

# Making Votes Count: Pre-analysis Report on Electoral Statistics

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***The views expressed in this report are CRRC-Georgia's alone and do not reflect the views of the United States Government, United States Embassy in Georgia, or any related entity.***

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## *Executive Summary*

In order to help monitor the fidelity of the October 2016 parliamentary election results, CRRC-Georgia will carry out quantitative analysis of election-related statistics using methods from the field of election forensics within the auspices of the Detecting Election Fraud through Data Analysis (DEFDA) project. The Project is funded by the Embassy of the United States of America in Tbilisi. In addition to the Embassy's generous financial assistance, Walter Mebane of the University of Michigan assisted by providing programming codes which were used to generate the results presented in the third section of this report. While support for this project comes from the United States Embassy in Georgia, the views expressed in the report represent the views of CRRC-Georgia alone.

CRRC-Georgia will use two types of statistical analyses to monitor the 2016 elections:

- Logical checks of official election returns, which test whether there were data entry errors when the vote was being recorded and collated;
- Tests for statistical anomalies in the official electoral returns, which may suggest electoral malfeasance.

This report is a pre-analysis report. In addition to demonstrating how the above statistical tests work, it provides a statistical analysis of the impact of the redistricting, which occurred as a result of the 2015 Constitutional Court decision that ruled the previous majoritarian electoral districts unconstitutional.

The analysis presented in the report leads us to conclude that:

- The new electoral boundaries are a significant improvement over the previous system as far as the equality of the vote;
- The new electoral boundaries are likely to decrease the representation of ethnic Armenians and Adjara Muslims in Parliament;
- The new electoral boundaries may have been inspired in part by short-term political goals;
- There were a great number of logical inconsistencies in precinct election protocols in 2012;
- Problems with the recording of election statistics were greatest in foreign electoral precincts.

In the first section of this report, we provide background on how the Georgian electoral system has changed over time. We then move on to discuss the potential impact of the new electoral boundaries on election returns. Next, we demonstrate how the statistical tools that CRRC will use to test for logical inconsistencies and statistical anomalies work. The report concludes with a number of recommendations for the Government and Parliament of Georgia, Central Election Commission and election monitors including:

- Consider transferring to either an electronic voting system or an electronic voting system with a paper trail backup;
- As the electoral reform moves forward following the elections, consider incentivizing parties to include minorities as party list candidates;
- Precinct Electoral Commission members, particularly in foreign precincts, should receive additional training on filling out protocols;

- The CEC should amend protocols to include a space explaining logical inconsistencies in the numbers reported on the protocol;
- The CEC should carry out logical checks of precinct protocols to ensure that votes are accurately recorded;
- In instances of illogical data reported on protocols, the CEC and election observers should investigate the source of the problem.

## Introduction

In order to help ensure the fidelity of the October 2016 parliamentary election results to the popular will and help inform the government about the effectiveness of the newly designed electoral system in representing the public's choice in parliament, CRRC-Georgia will carry out quantitative analysis of election-related statistics using methods from the fields of geography and election forensics, in addition to checking the logical consistency of official data reported by the Central Election Commission (CEC). This report is a pre-analysis report. It first presents an analysis of how the newly formed electoral boundaries are likely to impact the elections. It then goes on to demonstrate how the methods that CRRC-Georgia will use to help ensure the fidelity of the elections work. Using the 2012 proportional list election returns, we demonstrate tests of:

1. Logical inconsistencies in election returns;
2. Statistical anomalies in voting results.

With regard to the new electoral boundaries, the report uses geographic information systems (GIS) data and regression analysis to explore whether the newly drawn electoral districts:

- Defend the principle “one person, one vote”;
- Are likely to change the degree to which representation matches up with the popular vote;
- Potentially give an advantage to any of the political parties had the boundaries been used during the 2012 elections;
- Are likely to affect representation in Parliament of any particular social group.

This analysis aims to help inform the future design of the Georgian electoral system, which the government has stated its intention to further reform between 2016 and 2020.

With regard to logical inconsistencies present in the official 2012 proportional list election data, we look into a number of straightforward statistics and check:

- The number of voters who sign for a ballot per minute at the precinct level;
- Whether the number of voters who sign for a ballot is greater than, less than, or equal to the number of votes recorded and invalid ballots combined;
- Whether the number of votes at later points in the day is greater than, equal to, or less than the number of votes recorded at earlier points in the day.

This analysis aims to help the CEC detect irregularities in the way in which Precinct Election Commissions (PECs) report election statistics.

The third statistical analysis presented in this report aims to demonstrate the methods that CRRC-Georgia will use to check for suspicious statistical anomalies in election returns that may reflect issues with how the elections are carried out. In order to provide an analysis of statistical anomalies in voting statistics, we use methods from the field of election forensics.

Election forensics is a subfield in political science that has emerged over the last twenty years. The goal of election forensics is to identify suspicious statistical patterns in election statistics such as turnout, vote counts, and number of invalid ballots.

Scholars of electoral forensics are still developing methods that can be used to identify suspicious statistical patterns, and some research suggests that suspicious statistical patterns may also emerge as a result of strategic voting<sup>1</sup> or the presence of a distinctive voting population within a territory. Hence, rather than referring to suspicious test results as evidence of malfeasance, we use the term statistical anomaly to denote a test result that may indicate issues with election-related activities.

Given the fact that a number of activities could set off tests for statistical anomalies, substantive knowledge and further investigation are required to determine whether malfeasance actually occurred. Hence, even though the field of election forensics has made significant progress in methods for identifying potentially problematic results, two important caveats must be kept in mind when interpreting test outcomes:

- Results are probabilistic. A test may return a statistically anomalous result, and this suggests that a given result is highly unlikely to have occurred by chance alone. The way in which we calculate the test statistics are likely to provide 1 false positive for every 100 tests performed.
- If a test does suggest a statistical anomaly, it does not necessarily mean that election-related malfeasance caused the result, but rather, only that it may have. Statistical anomalies can be caused by benign activities such as strategic voting<sup>2</sup> or divergent voting patterns within a region. Electoral malfeasance does often cause a positive test result, however. Hence, substantive knowledge and judgment of each positive test are required to determine whether malfeasance actually did occur.

Given these caveats, electoral forensics methods are useful for detecting statistical anomalies in election data that are worthy of further investigation. This is to say that these methods can supplement traditional methods of election monitoring such as direct observation of polling places, parallel vote tabulation, and exit polling.

In the present report, we use the results of the 2012 proportional elections in order to demonstrate how these tests work. In using the 2012 proportional election results, we intend only to demonstrate the tests that we will use in 2016 rather than bring up potential past issues.

In the next section of this report, we provide a number of examples of how electoral design changes have affected Georgian elections in order to provide context for the remainder of the report. In the following three sections, we present the results of our analyses. Based on these analyses, we put forward a number of recommendations for the Central Election Commission, the Government of Georgia and Parliament of Georgia, and election observers working on the 2016 elections at the end of the report.

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<sup>1</sup> See Mebane and Hicken, 2015: <http://www-personal.umich.edu/~wmebane/USAID15/guide.pdf>

<sup>2</sup> See Mebane and Hicken, 2015: <http://www-personal.umich.edu/~wmebane/USAID15/guide.pdf>

## Background

Georgia has had a fair number of electoral systems and each has had different effects on the number of votes that resulted in representation in parliament. For instance, the 1992 snap parliamentary elections resulted in representatives of almost the entire political spectrum in Georgia gaining seats in parliament, with the exception of supporters of the ousted president Zviad Gamsakhurdia. In contrast, the 1995 parliamentary elections were conducted under a system in which the electoral threshold increased from 2% to 5%.<sup>3</sup> The design change contributed to an enormous number of “wasted votes”, i.e. votes for parties that did not gain representation in Parliament.<sup>4</sup> As a result, the government was formed by the Citizens’ Union of Georgia, which had received only 21% of the popular vote nationwide. The party took approximately 60% of seats in parliament (Fig. 1).

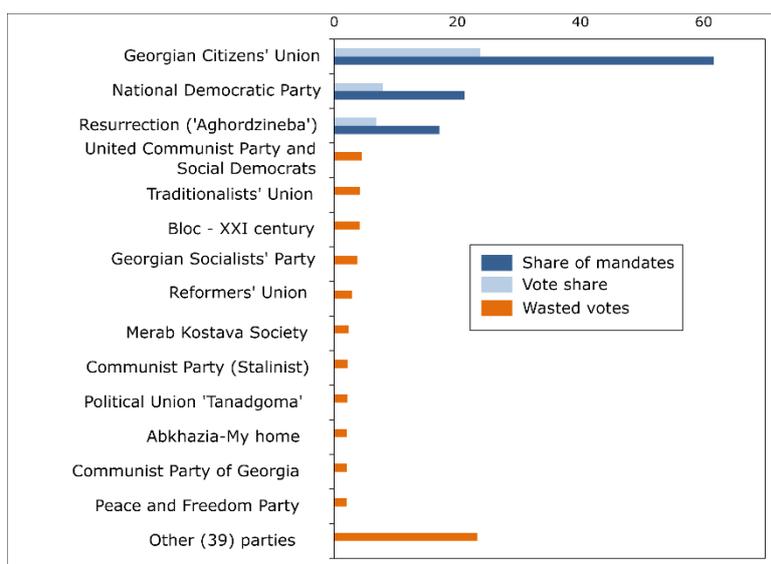


Figure 1: Results of proportional voting in 1995 parliamentary elections. Source: Central Elections Commission of Georgia

The electoral threshold, however, is not the only aspect of electoral system design that affects representation in Parliament. In the 2008 parliamentary elections, the United National Movement followed the Venice Commission recommendation to reduce the electoral threshold from 7% to 5%.<sup>5</sup> However, the number of voters in single-member districts (majoritarian electoral districts) was heavily unequal. In the most extreme disparity, approximately 5,000 voters in Kazbegi elected one majoritarian MP as did 150,000 voters in Kutaisi. That is to say, one vote in the Kazbegi electoral district had the weight of approximately thirty votes in the Kutaisi municipality. As a result, the United National Movement managed to garner approximately 80% of the seats in parliament even though the party had received roughly 59% of the popular vote. The excess number of mandates were obtained in the single-member districts.

<sup>3</sup> Shvetsova, Olga (1999): A survey of post-communist electoral institutions: 1990–1998. *Electoral Studies* 18 (1999) pp. 397–409

<sup>4</sup> Birch, Sarah (2001): *Electoral Systems and Party Systems in Europe East and West*. [in:] *Perspectives on European Politics and Society*.

<sup>5</sup> OSCE (2009): *Georgia Presidential and Parliamentary Elections 2008 - Lessons Learned*. Tbilisi, 2009

The issue with the size of electoral districts remained problematic until Spring 2015 when the Constitutional Court of Georgia ruled the system was unconstitutional<sup>6</sup> and ordered the borders to be redrawn. In accordance with the court's ruling, Parliament introduced changes to the electoral code. Additionally, the threshold for victory in majoritarian elections was set to 50%. The Venice Commission, an advisory board on constitutional law under the Council of Europe, noted that the redistricting changes are positive. However, in their report on the changes to the electoral legislation, they also noted that a number of stakeholders had raised concerns about transparency and inclusion in the redistricting process.<sup>7</sup>

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<sup>6</sup> Nanuashvili and Sharashidze vs. Parliament of Georgia. *Constitutional Court of Georgia*. May 28, 2015. Retrieved from: <http://www.constcourt.ge/ge/news/saqartvelos-sakonstitucio-sasamartlos-gadawyvetileba-saqmeze-saqartvelos-moqalaqeebi-ucha-nanuashvili-da-mixeil-sharashidze-saqartvelos-parlamentis-winaagmdeg.page>

<sup>7</sup> Venice Commission :: Council of Europe (2016). Retrieved August 14, 2016, from [http://www.venice.coe.int/webforms/documents/?pdf=CDL-AD\(2016\)003-e](http://www.venice.coe.int/webforms/documents/?pdf=CDL-AD(2016)003-e)

## *Potential implications of the 2016 redistricting*

Following the Constitutional Court's Spring 2015 ruling, the CEC proposed new boundaries for single member districts. Initially, the CEC put forward a proposal which significantly differed from the final districting that Parliament approved. The electoral redistricting may have a number of implications for the outcomes of the 2016 elections. In this section we discuss some of the potential implications based on an analysis of the 2012 electoral returns and the new electoral boundaries. Specifically, we discuss whether the new boundaries:

- Defend the principle of “one person, one vote”;
- Are likely to change the degree to which representation in parliament matches up with the popular vote;
- Potentially give an advantage to any of the political parties based on an analysis of results if the boundaries had been used during the 2012 elections;
- Are likely to affect minority group representation in Parliament.

In this section, we first describe the methods we use for the analysis and then move on to discuss the results and their implications for the above three subjects.

### **Methods**

For the present analysis of the implications of the new electoral system, we use qualitative assessment of the boundaries and two statistical methods. With the qualitative assessment, we look at new boundaries which are non-contiguous, and how changes to boundaries are likely to affect the representation of minorities.

The first statistical method we used allows us to compare the 2012 electoral results under the old boundaries to what the results would have been had the new boundaries been used in 2012. To do so, we employ a Geographic Information Systems (GIS) technique called spatial query and assigned already existing polling station spatial data to newly created districts. We use GIS data provided by the CEC,<sup>8</sup> as well as the CEC-compiled polling station address map.<sup>9</sup> As a result of this analysis, we are able to determine whether the new electoral boundaries would have changed the election results in 2012.

Second, a regression model is used to test whether district sizes appear to have been altered in a deliberate manner taking into consideration previous electoral geographies and party support. The rationale behind this technique is that when districting, an incumbent has the incentive to carve out smaller units where it previously had more support and to increase the size of districts where other contesting parties have more support to dilute it. Considering these incentives, we use a regression analysis to look at the size of the new districts in relation to district vote shares in favor of the Georgian Dream Coalition (GDC) in majoritarian voting in the 2012 parliamentary elections. Additionally, we control for electoral turnout.

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<sup>8</sup> Central Elections Commission (2016): *Voting districts and precincts*. Retrieved from <http://cesko.ge/geo/list/2246/saarchevno-olqebi-da-ubnebi>

<sup>9</sup> <http://map.cec.gov.ge/map.php?arcevnebi=16>

While the regression results do not necessarily mean that redistricting was performed with short-term political goals in mind, it does suggest that short-term electoral gains may have motivated redistricting in a number of cases. Notably, the redistricting of larger districts, in which, incidentally, support for the Georgian Dream was larger, was required in any case.

These techniques allow us to draw quantitative comparisons between the 2012 and current districting by assessing how many majoritarian seats would have been won by contesting parties if the current system had existed in 2012. The three methods described above allow us to tell if the new districts would have better represented the popular will in the Parliament of Georgia in 2012, whether the new districting appears to have favored a particular party, and whether the new districts are likely to result in lower levels of representation of minorities in Parliament.

## Results

In this section we explore how the new districts will affect a number of characteristics of the vote, including the defense of the principle of “one person, one vote”, whether the new system may benefit the ruling party and whether the districts are likely to decrease representation of ethnic minorities in parliament.

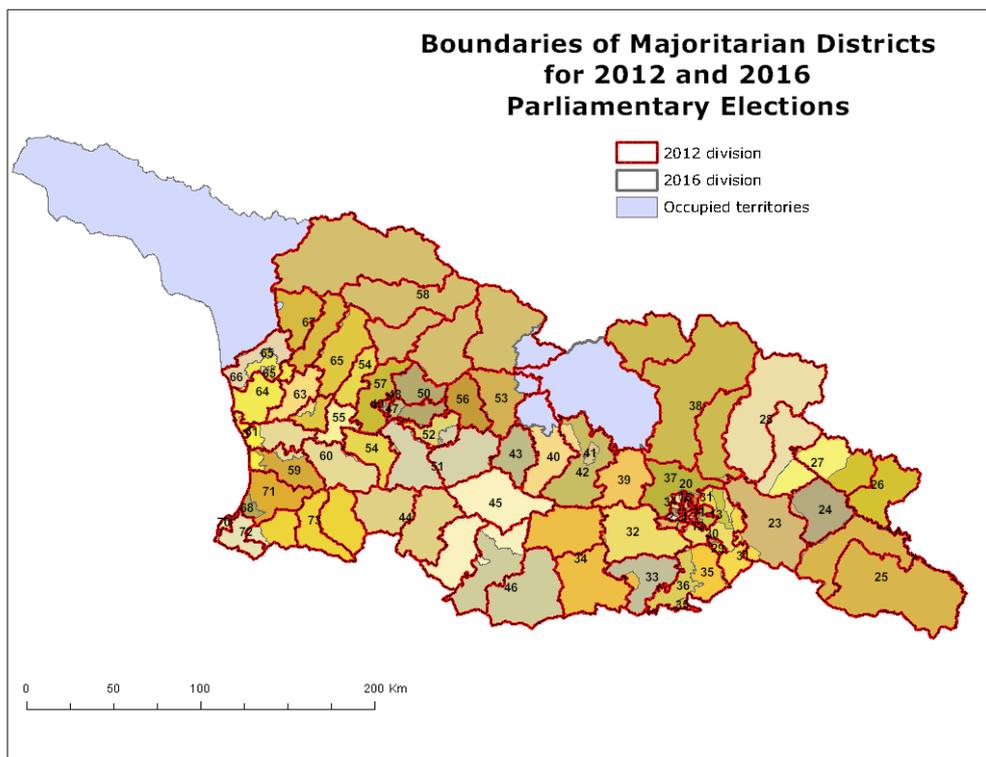


Figure 2. Boundaries of Majoritarian Districts for 2012 and 2016 Parliamentary Elections

### *Defense of the principle one person, one vote*

The new electoral districts are a significant step forward in defense of the principle of one person, one vote. The new districts have equalized the previously extreme disparities in size of electoral districts. In the past, the smallest single-member district in the 2012 parliamentary elections had 5,000 registered voters, while the largest district had over 150,000. New districts have on average 48,000 voters; the smallest

unit is composed of 42,000 voters and the largest, the 29<sup>th</sup> district of Gardabani, represents 54,000 voters. The system is now in line with international standards on the equality of the vote.

### *Potential for political advantage*

There are a number of characteristics of the new electoral districts which may provide political advantage to the incumbent party. To start, there are a number of non-contiguous electoral districts, which may have been created in part to support short-term political goals. Figure 3 shows two such cases of majoritarian districts created for the 2016 elections. According to the initial redistricting proposal, the 55<sup>th</sup> Samtredia district should have been split into two and these parts were to be merged with the bordering Vani and Khoni districts. However, the final proposal features two non-bordering territories (Vani and Khoni) merged together in one district, in which, incidentally, the United National Movement had a strong base of support in 2012. Similarly, two districts in Zugdidi municipality feature enclaves that do not border the main body of the corresponding electoral districts. However, these enclaves would not have given a clear advantage to the Georgian Dream Coalition in the 2012 elections.

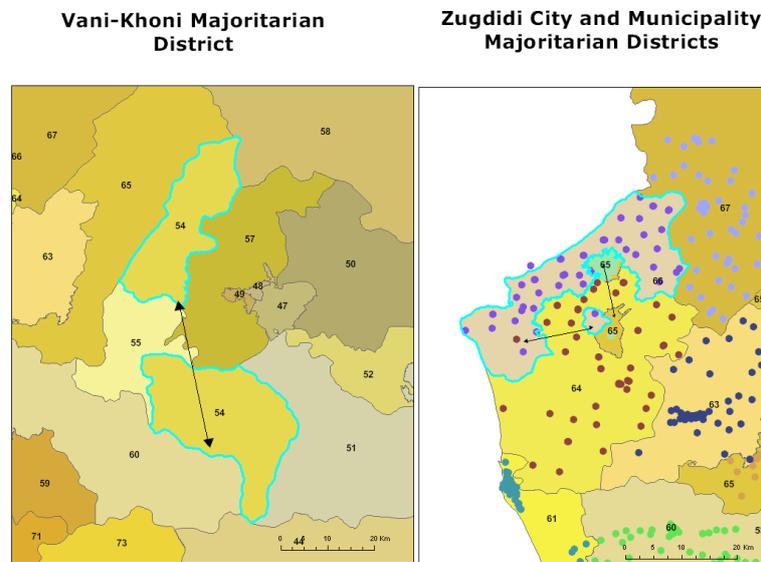


Figure 3. Majoritarian districts for 2016 parliamentary elections.

Besides these non-contiguous territories, comparing the new to the old electoral districts suggests that the Georgian Dream Coalition would have won more seats in 2012 under the new districts than under the old ones. To test this, we aggregated the results of the majoritarian voting in the 2012 parliamentary elections and recalculated the number of mandates that each party would have obtained hypothetically. Significantly, instead of the 41 mandates that the Georgian Dream actually won, the party would have won 50 under the new system, while the UNM would have won only 23 majoritarian mandates.

It is worth mentioning that in 2012, parties won a more or less proportional number of seats to what the vote share was during the elections (Figure 5). However, it could

be argued that in 2012, the opposition offered a strong contest in every electoral district, which yielded a similar distribution of mandates and vote share.

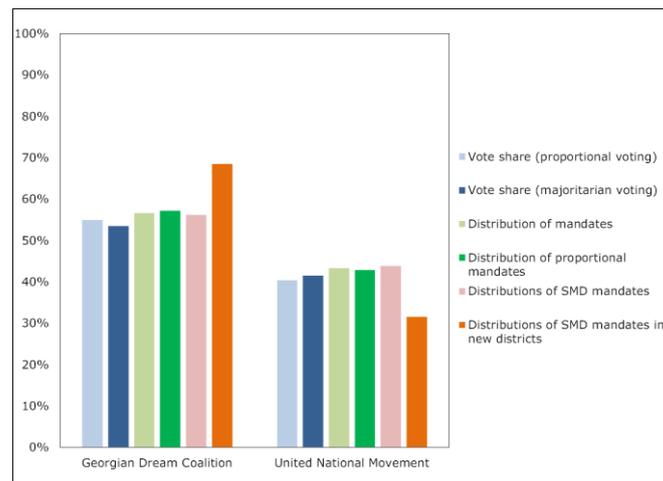


Figure 4 Predicted margins of regression models

In addition to the above analysis, we ran two models which test whether the district size decreased in relation to the number of voters which supported Georgian Dream in 2012 (Figure 4). In both cases, vote share for the majoritarian Georgian Dream Coalition (GDC) candidate has a strong and statistically significant negative effect on the size of the 2016 districts. The results suggest that the districts where the GDC had more support were made smaller, with high levels of support split between multiple districts. It should be noted that redistricting was especially needed in Tbilisi and larger cities, where the GDC was strong. Hence, this analysis only suggests that while the redistricting may have given the Georgian Dream an advantage, redistricting in many of the districts which give an advantage to the incumbent party was likely to happen in some form anyway.

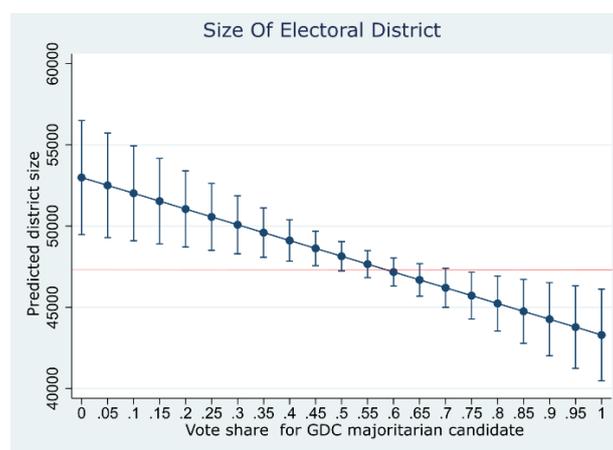


Figure 5 Predicted margins of regression models

Based on these analyses, we conclude that short-term political advantage may have been considered in designing the new electoral system. As the electoral system continues to be reformed after the elections, we recommend that:

- The Parliament and Government of Georgia commit to full transparency in the reform process.

### *Representation of Ethnic and Religious Minorities in Parliament*

The new districts are likely to result in lower representation of minorities in parliament. While the initial draft of districts featured separate single-member seats for Ninotsminda and Akhalkalaki municipalities, both with predominantly Armenian populations, the two municipalities were merged together in the final proposal. Three municipalities in upper Adjara, where more than half of the population is Sunni Muslim,<sup>10</sup> have only one majoritarian representative in the new electoral districts. Given that the new electoral system is likely to reduce minority representation in Parliament, as the government moves forward in reforming the election code following the elections, we recommend that

- The government enacts legislation which will incentivize parties to include minorities on their electoral lists.

This section has reviewed a number of the likely effects of the electoral redistricting on the 2016 electoral outcomes. Specifically, we have shown that the new districts are a dramatic improvement over the older districts insofar as they defend the principle of one person one vote. However, our analysis also suggests that the districts may have been drawn with short-term political goals in mind. Moreover, the new districting is likely to result in lower levels of representation of ethnic and religious minorities in Parliament.

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<sup>10</sup> According to 2014 national census, 62% of Keda, 75% of Shuakhevi and 95% of Khulo municipality residents are Muslim.

## *Logical inconsistencies in voting records*

For the 2016 elections, CRRC-Georgia will test election records for logical inconsistencies in the way election precincts report the vote in their election protocols. This section presents a number of logical inconsistencies that were present in 2012 regarding the recording of election statistics in the 2012 proportional list elections. Specifically, it compares the number of voters who turned out to the polls and compares it to the number of votes recorded and invalid ballots combined. It then looks at whether turnout, as provided for in official statistics, decreased over the course of the election day. After that, it looks at how many voters signed for a ballot per minute. Finally, this section looks at the large number of logical inconsistencies in the recording of votes in foreign precincts. This analysis is presented with the goal of encouraging the Central Election Commission to test for and report on the causes of these logical inconsistencies in 2016.

### **Extra signatures and too few signatures on election protocols**

In data received from the Central Election Commission (CEC), there are a significant number of precincts in which the number of voters who came to the polls and signed the voter list do not match up with the number of votes recorded for a party and the number of invalid ballots added together. If all signatures reflect a ballot cast, subtracting the number of recorded votes and invalid ballots from the total number of signatures should equal zero. A non-zero figure may indicate issues with the recording of election statistics and potentially malfeasance.

From the 3,680 precincts which had ten votes or more:

- 936 precincts had more or less signatures than votes and invalid ballots (25% of all precincts);
- Of these, 918 had more signatures registered than votes recorded for a party or ballots registered as invalid combined;
- 18 precincts had fewer signatures than votes registered for a party and invalid ballots combined;

These phenomena likely have numerous causes. While some are problematic, others are benign.

### ***More signatures than recorded votes and invalid ballots***

To start with the 918 cases of fewer votes registered for a party or invalid ballots than signatures recorded, the severity of the issue varies widely. In order to provide some sense of the severity, we have grouped precincts by the number of extra signatures into three categories: unlikely to be problematic (1-9 extra signatures), potentially problematic (10-49 extra signatures), and suspicious (50 or more extra signatures). Table 1 presents the number of precincts that fall into each category:

Table 1.

	Unlikely to be problematic	Potentially Problematic	Suspicious
# of Precincts	816 (89%)	56 (6%)	46 (5%)
Count foreign	0	4	42

As the table shows, the vast majority of instances of extra signatures are unlikely to be problematic, and only 11% of the 918 districts seem to have a potentially problematic or suspicious number of surplus signatures. The second row of the table notes how many cases are in foreign precincts, because a large share of the suspicious counts are in foreign precincts.

Among domestic precincts, there are four suspicious precincts with more than 50 extra signatures. In Marneuli's 22<sup>nd</sup> precinct, there were 51 extra signatures. In Khashuri's 32<sup>nd</sup> precinct, there were 63 extra signatures. In Gori's 63<sup>rd</sup> precinct, there were 71 extra signatures, and in Bolnisi's 62<sup>nd</sup> precinct, there were 87 extra signatures.

There are a number of likely explanations for this issue. Specifically, voters may have come to the polls and:

- Signed the voter list and left without voting;
- Voted only in the majoritarian race rather than in both the proportional and majoritarian races;
- Precinct electoral commissions may have inaccurately recorded votes, invalid ballots, and/or signature counts.

A number of other, more problematic explanations are also possible. However, we believe that in most of the “unlikely to be problematic” precincts and “potentially problematic” precincts, it is likely that voters only voted in the majoritarian race rather than in both the proportional and majoritarian races or signed the voter list and left without voting. In the suspicious domestic cases however, inaccurate voting records are a possible cause. While these issues do not appear to have had a significant effect on the 2012 returns, they should be taken into account in order to ensure public confidence in the results of the elections.

### ***Less signatures than recorded votes and invalid ballots***

With regard to there being more votes than signatures, this is clearly more of a problem than in instances of there being more signatures than votes. It is more problematic because the potential explanations for the discrepancy are less benign. Potential explanations for this include:

- Precinct electoral commissions may have incorrectly counted or reported vote statistics;
- Voters were allowed to vote without signing the voter list;
- Ballot box stuffing occurred.

In 18 precincts, there were more votes recorded in the proportional races than signatures for ballots. Given that this issue is more problematic, we classify precincts as either potentially problematic (0-9 extra votes) or suspicious (10+ extra votes).

In total, only one precinct – Gori's 70<sup>th</sup> precinct – qualifies as suspicious. However, the number of excess ballots over signatures is rather large: the precinct recorded 196 signatures less than invalid ballots and votes recorded combined. The high number of recorded invalid ballots (221) accounts for the number, however. This could indicate the prevention of a large-scale fraud by the precinct electoral commission, the disenfranchisement of a large share of voters in the precinct, or a clerical error on the PEC's behalf. In the remaining 17 cases, we suspect that the missing signature(s) were the result of a recording error.

Although we are not aware of the cause in any specific case regarding a higher number of votes and invalid ballots than signatures in 2012, the Central Election Commission and Election Monitors should be aware of this issue. We recommend that election monitors, District Election Commissions, and the Central Election Commission:

- Closely monitor precinct level election returns as they come in to ensure that there are at least as many signatures as votes recorded for parties and invalid ballots;
- Investigate instances where there are more votes and invalid ballots than signatures;
- Amend reporting protocols to include an area where precinct election commission officials can explain any logical discrepancies in the electoral statistics.

### Declining Turnout

A second clear logical inconsistency in the official statistics on the 2012 elections is that the number of votes in several precincts declined between 12PM and 5PM, as well as in one district between 5PM and 8PM. That is to say, according to the official record, fewer people had voted at 5PM, in total, compared to five hours earlier at 12PM in these districts. Table 2 presents the districts which saw a decline in recorded votes between 12PM and 5PM.

Table 2

District	Saburtalo	Nadzlisikhevi	Dmanisi	Dmanisi	Akhalkalaki	Mestia	Kobuleti
Precinct	63	44	23	30	48	25	14
Votes between 12PM and 5PM	-1	-159	-19	-58	-40	-43	-210

In Kobuleti 210 fewer votes were recorded at 5PM than at 12PM. In Nadzlisikhevi, there were 159 fewer votes recorded at 5PM than at 12PM. In addition to the declines between 12PM and 5PM, the vote count declined by three votes in Karieli's 35<sup>th</sup> precinct between 5PM and 8PM.

The most likely explanation for this issue is PEC reporting error, with PECs reporting the number of signatures between 12PM and 5PM rather than the total number of signatures for the day at 5PM. Given this fact, we recommend that:

- PEC, DEC and CEC officials should be careful to ensure the accurate recording of electoral statistics;
- DECs and the CEC should ensure that PEC officials have a clear understanding of how to report voter turnout figures.

### Votes per minute

One classic way of detecting electoral malfeasance is looking to the number of votes per minute. If the number of voters that sign for a ballot in under a minute is high, it brings up questions about how it was possible for so many people to vote at one time. In this section we report votes per minute as well as how many seconds it required per

vote in electoral precincts on average. For the purposes of this report, we identify any precinct where more than five people vote per minute, the equivalent of a voter signing for a ballot every 12 seconds. One important caveat to remember when looking at the numbers in this section is that we have not controlled for the number of voter signature desks that were available to voters to sign for ballots at in each district due to a lack of available data.

In the 2012 election, a small number of domestic precincts exhibit quite high rates of voting between 5PM and 8PM. High signature per minute counts and low seconds per vote are provided below for domestic precincts in Table 3. Foreign precincts are covered in the next section of the report.

Table 3

District	Precinct	Votes per minute	Seconds per vote
Mtatsminda	36	5.65	10.62
Vake	27	6.49	9.24
Saburtalo	32	8.73	6.87
Saburtalo	80	6.83	8.79
Saburtalo	35	5.54	10.83
Samgori	83	6.62	9.06
Samgori	84	6.00	10.00
Samgori	77	5.22	11.49
Sighnagi	13	5.39	11.13
Gardabani	33	7.24	8.29
Gardabani	34	6.89	8.70
Khashuri	32	5.32	11.29
Kutaisi	6	7.30	8.22
Senaki	15	7.38	8.13
Batumi	15	6.27	9.57

The vast majority of the above precincts contain special precincts, which is the likely source of the high rates of voter turnout. However Sighnagi's 13th Precinct and Khashuri's 32nd precinct do not contain special precincts. In both cases, elections were held again after the election due to irregularities on election day.

### Foreign precincts

Georgia has a substantial diaspora, and Georgian citizens residing abroad retain the right to vote in the proportional party list elections. Foreign precincts in Georgia have particularly troublesome official election statistics. In total, there were 46 foreign precincts with votes recorded in 2012, and all 46 reported problematic statistics. Given the severity of the issue, we have dedicated a special section of the report to issues with voting statistics in foreign precincts.

In every foreign precinct, there were more signatures than votes recorded and invalid ballots combined. In some cases, the numbers were particularly high, with several thousand more signatures than votes recorded. In total, there were 33,142 more signatures than votes recorded and invalid ballots combined in foreign precincts

according to the CEC’s official statistics. This equates to 1.5% of the total number of recorded signatures in the 2012 parliamentary elections. Over 80% of signatures in foreign precincts did not result in a cast vote or invalid ballot, according to the data set provided by the CEC.

We strongly suspect that this issue was caused by a clerical error during data entry. Again, while malfeasance does not appear to have occurred, this issue again reaffirms that the CEC should carry out logical checks of the protocols it receives in order to ensure the accuracy of voting records.

When it comes to the number of signatures recorded per minute, there were also extremely high numbers between 5PM and 8PM in many foreign districts. This high level of turnout is probably related again to the data entry error noted above. However, the 2012 elections were held on a Monday, and since Georgians abroad are likely working, it is intuitive that the majority would choose to vote between 5PM and 8PM. However, a number of precincts stand out for having improbably high turnout rates during this time period, above ten voters per minute (i.e. more than one voter every six seconds). Table 4 presents the results.

Table 4

Precinct	Votes per minute between 5PM and 8PM	Seconds per vote
Baku, Azerbaijan	13.03	4.60
New York, USA	13.8	4.35
Berlin, Germany	13.49	4.45
Athens, Greece	17.28	3.47
Athens, Greece	17.08	3.51
Thessaloniki, Greece	19.99	3.00

In Thessaloniki, there was an improbably high turnout rate of 20 voters per minute between 5PM and 8PM, meaning that one voter signed the voters’ list every three seconds. In Baku, New York, Berlin, and both precincts in Athens, comparably high turnout per minute figures are present. Again, this is likely related to the probable data entry error in foreign precincts.

Finally, in Kiev, Ukraine there were 120 signatures fewer registered at 5PM compared to 12PM. As mentioned in the previous section, this could be a clerical error.

Given the significant number of logical inconsistencies in foreign district statistics in 2012, we recommend that:

- Election staff working in foreign precincts be given extra training in how to properly record voting statistics;
- The CEC keeps a close eye on reporting and data entry in foreign precincts during the elections to ensure the proper recording of votes;
- Election observation organizations consider providing election observers to foreign precincts. Notably, this extra observer would be relatively inexpensive

for international observation missions to provide compared to providing observers in Georgia due to the lower travel costs of monitors.

## *Statistical anomalies in the data*

Direct observation of polling stations is the best method available to ensure the accuracy of the vote, however, election observers cannot be everywhere all the time. Given this fact, a number of statistical tests have been developed to test for statistical anomalies in election returns, which may suggest suspicious election-related activity. This section first provides an overview of these methods and then reports the outcomes of these tests as carried out on the 2012 parliamentary election proportional list voter statistics. Even though election monitors cannot be everywhere, by testing all districts using precinct level data, there is still a form of observation ongoing. We hope this will discourage malfeasance in the 2016 elections. Rather than attempting to focus on the past, here we only intend to demonstrate how the methods CRRC-Georgia will use to test the results of the 2016 parliamentary elections work in practice.

### *Methods in Election Forensics*

Election forensics has developed as a field over the last twenty or so years as a discipline within political science. In recent years, a number of more complex methods have emerged, particularly through the work of University of Michigan professor, Walter Mebane. However, rather than using these more complicated statistics, which are relatively difficult to communicate, we choose to focus on a number of simpler tests. Specifically, we use tests based on the distribution of the second digit in the votes cast, the final digit in the votes cast, and distribution of turnout within an electoral district.

Second digit tests are based on Benford's law<sup>11</sup>. Benford's law<sup>12</sup> provides the expected probability of the first digit being any digit one through nine in a number with multiple digits. Although one might expect this number to be equally likely to be any number, in fact 1 is more likely than 2, 2 more likely than 3, etc. Using Benford's Law, accountants test various documents for anomalies that may suggest issues in documents.<sup>13</sup> This law also applies to the second digit in a number, which researchers have found is more suitable for testing election results. A similar logic is applied to elections as in accounting, and in this report, we specifically test whether the skew,<sup>14</sup> kurtosis,<sup>15</sup> and the average of the second digit and its distribution follows the expected distribution or not.<sup>16</sup> Instances of non-conformity to Benford's law may suggest electoral malfeasance.

Besides second digit tests, a number of tests have been proposed for the last digit in vote counts. Here, the expected distribution of digits is much more intuitive, and one expects each digit, zero through nine, to be approximately 10% of the total distribution.

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<sup>11</sup> See Mebane and Hicken, 2015. Available at: <http://www.personal.umich.edu/~wmebane/USAID15/guide.pdf>

<sup>12</sup> Benford, Frank. "The Law of Anomalous Numbers." *Proceedings of the American Philosophical Society* 78, no. 4 (1938): 551-72. <http://www.jstor.org/stable/984802>.

<sup>13</sup> Suh, Ikseon, and T. Christopher Headrick. "A Comparative Analysis of the Bootstrap versus Traditional Statistical Procedures Applied to Digital Analysis Based on Benford's Law." Available at: [http://epublications.marquette.edu/cgi/viewcontent.cgi?article=1031&context=account\\_fac](http://epublications.marquette.edu/cgi/viewcontent.cgi?article=1031&context=account_fac).

<sup>14</sup> A measure of the symmetry of a distribution of numbers.

<sup>15</sup> A measure of how wide or slim a distribution of numbers is.

<sup>16</sup> Values for these test statistics are taken from Ikseon and Headrick, 2010.

Based on this distribution, we test the mean of the last digit and of the mean of the count of zeros and fives in the final digits of votes.

In order to test whether the above noted digit tests in fact indicate likely issues or whether the difference between the observed and expected values was a chance variation, we use a statistical method called bootstrapping to estimate 99% confidence intervals. In the present case, the confidence intervals provide a range within which the result could have fallen by chance. If the range covered does not include the expected value for a given test statistic, we conclude with 99% confidence that the number is different not by chance alone.

Finally, voter turnout is expected to have a relatively normal distribution with a single mode.<sup>17</sup> Based on this expectation, we test whether voter turnout in each electoral district has a single mode or multiple modes using what statisticians refer to as a dip test.

For a more detailed guide to these statistics, and their use in election forensics, see Mebane, 2015<sup>18</sup>.

### *Results*

Before reporting the test results, it is worth repeating several important caveats when interpreting these tests.

- Test results are probabilistic, which means that they say the distribution is highly unlikely (would occur 1% of the time in the present case), rather than impossible to occur in the absence of issues. For the tests, we calculated 99% confidence intervals. With 99% confidence intervals and having conducted 444 tests, statistically we would expect between four and five tests to be set off in the absence of issues due to chance alone.
- The lack of a test being set off does not necessarily mean a problem occurred, but it does suggest the need for further examination;

In total, 11 districts show statistical anomalies in the test results, and a total of 15 tests report suspicious results. Results are presented in Table 5. In the rows with district names and numbers, the actual test values are reported. In the row below the district name, 99% confidence intervals are reported. Red cells in the table indicate the presence of a statistical anomaly.

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<sup>17</sup> The most common number (or range of numbers) occurring in a series of numbers.

<sup>18</sup> Available at: <http://www-personal.umich.edu/~wmebane/USAID15/guide.pdf>

Table 5

District (Number)	Skew (Expected Value = 0.133114)	Kurtosis (Expected Value = 0.133114)	Last Digit Mean (Expected Value = 4.5)	Zero Five Count Mean (Expected Value = 0.2)	Mean of second digit (Expected Value = 4.18730)	Unimodality test (Expected Value = Greater than 0.05)	Suspicious test results
Vake (2)	0.06955028	-1.536138	4.576923	0.141026	3.769231	0.3135	1
	-0.3865, 0.5329	-1.852, -1.301	3.815, 5.342	0.0398, 0.2431	2.854, 4.689		
Saburtalo (3)	0.686175	-1.081396	4.58427	0.269663	2.775281	0.9902	1
	0.1751, 1.1898	-1.986, -0.271	3.826, 5.341	0.1489, 0.3894	1.920, 3.623		
Rustavi (20)	-0.3781824	-1.014678	5	0.172414	5.310345	0.004866	3
	-0.7760, 0.0149	-1.579, -0.505	4.231, 5.767	0.0675, 0.2771	4.545, 6.078		
Bolnisi (23)	-0.4295336	-0.8317933	4.596774	0.177419	5.241935	0.982	2
	-0.9161, 0.0383	-1.5710, -0.1360	3.700, 5.501	0.0516, 0.3027	4.432, 6.051		
Kareli (33)	-0.04800687	-1.493068	4.74359	0.076923	4.487179	0.955	1
	-0.6604, 0.5667	-2.036, -1.105	3.650, 5.844	-0.0342, 0.1877	3.200, 5.774		
Akhaltikhe (37)	-0.03753088	-1.125344	5.529412	0.058824	4.676471	0.2011	1
	-0.6479, 0.5503	-1.825, -0.539	4.327, 6.729	-0.0457, 0.1635	3.495, 5.848		
Adigeni (38)	0.9999353	-0.619113	2.823529	0.352941	2.882353	0.9564	1
	-0.3706, 2.3046	-5.4081, 3.2969	1.313, 4.338	0.0564, 0.6496	1.193, 4.570		
Vani (53)	0.06473582	-0.8763374	5.032258	0.225807	5.387097	0.8886	1
	-0.5816, 0.6828	-1.8422, -0.0053	3.642, 6.427	0.0336, 0.4204	4.373, 6.393		
Senaki (64)	-0.1734592	-1.089749	5	0.255814	5.395349	0.6876	1
	-0.7769, 0.4027	-1.840, -0.383	3.701, 6.292	0.0848, 0.4269	4.447, 6.348		
Martvili (65)	-0.4315549	-1.122544	3.710526	0.078947	5.131579	0.7918	1
	-1.0315, 0.1741	-2.241, -0.195	2.709, 4.713	-0.0344, 0.1922	3.899, 6.362		
Kobuleti (81)	-0.427176	-0.8347655	4.630769	0.2	5.323077	0.3885	2
	-0.8792, 0.0069	-1.5515, -0.1732	3.658, 5.604	0.0705, 0.3284	4.484, 6.162		

Rustavi's electoral returns set off three statistical tests. Given that we have no reason to expect specific voting patterns in Rustavi compared to other areas in the country that did not set off suspicious test results, this suggests that there may have been electoral malfeasance in Rustavi in 2012. Reviews of election monitoring reports,<sup>19</sup> however, did not suggest electoral malfeasance. This test may be picking up on undetected electoral malfeasance from 2012 in Rustavi. Although unlikely, these three tests could have also been set off by chance.

In Kobuleti, two tests were also set off. In Kobuleti, we would not expect a particularly distinctive voting pattern. Hence, there is relatively strong reason to believe that electoral malfeasance may have occurred in Kobuleti in the 2012 elections. This contention is supported by election monitoring reports, which reported issues in Kobuleti.<sup>20</sup>

In Bolnisi, two tests were set off. Complaints were filed in Bolnisi on election day, and the test may have been set off by these issues. However, given Bolnisi's relatively high ethnic minority population and distinctive voting pattern, the tests could have been set off by this rather than malfeasance.

Eight other districts had single positive tests for electoral malfeasance, including Vake, Saburtalo, Kareli, Akhaltsikhe, Adigeni, Vani, Senaki, and Martvili. A review of the OSCE<sup>21</sup> and GYLA<sup>22</sup> election monitoring reports suggest that issues may have occurred in at least half of these districts. Although these positive tests could have occurred by chance alone, the four districts in which a test was set off and observers did not report malfeasance in may also suggest unreported problems in the 2012 elections.

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<sup>19</sup> See <http://www.osce.org/odihr/98399?download=true>. and [https://gyla.ge/files/news/gamocemebi2012-2013/Monitoring%20Report%20of%20Parliamentary %20Elections%202012.pdf](https://gyla.ge/files/news/gamocemebi2012-2013/Monitoring%20Report%20of%20Parliamentary%20Elections%202012.pdf)

<sup>20</sup> *ibid*

<sup>21</sup> *ibid*

<sup>22</sup> *ibid*

## *Conclusions and Recommendations*

This report has provided an overview of the likely impact of the new electoral boundaries on the 2016 elections and demonstrated how the tests which CRRC-Georgia will use to monitor the elections work in practice. Based on our analysis of the new electoral districts and official election statistics from 2012, we have developed a number of short term recommendations for the Central Election Commission and election monitors based on the above findings, as well as a number of medium term recommendations for the Government and Parliament of Georgia:

To the Central Election Commission, we recommend that:

- In trainings for District and Precinct Election Commissions, particular emphasis be placed on how to fill out the election protocols, on different inconsistencies that could occur, and what to check to see if it is an actual inconsistency or a clerical error;
- Logical tests of the consistency of protocols be tested as they are reported. Specifically they should test for:
  - Whether the number of votes recorded at 5PM is higher than the number of votes recorded at 12PM and at 8PM compared to 5PM;
  - Whether the number of signatures recorded per minute exceeds one voter every 15 seconds per desk which is available for voters to sign for a ballot at;
  - Whether the number of signatures recorded is higher than or lower than the number of votes cast and invalid ballots together.
- In instances when any of these numbers show logical inconsistencies, we suggest that district electoral commissions inform election monitors and seek information from Precinct Election Commissions about the discrepancies. Election monitors should be allowed to observe any conversations between the PEC in question and its DEC and the CEC;
- Election protocols should be amended to include a space for reporting why logical inconsistencies are present.

To election monitoring organizations, we recommend that:

- Observation organizations should consider sending election monitors to observe the vote in foreign precincts. Notably this additional observer would be of a much lower cost than other observers for international observation organizations, since travel costs will be significantly lower for monitors.

In the medium term, to the Government and Parliament of Georgia, we recommend:

- Considering transferring to either an electronic voting system or an electronic voting system with a paper copy backup;
- Ensure the transition to a proportional voting scheme for the 2020 parliamentary elections. It will also likely result in fewer wasted votes and a Parliament more representative of the popular will, and could end a great number of allegations of political manipulation of the election system in the future;

- Incentivize political parties to represent women, ethnic and religious minority groups in the party lists. In the past, candidates from single-member districts have been mostly male and ethnic Georgian. The majoritarian system inherently disfavors vulnerable and minority groups. From the reform, ethnic and religious minorities have lost several majoritarian districts in Samtskhe-Javakheti and Upper Adjara. Consequently, this loss should be compensated through the party lists.
- Commit to the transparency of the reform of the electoral process