700
445	beta.nu[185]	constitJeollabuk do_4	5.044462e-02	2.29597e-02	0.082882500
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447	beta.nu[187]	constitJeollabuk do_6	5.524757e-02	2.92272e-02	0.082867000
448	beta.nu[188]	constitJeollabuk do_7	9.874115e-02	7.97717e-02	0.115292000
449	beta.nu[189]	constitJeollabuk do_8	1.225282e-02	-1.49949e-02	0.039186500
450	beta.nu[190]	constitJeollabuk do_9	6.433559e-02	5.47372e-02	0.077502800
451	beta.nu[191]	constitJeollanam-do_1	-1.677924e-02	-3.48470e-02	0.006603320
452	beta.nu[192]	constitJeollanam-do_10	1.032763e-01	6.98852e-02	0.137932000
453	beta.nu[193]	constitJeollanam-do_2	3.768772e-02	-2.29197e-02	0.087773600
454	beta.nu[194]	constitJeollanam-do_3	4.617241e-02	1.70868e-02	0.072900800
455	beta.nu[195]	constitJeollanam-do_4	5.230320e-02	8.35421e-03	0.081400700
456	beta.nu[196]	constitJeollanam-do_5	9.275326e-02	5.51105e-02	0.142827000
457	beta.nu[197]	constitJeollanam-do_6	1.193202e-01	8.99066e-02	0.143002000
458	beta.nu[198]	constitJeollanam-do_7	1.308495e-01	9.10217e-02	0.214713000
459	beta.nu[199]	constitJeollanam-do_8	9.194356e-02	6.11647e-02	0.126277000
460	beta.nu[200]	constitJeollanam-do_9	8.336669e-02	5.13615e-02	0.118787000
461	beta.nu[201]	constitSejong Special Self-governing City_1	3.525586e-02	-3.24093e-02	0.078943700
462	beta.nu[202]	constitSejong Special Self-governing City_2	3.306272e-02	-6.18604e-03	0.063749300
463	beta.nu[203]	constitSeoul_1	1.566973e-02	-1.85709e-02	0.040519400
464	beta.nu[204]	constitSeoul_10	4.251546e-02	-8.10562e-05	0.069487800
465	beta.nu[205]	constitSeoul_11	4.878269e-02	-4.24518e-03	0.109027000
466	beta.nu[206]	constitSeoul_12	3.380435e-02	-8.47596e-03	0.074774600
467	beta.nu[207]	constitSeoul_13	1.233820e-02	-6.86004e-02	0.078000000
468	beta.nu[208]	constitSeoul_14	5.534220e-03	-7.52230e-02	0.068089800
469	beta.nu[209]	constitSeoul_15	3.366127e-02	1.18332e-02	0.060831600
470	beta.nu[210]	constitSeoul_16	1.677213e-02	-1.48120e-02	0.054449400
471	beta.nu[211]	constitSeoul_17	2.265649e-02	-2.22301e-03	0.046767800
472	beta.nu[212]	constitSeoul_18	2.357859e-02	-1.59199e-02	0.057693300
473	beta.nu[213]	constitSeoul_19	5.511135e-03	-1.86128e-02	0.021141200
474	beta.nu[214]	constitSeoul_2	-3.202944e-03	-3.89070e-02	0.042560000
475	beta.nu[215]	constitSeoul_20	2.269914e-02	3.34738e-03	0.060192500
476	beta.nu[216]	constitSeoul_21	3.511210e-02	1.85991e-03	0.058140500
477	beta.nu[217]	constitSeoul_22	1.250349e-02	-1.38382e-02	0.041130000
478	beta.nu[218]	constitSeoul_23	3.059908e-02	-3.73561e-02	0.071194600
479	beta.nu[219]	constitSeoul_24	9.399392e-03	-3.65921e-02	0.046926000
480	beta.nu[220]	constitSeoul_25	1.009803e-03	-3.86501e-02	0.059791200
481	beta.nu[221]	constitSeoul_26	7.948540e-03	-7.06570e-02	0.042625200
482	beta.nu[222]	constitSeoul_27	1.984169e-02	-4.78218e-02	0.076744600
483	beta.nu[223]	constitSeoul_28	-2.082102e-02	-7.68947e-02	0.030544800
484	beta.nu[224]	constitSeoul_29	-3.964410e-03	-2.39737e-02	0.027639000
485	beta.nu[225]	constitSeoul_3	2.748223e-02	2.66589e-04	0.049347200
486	beta.nu[226]	constitSeoul_30	4.760445e-02	7.13862e-03	0.080503700
487	beta.nu[227]	constitSeoul_31	1.402547e-02	-6.21663e-03	0.035839100
488	beta.nu[228]	constitSeoul_32	3.273837e-02	1.27163e-02	0.050971100
489	beta.nu[229]	constitSeoul_33	-1.589971e-02	-5.41734e-02	0.015458000
490	beta.nu[230]	constitSeoul_34	6.416645e-03	-2.58301e-02	0.036655600
491	beta.nu[231]	constitSeoul_35	-1.938904e-04	-2.83491e-02	0.031656300
492	beta.nu[232]	constitSeoul_36	2.887748e-02	6.30988e-03	0.053647000
493	beta.nu[233]	constitSeoul_37	2.297925e-02	-3.31719e-02	0.072516600
494	beta.nu[234]	constitSeoul_38	2.359042e-02	4.52493e-03	0.038082200
495	beta.nu[235]	constitSeoul_39	3.434784e-02	7.39497e-03	0.062647800
496	beta.nu[236]	constitSeoul_4	-1.442003e-02	-5.95701e-02	0.049249500
497	beta.nu[237]	constitSeoul_40	9.940007e-03	-2.08616e-02	0.038565100
498	beta.nu[238]	constitSeoul_41	1.770026e-02	-3.81874e-02	0.103851000
499	beta.nu[239]	constitSeoul_42	-2.345831e-02	-8.13629e-02	0.008855650
500	beta.nu[240]	constitSeoul_43	1.517378e-02	-3.54200e-02	0.066681600
501	beta.nu[241]	constitSeoul_44	-1.885208e-02	-3.82479e-02	0.006596350
502	beta.nu[242]	constitSeoul_45	1.724652e-03	-1.92025e-02	0.028171700

503	beta.nu[243]	constitSeoul_46	-1.196656e-02	-5.60875e-02	0.043107700
504	beta.nu[244]	constitSeoul_47	2.261815e-02	-3.87323e-02	0.086170000
505	beta.nu[245]	constitSeoul_48	1.080411e-02	-4.45726e-02	0.050963600
506	beta.nu[246]	constitSeoul_49	-1.864706e-02	-3.50981e-02	0.003567860
507	beta.nu[247]	constitSeoul_5	3.603643e-02	-5.18292e-02	0.095784000
508	beta.nu[248]	constitSeoul_6	1.456662e-02	-1.07082e-02	0.041542200
509	beta.nu[249]	constitSeoul_7	3.247191e-02	-1.34924e-03	0.072513400
510	beta.nu[250]	constitSeoul_8	1.827916e-02	-1.59508e-02	0.073122900
511	beta.nu[251]	constitSeoul_9	3.308920e-02	-1.64147e-02	0.078986600
512	beta.nu[252]	constitUlsan Metropolitan City_1	-3.786219e-02	-5.87979e-02	-0.002012490
513	beta.nu[253]	constitUlsan Metropolitan City_2	-8.276909e-03	-4.37611e-02	0.030517100
514	beta.nu[254]	constitUlsan Metropolitan City_3	1.263516e-02	-2.62159e-02	0.032278500
515	beta.nu[255]	constitUlsan Metropolitan City_4	-3.601950e-02	-6.18623e-02	-0.019550000
516	beta.nu[256]	constitUlsan Metropolitan City_5	-2.226917e-02	-6.04889e-02	0.009650900
517	beta.nu[257]	constitUlsan Metropolitan City_6	-2.065407e-02	-6.23667e-02	0.038065000
518	beta.iota.m	(Intercept)	2.951485e-01	2.16284e-01	0.339614000
519	beta.iota.s	(Intercept)	-4.588055e-01	-5.05951e-01	-0.410698000
520	beta.chi.m	(Intercept)	-1.452836e-01	-2.35488e-01	-0.046219000
521	beta.chi.s	(Intercept)	-5.791656e-01	-6.90371e-01	-0.420073000

`eforensics` Parameter Posterior Means and 95% HPD Intervals, Constituency Leader Specification:

	Parameter	Covariate	Mean	HPD.lower	HPD.upper
1	pi[1]	No Fraud	9.270384e-01	9.19241e-01	9.33267e-01
2	pi[2]	Incremental Fraud	6.512788e-02	5.88438e-02	7.24786e-02
3	pi[3]	Extreme Fraud	7.833748e-03	6.50419e-03	9.05366e-03
4	beta.tau[1]	(Intercept)	7.568751e-01	6.87372e-01	8.27337e-01
5	beta.tau[2]	isprevoteTRUE	1.108130e+00	9.62600e-01	1.23914e+00
6	beta.tau[3]	typep	-4.033252e-02	-8.26054e-02	2.74751e-02
7	beta.tau[4]	isabroadTRUE	-7.109992e-02	-1.11289e-01	-2.94186e-03
8	beta.tau[5]	isdisabTRUE	3.821377e-02	3.99922e-04	7.12939e-02
9	beta.tau[6]	constitBusan_10	2.374025e-02	4.04847e-03	4.23252e-02
10	beta.tau[7]	constitBusan_11	-5.099162e-03	-2.95894e-02	2.99276e-02
11	beta.tau[8]	constitBusan_12	5.971536e-03	-2.00513e-02	2.53246e-02
12	beta.tau[9]	constitBusan_13	-1.601258e-02	-4.61268e-02	2.81555e-02
13	beta.tau[10]	constitBusan_14	8.956976e-03	-5.37386e-02	3.54746e-02
14	beta.tau[11]	constitBusan_15	-1.058801e-02	-5.00068e-02	4.96155e-02
15	beta.tau[12]	constitBusan_16	-1.335161e-02	-5.47815e-02	4.31133e-02
16	beta.tau[13]	constitBusan_17	8.930746e-03	-1.69128e-02	2.39643e-02
17	beta.tau[14]	constitBusan_18	4.841590e-03	-3.73091e-02	3.12827e-02
18	beta.tau[15]	constitBusan_2	1.882562e-02	3.53366e-03	4.48288e-02
19	beta.tau[16]	constitBusan_3	4.095276e-02	8.90009e-03	8.15721e-02
20	beta.tau[17]	constitBusan_4	-1.483410e-02	-3.36497e-02	-3.11300e-03
21	beta.tau[18]	constitBusan_5	1.567616e-02	-2.95204e-03	3.38301e-02
22	beta.tau[19]	constitBusan_6	-7.318027e-03	-4.11041e-02	1.37410e-02
23	beta.tau[20]	constitBusan_7	-6.570729e-03	-2.33949e-02	1.78108e-02
24	beta.tau[21]	constitBusan_8	5.993937e-03	-6.20754e-02	6.50334e-02
25	beta.tau[22]	constitBusan_9	9.290129e-03	-3.29076e-02	5.19879e-02
26	beta.tau[23]	constitChung-cheong bukdo_1	1.196187e-02	-3.30348e-02	4.96451e-02
27	beta.tau[24]	constitChung-cheong bukdo_2	-7.572350e-03	-4.32137e-02	2.52742e-02
28	beta.tau[25]	constitChung-cheong bukdo_3	-3.023872e-02	-6.16645e-02	-8.24562e-03
29	beta.tau[26]	constitChung-cheong bukdo_4	-5.141638e-03	-5.60276e-02	2.85081e-02
30	beta.tau[27]	constitChung-cheong bukdo_5	-1.355573e-02	-2.99277e-02	6.89464e-03
31	beta.tau[28]	constitChung-cheong bukdo_6	2.874208e-03	-2.01981e-02	3.82237e-02
32	beta.tau[29]	constitChung-cheong bukdo_7	-9.935217e-03	-3.64412e-02	2.16020e-02
33	beta.tau[30]	constitChung-cheong bukdo_8	5.580535e-03	-2.13786e-02	3.65362e-02
34	beta.tau[31]	constitChungcheongnam-do_1	6.133656e-03	-5.49225e-02	6.01042e-02
35	beta.tau[32]	constitChungcheongnam-do_10	9.575699e-03	-5.10625e-02	6.81655e-02
36	beta.tau[33]	constitChungcheongnam-do_11	8.773262e-03	-3.30789e-02	3.76462e-02
37	beta.tau[34]	constitChungcheongnam-do_2	-9.588676e-04	-2.61093e-02	1.98530e-02
38	beta.tau[35]	constitChungcheongnam-do_3	1.943231e-02	-3.18927e-02	7.14147e-02
39	beta.tau[36]	constitChungcheongnam-do_4	6.655159e-03	-2.94314e-02	3.81748e-02
40	beta.tau[37]	constitChungcheongnam-do_5	9.992877e-04	-5.58853e-02	3.85915e-02
41	beta.tau[38]	constitChungcheongnam-do_6	-2.127085e-03	-5.27542e-02	3.67143e-02

42	beta.tau[39]	constitChungcheongnam-do_7	-3.743384e-03	-4.51756e-02	2.27133e-02
43	beta.tau[40]	constitChungcheongnam-do_8	2.859301e-02	-6.06247e-03	5.63894e-02
44	beta.tau[41]	constitChungcheongnam-do_9	6.012535e-03	-5.07698e-02	3.82828e-02
45	beta.tau[42]	constitDaegu Metropolitan City_1	2.210305e-03	-3.65302e-02	4.22373e-02
46	beta.tau[43]	constitDaegu Metropolitan City_10	9.699808e-03	-1.49103e-02	5.00044e-02
47	beta.tau[44]	constitDaegu Metropolitan City_11	-2.781636e-03	-2.53982e-02	3.38146e-02
48	beta.tau[45]	constitDaegu Metropolitan City_12	-2.112588e-02	-3.95629e-02	-6.50934e-04
49	beta.tau[46]	constitDaegu Metropolitan City_2	1.060608e-02	-3.65281e-02	4.17911e-02
50	beta.tau[47]	constitDaegu Metropolitan City_3	-1.377238e-02	-5.70548e-02	3.13068e-02
51	beta.tau[48]	constitDaegu Metropolitan City_4	-1.015958e-02	-5.67364e-02	4.54932e-02
52	beta.tau[49]	constitDaegu Metropolitan City_5	7.178420e-03	-3.43613e-02	2.61157e-02
53	beta.tau[50]	constitDaegu Metropolitan City_6	-8.948794e-03	-5.63607e-02	4.18658e-02
54	beta.tau[51]	constitDaegu Metropolitan City_7	2.113316e-03	-3.39196e-02	3.44561e-02
55	beta.tau[52]	constitDaegu Metropolitan City_8	8.275740e-03	-2.12859e-02	6.22350e-02
56	beta.tau[53]	constitDaegu Metropolitan City_9	1.193235e-03	-3.53451e-02	5.81250e-02
57	beta.tau[54]	constitDaejeon_1	-2.215701e-02	-5.49963e-02	2.20877e-02
58	beta.tau[55]	constitDaejeon_2	-1.063725e-02	-4.81010e-02	3.96391e-02
59	beta.tau[56]	constitDaejeon_3	-3.355762e-03	-2.18662e-02	1.07853e-02
60	beta.tau[57]	constitDaejeon_4	-1.046844e-02	-4.22916e-02	3.43713e-02
61	beta.tau[58]	constitDaejeon_5	3.758236e-03	-1.76448e-02	3.79505e-02
62	beta.tau[59]	constitDaejeon_6	1.362136e-02	-3.25453e-02	3.74886e-02
63	beta.tau[60]	constitDaejeon_7	-1.766235e-02	-8.35607e-02	3.70345e-02
64	beta.tau[61]	constitGangwon-do_1	3.755472e-03	-2.11176e-02	2.20706e-02
65	beta.tau[62]	constitGangwon-do_2	3.586138e-02	-1.93523e-02	1.02102e-01
66	beta.tau[63]	constitGangwon-do_3	1.173836e-02	-4.48471e-02	4.70775e-02
67	beta.tau[64]	constitGangwon-do_4	7.854659e-03	-2.94539e-02	4.61422e-02
68	beta.tau[65]	constitGangwon-do_5	-4.929073e-03	-4.43420e-02	3.66884e-02
69	beta.tau[66]	constitGangwon-do_6	2.283254e-02	-2.76767e-03	4.97622e-02
70	beta.tau[67]	constitGangwon-do_7	7.442457e-03	-2.71191e-02	2.80262e-02
71	beta.tau[68]	constitGangwon-do_8	2.104728e-02	1.50518e-03	4.81142e-02
72	beta.tau[69]	constitGwangju_1	-2.233480e-02	-3.85769e-02	5.42576e-04
73	beta.tau[70]	constitGwangju_2	-1.895228e-02	-5.53105e-02	2.33349e-03
74	beta.tau[71]	constitGwangju_3	-5.227977e-03	-3.16830e-02	2.42300e-02
75	beta.tau[72]	constitGwangju_4	-9.577827e-03	-5.61790e-02	2.60773e-02
76	beta.tau[73]	constitGwangju_5	-3.532445e-02	-6.60497e-02	6.90881e-03
77	beta.tau[74]	constitGwangju_6	1.973110e-03	-4.70816e-02	3.54872e-02
78	beta.tau[75]	constitGwangju_7	-1.482739e-02	-2.93619e-02	6.94313e-03
79	beta.tau[76]	constitGwangju_8	-1.198226e-02	-6.77050e-02	4.30592e-02
80	beta.tau[77]	constitGyeonggi-do_1	6.061398e-03	-1.34487e-02	2.58319e-02
81	beta.tau[78]	constitGyeonggi-do_10	-6.462539e-04	-3.92478e-02	4.87731e-02
82	beta.tau[79]	constitGyeonggi-do_11	-1.167486e-02	-3.52417e-02	3.02597e-02
83	beta.tau[80]	constitGyeonggi-do_12	8.625132e-03	-3.25706e-02	4.09282e-02
84	beta.tau[81]	constitGyeonggi-do_13	-6.549035e-03	-4.36567e-02	3.23508e-02
85	beta.tau[82]	constitGyeonggi-do_14	-1.925429e-02	-4.59281e-02	5.66467e-03
86	beta.tau[83]	constitGyeonggi-do_15	-3.566996e-02	-6.49770e-02	-5.03411e-03
87	beta.tau[84]	constitGyeonggi-do_16	-1.368191e-02	-5.09530e-02	2.06548e-02
88	beta.tau[85]	constitGyeonggi-do_17	1.002780e-03	-3.17570e-02	3.64245e-02
89	beta.tau[86]	constitGyeonggi-do_18	2.085623e-02	-2.33909e-02	7.06325e-02
90	beta.tau[87]	constitGyeonggi-do_19	9.377473e-03	-5.67031e-02	4.58343e-02
91	beta.tau[88]	constitGyeonggi-do_2	4.100132e-03	-1.61308e-02	3.24467e-02
92	beta.tau[89]	constitGyeonggi-do_20	-4.822073e-03	-3.78440e-02	1.42331e-02
93	beta.tau[90]	constitGyeonggi-do_21	8.443300e-03	-2.40262e-02	3.78768e-02
94	beta.tau[91]	constitGyeonggi-do_22	1.536706e-03	-4.71694e-02	2.34769e-02
95	beta.tau[92]	constitGyeonggi-do_23	-2.082446e-02	-4.86044e-02	9.57457e-03
96	beta.tau[93]	constitGyeonggi-do_24	2.203648e-03	-3.19061e-02	5.27686e-02
97	beta.tau[94]	constitGyeonggi-do_25	2.010503e-02	-1.95119e-02	5.06804e-02
98	beta.tau[95]	constitGyeonggi-do_26	-5.575544e-03	-4.63036e-02	1.74661e-02
99	beta.tau[96]	constitGyeonggi-do_27	4.680222e-03	-1.73943e-02	3.46610e-02
100	beta.tau[97]	constitGyeonggi-do_28	-1.348153e-02	-5.34841e-02	2.28265e-02
101	beta.tau[98]	constitGyeonggi-do_29	4.666144e-03	-2.68788e-02	2.34122e-02
102	beta.tau[99]	constitGyeonggi-do_3	1.045142e-02	-5.27772e-02	4.37975e-02
103	beta.tau[100]	constitGyeonggi-do_30	4.366304e-03	-2.44151e-02	3.51785e-02
104	beta.tau[101]	constitGyeonggi-do_31	1.870142e-02	-8.94581e-05	4.66857e-02
105	beta.tau[102]	constitGyeonggi-do_32	7.422263e-03	-2.31449e-02	4.79118e-02
106	beta.tau[103]	constitGyeonggi-do_33	-1.227990e-02	-3.55603e-02	1.83731e-02
107	beta.tau[104]	constitGyeonggi-do_34	-2.973248e-02	-5.55045e-02	-9.80195e-03
108	beta.tau[105]	constitGyeonggi-do_35	4.219637e-04	-3.66226e-02	3.51454e-02
109	beta.tau[106]	constitGyeonggi-do_36	9.983727e-03	-4.26313e-02	3.99465e-02

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110 beta.tau[107]                        constitGyeonggi-do_37  1.854643e-02 -2.31619e-02  7.49449e-02
111 beta.tau[108]                        constitGyeonggi-do_38 -1.939871e-04 -1.75332e-02  1.47246e-02
112 beta.tau[109]                        constitGyeonggi-do_39 -2.907119e-02 -4.00770e-02 -1.23790e-02
113 beta.tau[110]                         constitGyeonggi-do_4 -9.475195e-03 -6.23315e-02  2.21252e-02
114 beta.tau[111]                        constitGyeonggi-do_40  1.054695e-02 -2.17229e-02  4.09083e-02
115 beta.tau[112]                        constitGyeonggi-do_41 -1.061787e-02 -4.74677e-02  1.46268e-02
116 beta.tau[113]                        constitGyeonggi-do_42  9.334576e-03 -4.31532e-02  4.29186e-02
117 beta.tau[114]                        constitGyeonggi-do_43  1.015340e-02 -5.09002e-02  4.47469e-02
118 beta.tau[115]                        constitGyeonggi-do_44  3.180646e-03 -1.19353e-02  1.98352e-02
119 beta.tau[116]                        constitGyeonggi-do_45  2.145437e-03 -5.42315e-02  6.96960e-02
120 beta.tau[117]                        constitGyeonggi-do_46  9.441733e-03 -4.88795e-02  7.19274e-02
121 beta.tau[118]                        constitGyeonggi-do_47 -2.679196e-02 -6.92319e-02  4.40226e-02
122 beta.tau[119]                        constitGyeonggi-do_48  4.422445e-03 -1.99732e-02  5.31659e-02
123 beta.tau[120]                        constitGyeonggi-do_49 -1.315381e-02 -3.56692e-02  1.38990e-02
124 beta.tau[121]                         constitGyeonggi-do_5 -1.963138e-02 -5.49262e-02  3.20433e-02
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134 beta.tau[131]                        constitGyeonggi-do_59 -5.678322e-03 -2.72577e-02  3.16175e-02
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139 beta.tau[136]                  constitGyeongsangbuk-do_1 -1.233880e-02 -2.71361e-02  7.60731e-03
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168 beta.tau[165]           constitIncheon Metropolitan City_1 -1.582212e-02 -3.81863e-02  1.81012e-02
169 beta.tau[166]          constitIncheon Metropolitan City_10  1.800158e-02 -4.09490e-03  4.52585e-02
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173 beta.tau[170]           constitIncheon Metropolitan City_2 -5.043936e-03 -4.16328e-02  3.91481e-02
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204	beta.tau[201]	constitSejong Special Self-governing City_1	8.112612e-03	-1.56224e-02	6.19497e-02
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207	beta.tau[204]	constitSeoul_10	1.365651e-02	-5.80946e-03	3.25377e-02
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213	beta.tau[210]	constitSeoul_16	-1.592033e-02	-3.42337e-02	4.06825e-03
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217	beta.tau[214]	constitSeoul_2	6.438721e-03	-7.67726e-03	2.27915e-02
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222	beta.tau[219]	constitSeoul_24	1.742329e-02	-6.07156e-03	3.22451e-02
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306   beta.nu[46]                constitDaegu Metropolitan City_2  3.812529e-02 -1.73840e-02  1.14713e-01
307   beta.nu[47]                constitDaegu Metropolitan City_3  1.516528e-03 -6.12511e-02  3.51628e-02
308   beta.nu[48]                constitDaegu Metropolitan City_4  7.531832e-02  4.73589e-02  1.09510e-01
309   beta.nu[49]                constitDaegu Metropolitan City_5 -1.589027e-01 -2.04303e-01 -1.26570e-01
310   beta.nu[50]                constitDaegu Metropolitan City_6 -1.003320e-01 -1.46816e-01 -6.37212e-02
311   beta.nu[51]                constitDaegu Metropolitan City_7  1.532286e-02 -1.37685e-02  5.39312e-02
312   beta.nu[52]                constitDaegu Metropolitan City_8 -6.420370e-02 -1.25195e-01 -2.08432e-03
313   beta.nu[53]                constitDaegu Metropolitan City_9 -4.110179e-03 -4.55096e-02  1.98236e-02
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314	beta.nu[54]	constitDaejeon_1	-2.963649e-02	-6.21889e-02	6.77089e-03
315	beta.nu[55]	constitDaejeon_2	-2.178269e-02	-4.11062e-02	7.16968e-03
316	beta.nu[56]	constitDaejeon_3	-4.598807e-02	-6.72369e-02	-2.67272e-02
317	beta.nu[57]	constitDaejeon_4	6.661704e-03	-1.87981e-02	4.80027e-02
318	beta.nu[58]	constitDaejeon_5	-1.309739e-02	-6.30109e-02	2.41747e-02
319	beta.nu[59]	constitDaejeon_6	-3.374732e-03	-2.29525e-02	1.31964e-02
320	beta.nu[60]	constitDaejeon_7	-4.570114e-02	-8.32833e-02	6.08863e-03
321	beta.nu[61]	constitGangwon-do_1	-5.869690e-02	-8.44532e-02	-2.91322e-02
322	beta.nu[62]	constitGangwon-do_2	-1.015410e-02	-4.40863e-02	3.27665e-02
323	beta.nu[63]	constitGangwon-do_3	-3.987465e-02	-7.97919e-02	8.02125e-03
324	beta.nu[64]	constitGangwon-do_4	-4.967384e-02	-7.39209e-02	-2.50957e-02
325	beta.nu[65]	constitGangwon-do_5	-5.751137e-02	-1.03355e-01	-2.80429e-02
326	beta.nu[66]	constitGangwon-do_6	1.886710e-02	-1.66816e-02	5.13271e-02
327	beta.nu[67]	constitGangwon-do_7	8.396711e-03	-2.48760e-02	6.62693e-02
328	beta.nu[68]	constitGangwon-do_8	-1.745275e-02	-4.97652e-02	1.15958e-02
329	beta.nu[69]	constitGwangju_1	5.154580e-02	2.51363e-02	6.66098e-02
330	beta.nu[70]	constitGwangju_2	7.195234e-02	3.39826e-02	1.26284e-01
331	beta.nu[71]	constitGwangju_3	8.020334e-02	2.16031e-02	1.16531e-01
332	beta.nu[72]	constitGwangju_4	4.447365e-02	8.29871e-03	7.33270e-02
333	beta.nu[73]	constitGwangju_5	7.557110e-03	-1.79313e-02	4.23346e-02
334	beta.nu[74]	constitGwangju_6	9.055553e-02	5.15674e-02	1.16666e-01
335	beta.nu[75]	constitGwangju_7	5.620031e-02	2.42616e-02	1.00782e-01
336	beta.nu[76]	constitGwangju_8	8.267575e-02	3.94867e-02	1.15848e-01
337	beta.nu[77]	constitGyeonggi-do_1	-1.269112e-02	-2.69376e-02	-4.09311e-03
338	beta.nu[78]	constitGyeonggi-do_10	-2.405134e-02	-6.31406e-02	1.47499e-02
339	beta.nu[79]	constitGyeonggi-do_11	-3.632682e-02	-4.91893e-02	-2.73041e-02
340	beta.nu[80]	constitGyeonggi-do_12	-2.561560e-02	-6.05858e-02	-4.20184e-04
341	beta.nu[81]	constitGyeonggi-do_13	4.405379e-03	-4.84524e-02	3.70387e-02
342	beta.nu[82]	constitGyeonggi-do_14	-3.508184e-02	-8.68324e-02	1.03344e-02
343	beta.nu[83]	constitGyeonggi-do_15	9.498093e-03	-1.96567e-02	3.42218e-02
344	beta.nu[84]	constitGyeonggi-do_16	-2.488662e-02	-7.64040e-02	2.14509e-02
345	beta.nu[85]	constitGyeonggi-do_17	2.749627e-02	6.44262e-03	5.22445e-02
346	beta.nu[86]	constitGyeonggi-do_18	1.519972e-03	-2.22820e-02	4.70589e-02
347	beta.nu[87]	constitGyeonggi-do_19	-1.290469e-02	-4.78572e-02	1.05922e-02
348	beta.nu[88]	constitGyeonggi-do_2	-3.396447e-03	-2.31034e-02	3.02296e-02
349	beta.nu[89]	constitGyeonggi-do_20	3.284233e-02	-4.83318e-03	6.82786e-02
350	beta.nu[90]	constitGyeonggi-do_21	-4.491160e-02	-9.03877e-02	-4.51496e-03
351	beta.nu[91]	constitGyeonggi-do_22	-1.267204e-02	-8.43605e-02	2.62866e-02
352	beta.nu[92]	constitGyeonggi-do_23	1.129988e-02	-2.62869e-02	6.76563e-02
353	beta.nu[93]	constitGyeonggi-do_24	5.029911e-03	-3.79680e-02	6.30244e-02
354	beta.nu[94]	constitGyeonggi-do_25	-1.064332e-02	-4.17484e-02	1.84632e-02
355	beta.nu[95]	constitGyeonggi-do_26	1.093132e-02	-2.18808e-02	3.79823e-02
356	beta.nu[96]	constitGyeonggi-do_27	-1.145428e-02	-4.00723e-02	1.70917e-02
357	beta.nu[97]	constitGyeonggi-do_28	-8.557886e-02	-1.49949e-01	-3.66939e-02
358	beta.nu[98]	constitGyeonggi-do_29	-2.017152e-02	-4.73819e-02	1.67507e-02
359	beta.nu[99]	constitGyeonggi-do_3	1.630271e-02	-8.50907e-03	4.08979e-02
360	beta.nu[100]	constitGyeonggi-do_30	1.199694e-02	-2.38381e-02	4.67324e-02
361	beta.nu[101]	constitGyeonggi-do_31	-1.740106e-02	-4.49221e-02	2.27790e-03
362	beta.nu[102]	constitGyeonggi-do_32	-3.281967e-02	-5.19524e-02	-1.07114e-02
363	beta.nu[103]	constitGyeonggi-do_33	-2.988829e-02	-7.46130e-02	-2.34540e-03
364	beta.nu[104]	constitGyeonggi-do_34	-1.118523e-02	-3.35703e-02	9.25815e-03
365	beta.nu[105]	constitGyeonggi-do_35	-5.268889e-04	-2.12973e-02	1.97798e-02
366	beta.nu[106]	constitGyeonggi-do_36	-6.512091e-02	-7.94317e-02	-4.95695e-02
367	beta.nu[107]	constitGyeonggi-do_37	-1.013481e-02	-3.33535e-02	1.29826e-02
368	beta.nu[108]	constitGyeonggi-do_38	-1.311004e-02	-4.44138e-02	2.35254e-02
369	beta.nu[109]	constitGyeonggi-do_39	2.908625e-02	-3.28131e-02	7.56528e-02
370	beta.nu[110]	constitGyeonggi-do_4	3.972597e-03	-5.02822e-02	3.67748e-02
371	beta.nu[111]	constitGyeonggi-do_40	1.031122e-02	-5.15785e-02	6.84827e-02
372	beta.nu[112]	constitGyeonggi-do_41	-2.991433e-02	-8.01816e-02	7.48092e-03
373	beta.nu[113]	constitGyeonggi-do_42	7.923458e-03	-3.91490e-02	6.49981e-02
374	beta.nu[114]	constitGyeonggi-do_43	1.467813e-02	-2.87268e-02	6.04285e-02
375	beta.nu[115]	constitGyeonggi-do_44	-6.173588e-02	-1.02960e-01	-1.10307e-02
376	beta.nu[116]	constitGyeonggi-do_45	2.015242e-03	-4.11836e-02	6.10541e-02
377	beta.nu[117]	constitGyeonggi-do_46	1.582019e-02	-6.62797e-03	4.22834e-02
378	beta.nu[118]	constitGyeonggi-do_47	-2.392652e-02	-5.66814e-02	-3.02578e-05
379	beta.nu[119]	constitGyeonggi-do_48	1.856893e-02	-7.98733e-03	6.16846e-02
380	beta.nu[120]	constitGyeonggi-do_49	-4.726852e-02	-6.28301e-02	-3.06776e-02
381	beta.nu[121]	constitGyeonggi-do_5	-1.857788e-02	-5.76875e-02	2.55932e-02

382	beta.nu[122]	constitGyeonggi-do_50	-3.387572e-03	-3.61564e-02	2.67689e-02
383	beta.nu[123]	constitGyeonggi-do_51	-3.716175e-02	-5.95466e-02	7.84369e-04
384	beta.nu[124]	constitGyeonggi-do_52	-7.827373e-02	-1.20613e-01	-4.21738e-02
385	beta.nu[125]	constitGyeonggi-do_53	3.517722e-02	8.15768e-03	6.98541e-02
386	beta.nu[126]	constitGyeonggi-do_54	4.770783e-02	1.73914e-02	9.11487e-02
387	beta.nu[127]	constitGyeonggi-do_55	-1.986257e-03	-5.78179e-02	4.17459e-02
388	beta.nu[128]	constitGyeonggi-do_56	-1.299428e-02	-5.25104e-02	3.23031e-02
389	beta.nu[129]	constitGyeonggi-do_57	-1.086511e-03	-4.84736e-02	4.21375e-02
390	beta.nu[130]	constitGyeonggi-do_58	-2.511220e-02	-7.15856e-02	1.47450e-02
391	beta.nu[131]	constitGyeonggi-do_59	1.236483e-02	-2.79358e-02	4.71419e-02
392	beta.nu[132]	constitGyeonggi-do_6	2.174868e-02	-4.83256e-03	5.54856e-02
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394	beta.nu[134]	constitGyeonggi-do_8	-6.657616e-02	-9.84250e-02	-3.74189e-02
395	beta.nu[135]	constitGyeonggi-do_9	-6.694656e-02	-9.03126e-02	-3.73129e-02
396	beta.nu[136]	constitGyeongsangbuk-do_1	7.709960e-02	3.36746e-02	1.14576e-01
397	beta.nu[137]	constitGyeongsangbuk-do_10	1.194407e-01	6.68855e-02	1.83636e-01
398	beta.nu[138]	constitGyeongsangbuk-do_11	5.825227e-02	3.98315e-02	7.62187e-02
399	beta.nu[139]	constitGyeongsangbuk-do_12	9.163560e-02	4.66548e-02	1.54216e-01
400	beta.nu[140]	constitGyeongsangbuk-do_13	5.696472e-02	1.08677e-02	9.36591e-02
401	beta.nu[141]	constitGyeongsangbuk-do_2	1.971922e-02	4.41488e-03	4.39421e-02
402	beta.nu[142]	constitGyeongsangbuk-do_3	-1.650679e-02	-6.39469e-02	7.46592e-03
403	beta.nu[143]	constitGyeongsangbuk-do_4	1.197284e-01	7.68418e-02	1.68785e-01
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405	beta.nu[145]	constitGyeongsangbuk-do_6	3.200972e-02	1.13410e-03	5.67172e-02
406	beta.nu[146]	constitGyeongsangbuk-do_7	2.363788e-02	1.68925e-02	3.14841e-02
407	beta.nu[147]	constitGyeongsangbuk-do_8	6.199773e-02	2.04943e-02	1.15358e-01
408	beta.nu[148]	constitGyeongsangbuk-do_9	-4.280539e-03	-2.39541e-02	2.73040e-02
409	beta.nu[149]	constitGyeongsangnam-do_1	2.877247e-02	-8.28323e-03	6.16170e-02
410	beta.nu[150]	constitGyeongsangnam-do_10	-5.982249e-02	-8.53117e-02	-1.90669e-02
411	beta.nu[151]	constitGyeongsangnam-do_11	-4.785871e-02	-9.56216e-02	-7.51710e-03
412	beta.nu[152]	constitGyeongsangnam-do_12	9.706279e-02	5.04325e-02	1.33211e-01
413	beta.nu[153]	constitGyeongsangnam-do_13	-1.066070e-02	-4.69949e-02	3.70321e-02
414	beta.nu[154]	constitGyeongsangnam-do_14	-7.876891e-03	-2.61933e-02	1.37641e-02
415	beta.nu[155]	constitGyeongsangnam-do_15	-1.891241e-02	-4.07853e-02	3.25540e-02
416	beta.nu[156]	constitGyeongsangnam-do_16	-6.187460e-02	-1.11820e-01	-2.50053e-02
417	beta.nu[157]	constitGyeongsangnam-do_2	-3.049883e-02	-4.83281e-02	2.79031e-03
418	beta.nu[158]	constitGyeongsangnam-do_3	3.520247e-02	-2.38061e-02	8.90563e-02
419	beta.nu[159]	constitGyeongsangnam-do_4	2.911893e-02	-1.21934e-02	8.13287e-02
420	beta.nu[160]	constitGyeongsangnam-do_5	-6.931396e-03	-4.92218e-02	3.42774e-02
421	beta.nu[161]	constitGyeongsangnam-do_6	1.169849e-02	-4.42288e-02	5.46381e-02
422	beta.nu[162]	constitGyeongsangnam-do_7	6.846953e-03	-4.51385e-02	5.36597e-02
423	beta.nu[163]	constitGyeongsangnam-do_8	4.792947e-02	2.59034e-02	7.72278e-02
424	beta.nu[164]	constitGyeongsangnam-do_9	5.720905e-02	1.59897e-02	9.71515e-02
425	beta.nu[165]	constitIncheon Metropolitan City_1	1.513114e-02	-5.98341e-03	3.36534e-02
426	beta.nu[166]	constitIncheon Metropolitan City_10	-6.133194e-03	-3.63662e-02	2.01795e-02
427	beta.nu[167]	constitIncheon Metropolitan City_11	-3.622099e-03	-2.81398e-02	2.87279e-02
428	beta.nu[168]	constitIncheon Metropolitan City_12	-3.086026e-02	-4.34409e-02	-1.69587e-02
429	beta.nu[169]	constitIncheon Metropolitan City_13	5.048966e-03	-1.51000e-02	2.15037e-02
430	beta.nu[170]	constitIncheon Metropolitan City_2	-4.538345e-02	-8.01857e-02	-6.58651e-04
431	beta.nu[171]	constitIncheon Metropolitan City_3	-6.172087e-02	-7.94985e-02	-3.31405e-02
432	beta.nu[172]	constitIncheon Metropolitan City_4	-1.158965e-04	-3.75042e-02	3.55943e-02
433	beta.nu[173]	constitIncheon Metropolitan City_5	-5.227938e-02	-6.75536e-02	-3.06834e-02
434	beta.nu[174]	constitIncheon Metropolitan City_6	-6.738353e-03	-4.61820e-02	2.77373e-02
435	beta.nu[175]	constitIncheon Metropolitan City_7	-2.078813e-02	-4.58787e-02	1.24450e-02
436	beta.nu[176]	constitIncheon Metropolitan City_8	-9.606471e-03	-2.93855e-02	5.56965e-03
437	beta.nu[177]	constitIncheon Metropolitan City_9	-2.025554e-02	-4.63579e-02	5.09793e-03
438	beta.nu[178]	constitJeju Special Self-Governing Province_1	-5.306791e-02	-7.12520e-02	-1.71410e-02
439	beta.nu[179]	constitJeju Special Self-Governing Province_2	-3.235247e-03	-5.13605e-02	5.35385e-02
440	beta.nu[180]	constitJeju Special Self-Governing Province_3	-3.846599e-03	-6.09279e-02	3.27643e-02
441	beta.nu[181]	constitJeollabuk do_1	4.272891e-02	1.61660e-02	5.81131e-02
442	beta.nu[182]	constitJeollabuk do_10	-2.403459e-02	-4.82563e-02	4.41456e-03
443	beta.nu[183]	constitJeollabuk do_2	1.640660e-02	-8.05930e-03	5.39247e-02
444	beta.nu[184]	constitJeollabuk do_3	5.563594e-02	3.81125e-02	8.01852e-02
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446	beta.nu[186]	constitJeollabuk do_5	7.143177e-02	3.31554e-02	1.14097e-01
447	beta.nu[187]	constitJeollabuk do_6	5.869442e-02	4.14325e-02	8.14037e-02
448	beta.nu[188]	constitJeollabuk do_7	1.025150e-01	6.00192e-02	1.59457e-01
449	beta.nu[189]	constitJeollabuk do_8	6.473647e-03	-2.73698e-02	3.43804e-02

450	beta.nu[190]	constitJeollabuk do_9	4.854676e-02	2.28911e-02	9.76077e-02
451	beta.nu[191]	constitJeollanam-do_1	-5.373250e-02	-7.12880e-02	-3.63504e-02
452	beta.nu[192]	constitJeollanam-do_10	1.385623e-01	1.14996e-01	1.76779e-01
453	beta.nu[193]	constitJeollanam-do_2	-4.321762e-03	-4.42665e-02	5.10809e-02
454	beta.nu[194]	constitJeollanam-do_3	4.805035e-02	3.32350e-02	7.97912e-02
455	beta.nu[195]	constitJeollanam-do_4	-4.612758e-03	-5.46246e-02	6.76322e-02
456	beta.nu[196]	constitJeollanam-do_5	6.252639e-02	7.04321e-03	9.35783e-02
457	beta.nu[197]	constitJeollanam-do_6	8.006886e-02	4.66334e-02	1.09175e-01
458	beta.nu[198]	constitJeollanam-do_7	1.820555e-01	1.31909e-01	2.20372e-01
459	beta.nu[199]	constitJeollanam-do_8	5.283040e-02	2.66497e-02	8.63898e-02
460	beta.nu[200]	constitJeollanam-do_9	5.728314e-02	2.10233e-02	7.78754e-02
461	beta.nu[201]	constitSejong Special Self-governing City_1	-1.718673e-02	-5.34258e-02	1.75282e-02
462	beta.nu[202]	constitSejong Special Self-governing City_2	-2.159412e-02	-5.28376e-02	2.59561e-02
463	beta.nu[203]	constitSeoul_1	6.860546e-03	-4.01228e-02	4.94055e-02
464	beta.nu[204]	constitSeoul_10	-2.909696e-03	-2.47947e-02	1.35916e-02
465	beta.nu[205]	constitSeoul_11	-7.872327e-03	-4.41355e-02	1.83985e-02
466	beta.nu[206]	constitSeoul_12	-6.349827e-03	-2.51559e-02	1.55595e-02
467	beta.nu[207]	constitSeoul_13	-1.211447e-02	-6.59507e-02	2.78765e-02
468	beta.nu[208]	constitSeoul_14	2.529949e-02	-8.27760e-03	5.83186e-02
469	beta.nu[209]	constitSeoul_15	-8.146849e-03	-4.99776e-02	1.39582e-02
470	beta.nu[210]	constitSeoul_16	-2.158319e-02	-4.70794e-02	3.48366e-02
471	beta.nu[211]	constitSeoul_17	-1.880210e-02	-2.56534e-02	-1.29733e-02
472	beta.nu[212]	constitSeoul_18	1.520841e-02	-7.61591e-03	3.73244e-02
473	beta.nu[213]	constitSeoul_19	1.076287e-02	-2.39918e-02	8.69314e-02
474	beta.nu[214]	constitSeoul_2	-1.629637e-02	-5.44633e-02	2.49861e-02
475	beta.nu[215]	constitSeoul_20	2.356910e-02	-3.52111e-03	4.04774e-02
476	beta.nu[216]	constitSeoul_21	9.889683e-04	-2.75047e-02	3.83965e-02
477	beta.nu[217]	constitSeoul_22	-1.331746e-02	-3.23920e-02	6.52668e-03
478	beta.nu[218]	constitSeoul_23	1.072714e-02	-9.76979e-03	2.22357e-02
479	beta.nu[219]	constitSeoul_24	-1.787584e-02	-6.05867e-02	3.31181e-02
480	beta.nu[220]	constitSeoul_25	-1.500131e-02	-4.81826e-02	1.69077e-02
481	beta.nu[221]	constitSeoul_26	-2.868826e-02	-6.95090e-02	-2.73144e-03
482	beta.nu[222]	constitSeoul_27	-1.009155e-02	-7.05643e-02	6.24284e-02
483	beta.nu[223]	constitSeoul_28	-4.929046e-03	-3.77296e-02	3.65183e-02
484	beta.nu[224]	constitSeoul_29	-1.018873e-02	-6.04820e-02	2.83424e-02
485	beta.nu[225]	constitSeoul_3	-1.477541e-02	-5.41279e-02	8.32188e-03
486	beta.nu[226]	constitSeoul_30	-3.788150e-02	-7.40158e-02	-6.18334e-03
487	beta.nu[227]	constitSeoul_31	-1.534847e-02	-7.07631e-02	4.33913e-02
488	beta.nu[228]	constitSeoul_32	-9.719155e-03	-3.68096e-02	1.82280e-02
489	beta.nu[229]	constitSeoul_33	-2.921042e-02	-8.12880e-02	8.01932e-03
490	beta.nu[230]	constitSeoul_34	-2.008221e-02	-3.92418e-02	-4.78141e-03
491	beta.nu[231]	constitSeoul_35	-2.801026e-02	-7.66810e-02	4.61246e-02
492	beta.nu[232]	constitSeoul_36	-2.964309e-02	-1.06122e-01	2.45258e-02
493	beta.nu[233]	constitSeoul_37	-2.750080e-02	-7.02642e-02	1.47963e-02
494	beta.nu[234]	constitSeoul_38	-1.752420e-02	-6.08371e-02	1.12728e-02
495	beta.nu[235]	constitSeoul_39	-3.083663e-02	-6.01302e-02	-1.54101e-03
496	beta.nu[236]	constitSeoul_4	-3.458996e-02	-9.85479e-02	1.34943e-02
497	beta.nu[237]	constitSeoul_40	2.434083e-02	-1.60543e-02	6.38106e-02
498	beta.nu[238]	constitSeoul_41	9.425761e-03	-3.76876e-02	6.01606e-02
499	beta.nu[239]	constitSeoul_42	-7.886287e-03	-5.16371e-02	3.34753e-02
500	beta.nu[240]	constitSeoul_43	-5.099703e-03	-4.94660e-02	4.17927e-02
501	beta.nu[241]	constitSeoul_44	1.103074e-02	-3.88779e-02	4.98031e-02
502	beta.nu[242]	constitSeoul_45	-6.713044e-03	-2.95299e-02	9.38430e-03
503	beta.nu[243]	constitSeoul_46	-2.836999e-02	-8.55225e-02	3.44873e-02
504	beta.nu[244]	constitSeoul_47	-3.428739e-02	-9.91914e-02	1.52484e-02
505	beta.nu[245]	constitSeoul_48	-5.152996e-02	-7.74537e-02	-3.26412e-02
506	beta.nu[246]	constitSeoul_49	-4.434332e-02	-7.72019e-02	-2.42234e-02
507	beta.nu[247]	constitSeoul_5	-1.131655e-02	-5.96006e-02	2.41517e-02
508	beta.nu[248]	constitSeoul_6	-3.482140e-02	-6.97856e-02	6.77051e-03
509	beta.nu[249]	constitSeoul_7	-2.007616e-02	-3.14014e-02	-9.62450e-03
510	beta.nu[250]	constitSeoul_8	-5.383768e-03	-3.02820e-02	2.70291e-02
511	beta.nu[251]	constitSeoul_9	-8.546156e-03	-3.57467e-02	1.82757e-02
512	beta.nu[252]	constitUlsan Metropolitan City_1	9.351479e-03	-4.44259e-02	5.93673e-02
513	beta.nu[253]	constitUlsan Metropolitan City_2	4.019833e-03	-2.75262e-02	2.54996e-02
514	beta.nu[254]	constitUlsan Metropolitan City_3	2.145210e-02	-1.18057e-02	4.95828e-02
515	beta.nu[255]	constitUlsan Metropolitan City_4	-7.055998e-02	-9.95224e-02	-2.59660e-02
516	beta.nu[256]	constitUlsan Metropolitan City_5	-3.497198e-02	-7.99640e-02	1.67927e-02
517	beta.nu[257]	constitUlsan Metropolitan City_6	1.069686e-02	-8.74206e-03	3.43474e-02

518	beta.iota.m	(Intercept)	1.744052e-01	1.40994e-01	1.98129e-01
519	beta.iota.s	(Intercept)	-8.591155e-01	-9.37079e-01	-8.02521e-01
520	beta.chi.m	(Intercept)	-2.870988e-01	-3.25324e-01	-2.30152e-01
521	beta.chi.s	(Intercept)	-8.173870e-01	-1.08694e+00	-6.04918e-01

eforensics Parameter Posterior Means and 95% HPD Intervals, Future Korea Party Specification:

	Parameter	Covariate	Mean	HPD.lower	HPD.upper
1	pi[1]	No Fraud	0.9554357430	9.52475e-01	0.958436000
2	pi[2]	Incremental Fraud	0.0443523797	4.12297e-02	0.047107900
3	pi[3]	Extreme Fraud	0.0002118793	4.08028e-05	0.000419374
4	beta.tau[1]	(Intercept)	0.1272775640	1.18697e-01	0.136123000
5	beta.tau[2]	isprevoteTRUE	3.0013993500	2.99668e+00	3.008140000
6	beta.tau[3]	typep	-0.0642359824	-7.20363e-02	-0.054992800
7	beta.tau[4]	isabroadTRUE	-0.6804265470	-7.29965e-01	-0.636823000
8	beta.tau[5]	isdisabTRUE	0.5851198110	5.07103e-01	0.647553000
9	beta.nu[1]	(Intercept)	-0.8498179370	-8.66493e-01	-0.831223000
10	beta.nu[2]	isprevoteTRUE	-0.4743879020	-4.84236e-01	-0.463862000
11	beta.nu[3]	typep	0.1749439140	1.66586e-01	0.188163000
12	beta.nu[4]	isabroadTRUE	-0.1034548719	-1.15369e-01	-0.095240400
13	beta.nu[5]	isdisabTRUE	-0.1251443700	-1.29812e-01	-0.119662000
14	beta.iota.m	(Intercept)	0.2049184590	1.85594e-01	0.225396000
15	beta.iota.s	(Intercept)	-0.8639855560	-8.83760e-01	-0.833646000
16	beta.chi.m	(Intercept)	-0.0429112080	-5.40807e-02	-0.032432200
17	beta.chi.s	(Intercept)	-0.1116372156	-1.31574e-01	-0.098274700

eforensics Parameter Posterior Means and 95% HPD Intervals, Platform Party Specification:

	Parameter	Covariate	Mean	HPD.lower	HPD.upper
1	pi[1]	No Fraud	9.617300e-01	9.58581e-01	0.96524000
2	pi[2]	Incremental Fraud	3.821183e-02	3.49011e-02	0.04161080
3	pi[3]	Extreme Fraud	5.818085e-05	7.09872e-08	0.00018169
4	beta.tau[1]	(Intercept)	-1.155634e-01	-1.39834e-01	-0.09293950
5	beta.tau[2]	isprevoteTRUE	3.002471e+00	2.97105e+00	3.03654000
6	beta.tau[3]	typep	2.554812e-01	2.39648e-01	0.27361600
7	beta.tau[4]	isabroadTRUE	5.653088e-01	5.00119e-01	0.63941500
8	beta.tau[5]	isdisabTRUE	9.542181e-01	9.23600e-01	0.98011500
9	beta.nu[1]	(Intercept)	-8.632377e-01	-8.76773e-01	-0.85086200
10	beta.nu[2]	isprevoteTRUE	1.223453e-01	1.14415e-01	0.12916400
11	beta.nu[3]	typep	-5.789002e-03	-2.07915e-02	0.00298988
12	beta.nu[4]	isabroadTRUE	1.274714e-01	1.16253e-01	0.14435600
13	beta.nu[5]	isdisabTRUE	-5.417925e-02	-7.34870e-02	-0.03873120
14	beta.iota.m	(Intercept)	1.138850e-01	1.02790e-01	0.12651700
15	beta.iota.s	(Intercept)	-7.497073e-01	-7.77006e-01	-0.72658400
16	beta.chi.m	(Intercept)	1.006223e-01	9.33521e-02	0.10796400
17	beta.chi.s	(Intercept)	8.203355e-02	7.38885e-02	0.09362820

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