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COMPLEXITY SCIENCE HUB VIENNA

POLICY BRIEF

Forensic analysis shows signs of election fraud in Turkey

SUMMARY.

Concerns about the integrity of Turkey's elections have increased with the recent transition from a parliamentary democracy to an executive presidency under Recep Tayyip Erdogan. Election forensics tools are used to identify statistical traces of certain types of electoral fraud, providing important information about the integrity and validity of democratic elections. Such analyses of the 2017 and 2018 Turkish elections revealed that malpractices such as ballot stuffing or voter manipulation may indeed have played a significant role in determining the election results. Here, we apply election forensic statistical tests for ballot stuffing and voter manipulation to the results of the first round of the 2023 presidential election in Turkey.

*We find that the **2023 elections exhibit similar statistical irregularities to those observed in the 2018 presidential elections**, however the magnitude of these distortions has decreased. We estimate that 2.4% (SD 1.9%) of electoral units may have been affected by ballot-stuffing practices in favour of Erdogan, compared to 8.5% (SD 3.9%) in 2018. We also find that areas with few and smaller polling stations had significantly inflated vote and turnout numbers, again, in favour of Erdogan. Our results suggest that Turkish elections continue to be riddled with statistical irregularities, which may be indicative of electoral fraud.*

THE 2023 PRESIDENTIAL ELECTION. BACKGROUND.

The first round of the 2023 presidential election was held on 14 May 2023 and pitted incumbent President Recep Tayyip Erdogan of the Justice and Development Party (AKP) against opposition candidate Kemal Kilicdaroglu, who led an alliance of six opposition parties. The election was seen as the first real threat to Erdogan's presidency in a long time, as Turkey was reeling from a prolonged economic crisis with inflation rates of up to 85% and the aftermath of devastating earthquakes in February 2023 that killed more than 50,000 people, coupled with public outrage at the government's slow response to these crises [1]. Despite polls to the contrary, Erdogan won by a healthy margin over Kilicdaroglu with 49 per cent to 45 per cent of the vote, sending Turkey into a run-off between the two candidates on 28 May.

While elections in Turkey are generally considered to be free and fair, the playing field is clearly not level. For example, according to Turkish media monitoring, Erdogan received almost 33 hours of airtime on the main state television channel, compared to 32 minutes for Kilicdaroglu [2]. These and other imbalances became possible after Erdogan transformed Turkey from a parliamentary democracy to an executive presidency following a 2017 referendum in which a reform package narrowly won. That election, however, was marred by allegations of fraud, as unverified videos and reports emerged on social media showing various forms of electoral malpractice, such as ballot stuffing (casting multiple

votes for one candidate) and voter coercion (preventing potentially opposing voters from casting their ballots) [3,4]. Also practices such as handing out cash to supporters have been reported [5].

In a forensic analysis of the 2017 election, we confirmed that the election records indeed show specific statistical irregularities that point toward ballot stuffing and voter coercion [6]. More specifically, ballot stuffing, when carried out on a large scale, typically leads to a correlation between voter turnout and the vote for the candidate [7]. Voter manipulation or coercion tends to inflate votes and turnout in smaller or more remote regions, where opponents are easier to identify, and irregularities are less likely to be observed or reported [8].

For the constitutional referendum, we found that 11% of areas were potentially affected by ballot stuffing and that removing the affected influences from the data would have turned the overall vote of the referendum from 'Yes' to 'No'. There were also small but significant traces of ballot stuffing. Similar statistical irregularities were also observed in the 2018 presidential and parliamentary elections.

In this policy brief we ask whether similar forensic patterns are present also in the first round of the 2023 presidential election [9]. In the following analyses, the data consists of 191,860 electoral units (here also referred to as "ballot boxes" or "boxes") for which we consider the size of the electorate (number of eligible voters), the number of valid votes, and the number of votes for Recep T. Erdogan. In applying the ballot-stuffing and voter-rigging tests, all electoral units with an electorate of less than one hundred voters are excluded to rule out that the results are driven by small-number artefacts. That reduces the number of used electoral units to 180,3013. The number of valid votes divided by the size of the electorate is called the ‘turnout’, the number of votes divided by the valid votes is called the ‘vote share’.

RESULTS.

The cumulative percentage of votes for Erdogan is shown as a function of turnout in Figure 1. For each turnout level (x-axis), the share of votes from boxes with that turnout level or lower is shown on the y-axis. In 2018, the share of votes exceeds the 50% threshold only if we include voting boxes with turnout of more than 90%. In 2023, we observe a similarly shaped curve with an overall higher turnout (the curve is shifted to the right) but without crossing the 50% threshold.

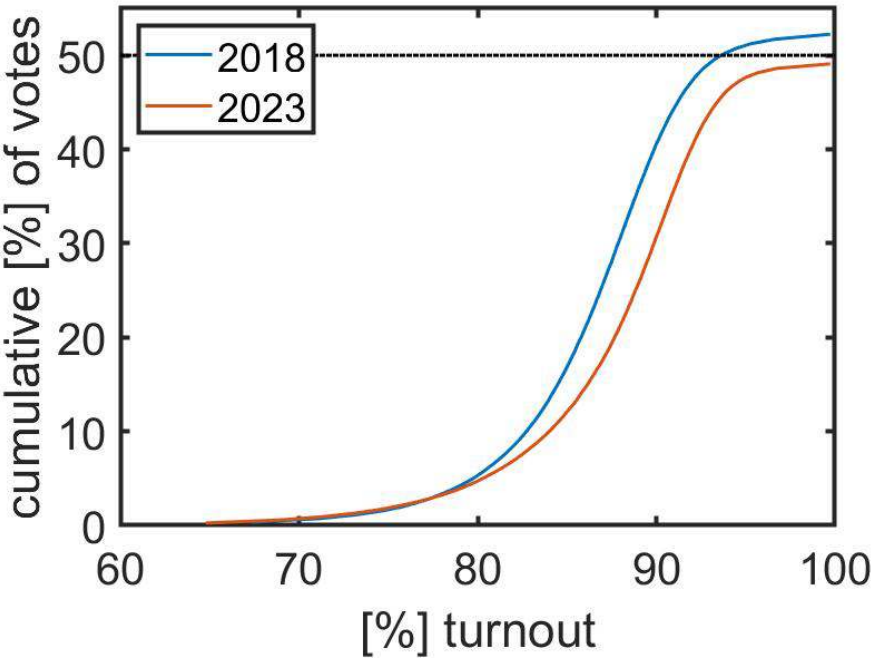

Figure 1: *Votes for Erdogan as a function of voter turnout for 2018 and 2023. For a given turnout level, the cumulative vote share of ballot boxes with this or lower turnout is shown. In 2018, a majority of more than 50% is achieved by including boxes with a turnout of more than 90%. In 2023 (red line) we observe similar characteristics with higher turnout and lower vote shares (below 50%).*

Ballot stuffing test. In Figure 2, we test for the presence of electoral malpractices that lead to vote-turnout correlations (such as ballot stuffing) using so-called electoral fingerprints, i.e., a 2-d histogram of the vote-turnout distribution. The fingerprint for the 2023 Turkish presidential election is shown in Figure 2(A). The colour intensity (blue) indicates the number of boxes with the corresponding percentage of votes (x-axis) and turnout (y-axis), together with a box plot of the distribution of turnout for a given percentage of votes. If there were no non-linear correlations between votes and turnout, the bulk of the distribution in Figure 2(A) should be circular or elliptical symmetric. Malpractices such as ballot stuffing would inflate turnout and simultaneously increase vote shares, breaking the elliptical symmetry in the fingerprints if the number of affected boxes is large enough.

Considering the region of high voting and turnout, in both 2023 and 2018 we see a smearing of the bulk towards inflated votes and turnout, towards values of 100% votes for Erdogan and 100% turnout. To assess whether such deviations between symmetric and biased fingerprints are statistically significant, we run a parametric test that was proposed previously [6]. This model is designed to test if the observed deviations from the normal distribution in vote and turnout shares can be better explained by a model where ballot stuffing occurs in a given fraction of ballot boxes (fraud parameter 'f'). To fit and evaluate this statistical model, we follow a previously described strategy [6] and further restrict the analysis to boxes with a vote and turnout share of more than 25%.

For 2023 we find a fraud parameter of f=0.024 with a standard deviation (SD) of 0.019. For 2018 we find higher values with f=0.085(SD 0.039). Therefore, the test suggests that the number of ballot boxes affected by such statistical irregularities has decreased from 2018 to 2023, to a point where the ballot stuffing test does not detect statistically significant effects.

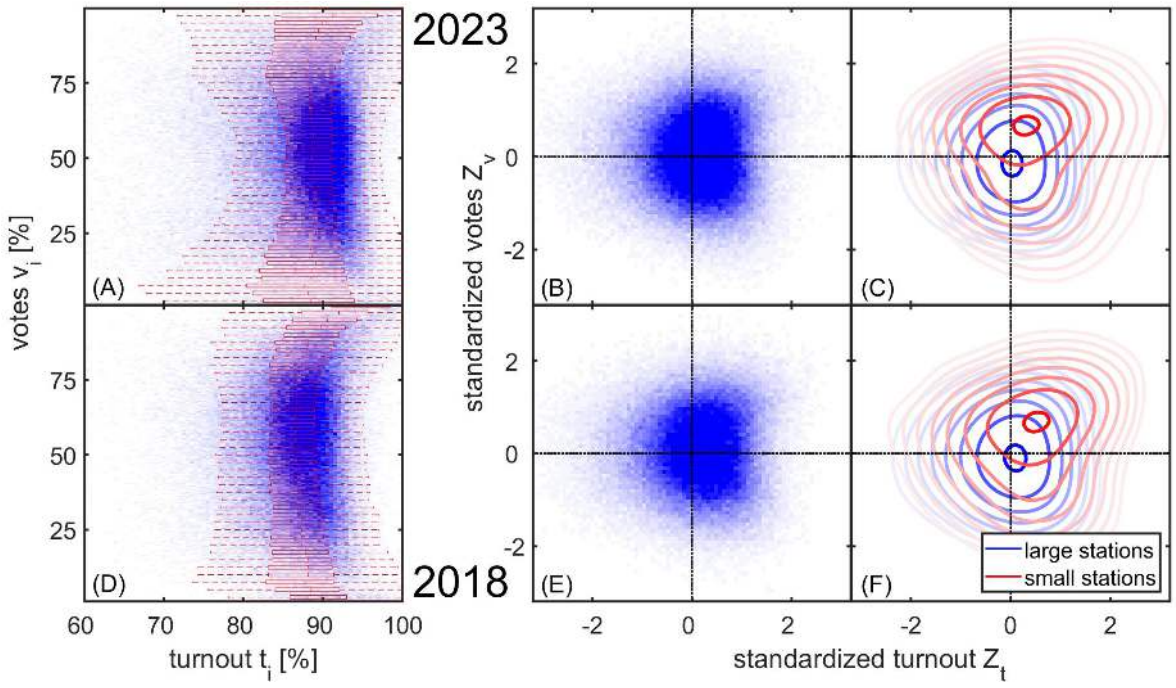

Figure 2: *Forensic electoral fingerprints for the 2018 and 2023 presidential elections. The fingerprints for (A) 2023 and (B) 2018 show joint vote-turnout distributions with color intensity encoding the number of ballot boxes with a given vote (y-axis) and turnout (x-axis). For both elections, we find a visible correlation in the region of high vote and turnout (e.g. more than 80%), which can be associated with ballot stuffing. A box plot (red horizontal boxes) shows the 25th, 50th and 75th percentiles of voter turnout as a function of votes (whiskers indicate the 95% confidence interval). (C) To adjust for regional characteristics, the fingerprints can be adjusted by rescaling the vote and turnout shares by their typical levels in the unit's region, resulting in the standardised fingerprint shown. (D) Traces of voter coercion can be identified by comparing the standardised fingerprints of small (red lines) and large (blue) units, as voter coercion results in their being shifted towards inflated votes and turnout, as observed here. (E,F) The 2018 standardised fingerprints are similar to those of 2023.*

Voter rigging test. The fingerprints shown in Figure 2(A) and (D) may also show deviations from elliptical symmetry due to geographical effects. To account for such effects, it has been suggested to compare the unit with other units in close geographical proximity [8]. Here, we compare the vote and turnout figures of a polling station with the averages observed in other polling stations in the same constituency. We refer to these rescaled vote and turnout shares as standardised votes and turnout, respectively. We call their joint distribution (2D histogram) the 'standardised fingerprint'.

Standardised fingerprints are shown in Figure 2(C) for 2023. For the voter coercion test, we ask whether small and large units have different standardised fingerprints. The underlying hypothesis of this test is that coercion is more likely to occur in smaller units because they are more susceptible to coercion tactics. Reasons for this include that (i) it is easier to identify opponents in smaller units, (ii) fewer eyewitnesses can be expected, and (iii) election observers are less likely to be present. In line with these assumptions, voter manipulation suggests that the standardised fingerprints of small units are biased towards increased voting and turnout compared to larger units.

We use different definitions of "small units". Figure 2(B) shows the standardised fingerprints for small (red) and large (blue) units, where small units are those in the lowest p=10th percentile of all units. It can clearly be seen that the fingerprints for small units are shifted towards the upper right corner, see

Figure 2(C), which is consistent with voter manipulation. For the 2018 presidential election, we found almost identical standardised fingerprints, see Figs. 2(E) and 2(F).

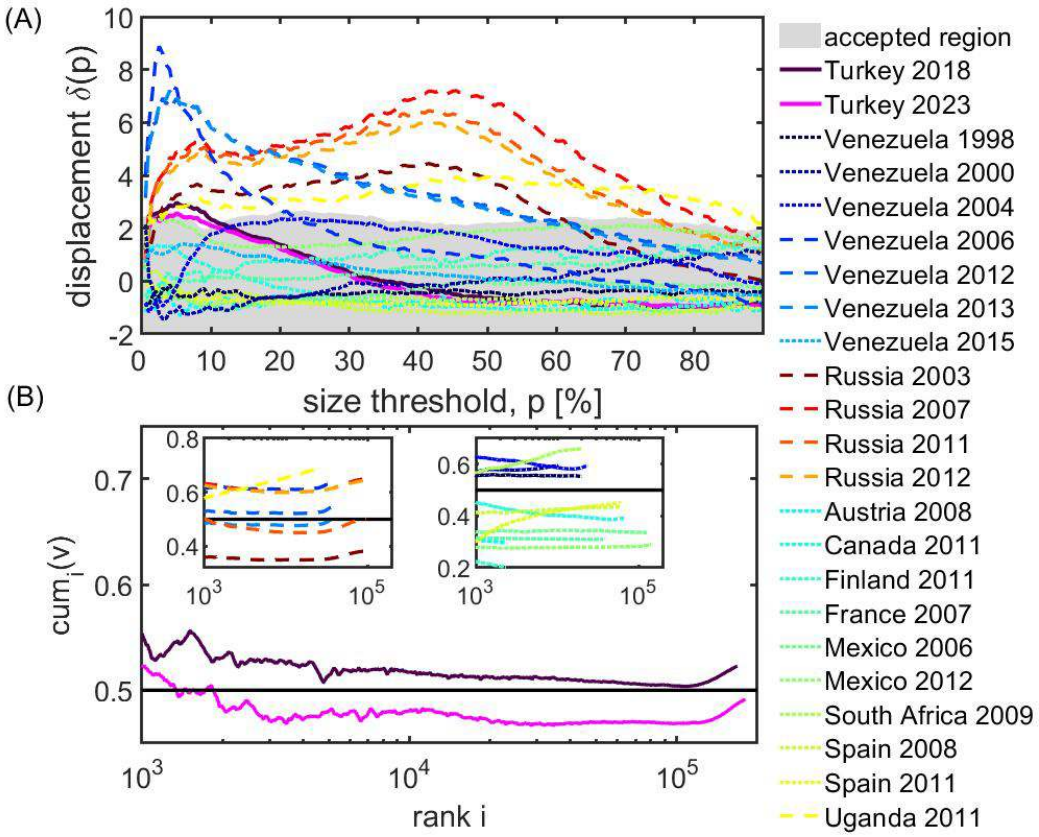

Figure 3: *Results of the statistical test for voter manipulation. (A) The displacement δ(p) between small and large units for the 2023 (solid dark magenta line) and 2018 (solid light magenta line) elections is very narrowly outside the accepted range for a restricted set of size thresholds. These displacements are much smaller displacements in the Russian or Venezuelan elections (dashed lines); the reference elections are shown as dotted lines. (B) Units in the 2023 and 2018 Turkish elections are ranked according to their electorate size. We show the cumulative vote share, cum$_i$(v), calculated over all units with a size greater than the given rank. As in 2018, we observe a characteristic 'hockey stick' in 2023, meaning that units with high rank (low electorate size) show a clear tendency to favour Erdogan.*

The magnitude of the displacement between the average standardised votes and the turnout of small and large units depends on the size threshold p and is denoted by δ(p), see [6,8] for methodological details. To assess whether this shift is statistically significant, we apply the Jimenez et al. voter rigging test [8]. The idea behind this test is to estimate the expected shifts between small and large units based on a reference set of trustworthy elections, yielding a range of "acceptable shift sizes". We obtain this acceptable region from 21 different reference elections in ten countries, see [6,8]. For a given election, one can now check whether the actual observed displacement between small and large units for a size threshold p lies within this region (‘accepted region’) or not.

The displacement, δ(p), is shown in Figure 3(A) for the reference set of elections (solid lines), the elections in Russia and Venezuela (dashed line) next to the 2023 (solid magenta) and 2018 (solid black) Turkish elections. For small size thresholds, p, both Turkish datasets show shifts that are slightly

outside the acceptable range. This indicates statistically significant signs of voter manipulation, however, only for a limited region of thresholds. The shifts in 2023 are slightly smaller than in 2018.

To assess the potential impact of these voter rigging effects in the data, we rank the units by their electorate size in descending order and calculate the vote share over all units with smaller ranks (higher electorate size), see Figure 3(B). In this plot, voter manipulation takes the form of a "hockey stick", i.e., a sharp increase for the smallest units. This signal is also found in Russia and Venezuela, but is absolutely absent in the reference elections, see the insets in Figure 3(B).

To further show the bias in small units in 2023, we compare the fingerprint observed in all units with an electorate size larger than 100, Fig. 4(A), with the fingerprints of two different definitions of "small". First, we consider only boxes with an electorate of one hundred or less, resulting in 11,689 units, see Fig. 4(B). Alternatively, one can consider only boxes from areas with one or two ballot boxes in total, resulting in 38,662 boxes, see Fig. 4(C). The small units show completely different fingerprints when compared to the large ones. They show a bimodal distribution with a larger mode in the high vote-high turnout region and a smaller mode in the low vote-high turnout region.

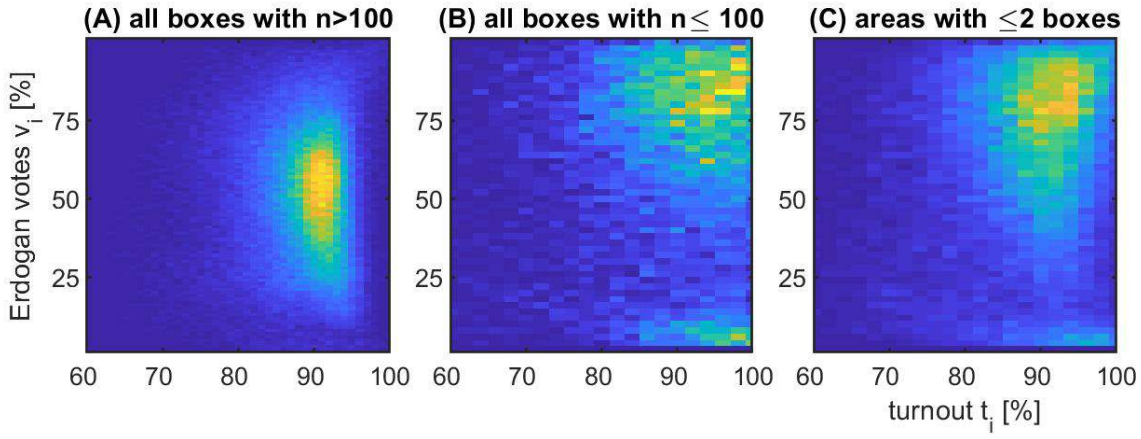

Figure 4: *The fingerprints in 2023 for small units (B,C) show very different patterns than those with an electorate size of more than 100 (A). Considering only areas with an electorate size of less than 100 (B), or alternatively ballot boxes from areas with one or two ballot boxes (C), results in a bimodal distribution with a large mode in the region with very high turnout and votes for Erdogan.*

CONCLUSIONS.

An electoral forensic analysis of the first round of the 2023 presidential election in Turkey identifies statistical irregularities similar to those observed in the 2018 election and the 2017 constitutional referendum. However, the estimated magnitude of these irregularities has decreased in 2023 compared to the 2018 presidential election. For 2023, we observe trends in turnout inflation, as would be expected in the presence of electoral malpractices such as ballot stuffing. However, the percentage of electoral units potentially affected by these distortions has fallen to 2.4% (SD 1.9%), making the results statistically insignificant.

In 2023, we also observe a tendency for areas with small electorates to show different voting and turnout patterns compared to other regions. Such biases are consistent with the presence of voter coercion or intimidation techniques, to which smaller and more remote electoral units are more

susceptible. The effect size of these deviations is statistically significant only by a small margin and for a limited set of size thresholds.

In summary, these results suggest that the presence of certain types of electoral malpractice in the first round of the 2023 presidential election cannot be ruled out. However, in 2023 these malpractices appear to have been less frequent than in 2018 and less decisive in swinging the vote to one side or the other.

ABOUT THE CSH

The Complexity Science Hub Vienna was founded with the aim of using Big Data for the benefit of society. Among other things, the CSH systematically and strategically prepares large data sets in such a way that the effects of decisions in complex situations can be tested in advance and systematically evaluated. In doing so, the CSH provides the foundations for evidence-based policy.

CSH Policy Briefs present socially relevant statements that can be derived from CSH research findings.

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