Fraud or human error in Mexico's presidential election?

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Mexico's recent presidential election put the whole electoral system, from candidates to citizens and authorities, to the test. Soon after election-day, one of the losing candidates and other observers alleged that fraudulent practices of different sorts took place on July 2nd. Beyond and above the use of fraud claims as a political strategy, do these claims hold any water? There are no definitive tests of electoral fraud, but a statistical analysis of polling data from the more than 130 thousand precincts can shed some light on the issue.

Quick count, PREP and the district tally

The statistical consistency between the election results estimated by the quick count, the PREP (a preliminary report system executed in real time right after polls close), and the district-level count (the official tally from IFE computed three days later), all of which pointed in the same direction, constitute the earliest evidence of a reliable election. Why? The quick count, taken from 7,636 voting stations on election-day, could not indicate a clear winner beyond the margin of error. But this count indeed suggested an outcome with a margin smaller than 0.6%, and it also gave PAN's candidate, Felipe Calderon, a slightly higher probability of leading. A few days later, the district count gave him a 0.58% margin of victory (243,934 votes), thus validating the quick count estimate. Clearly, if the official district tally had been too far off from the quick count, either one or the other procedures could be under suspicion.

Since we didn't have a clear winner on the evening of election-day, everybody looked for clues into the PREP minute by minute data flows. The pattern of these data flows, which almost always gave a consistent lead to Calderon, seemed a bit surprising to some and then the "cybernetic fraud" claim was born. As it turns out, such fraud is useless because what matters is the final outcome and not who leads the data flow every hour. Moreover, any manipulation of PREP data would last only 72 hours, just when the official tally would come out.

How come the PREP did not show any "switches" between Calderon's lead and Lopez Obrador if the election was so close? First of all, the PREP is not an entirely random data gathering process based on any sample (as was the case of exit polls and quick counts). Non random factors, such as the urbanization of localities and different time zones affect the time that it takes for the precinct results to reach the 300 district centers that captured these data. So, if urban precincts are captured somewhat sooner than rural ones, and if one candidate leads in urban areas, the PREP data flow will favor such candidate. Calderon led AMLO by 691 thousand votes in urban locations (about 70% of precincts) whereas AMLO

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led him by about 450 thousand votes in rural locations. But urban locations were captured sooner than rural ones, thus producing the observed pattern on the PREP.

Right after the PREP finished, some argued that three millions of votes were missing. The missing votes came from what is know as "inconsistent acts", polling data sheets with errors or important data omissions such as leaving blank the vote tally of one candidate instead of writing a zero. 11,184 such acts where not included in the PREP estimates but were kept in an alternate filing system. All political parties were aware of this procedure but not the public, and perhaps Lopez Obrador's team used this fact to his convenience.

The official district tally (*computo distrital*) took place on July 5th and 6th on the 300 different district counsels that IFE has around the country. It was surprising to some, because in this tally AMLO had the lead for several hours before the reversal of the trends. How come? This tally was even less random than the PREP. In each district, each precinct act (*acta de casilla*) had to be discussed and approved before being computed. If "blue districts" (districts won by PAN) were more heatedly debated than "yellow districts"— since PRD representatives demanded recounts in many of the former districts—then AMLO would lead the tally for a while. This happened to be the case. Instead of an urban bias, the district tally had a politically-induced partisan bias that gave AMLO an advantage that steadily decreased until it reversed to the final outcome.

Arithmetic errors in polling station acts

About a week after the election, the coalition behind AMLO challenged the official district tally from IFE both in Mexico City streets and at the Election Tribunal of the judicial branch (TEPJF). Key sources of concern were the so-called arithmetic errors in polling station acts (*actas de casilla*). The polling station act includes the number of ballots received, used and leftover, as well as the number of citizens that voted and the votes cast for each candidate. Clearly, if any of these fields is miscounted or misreported, the tally sheet will not add up. For instance, if the station received 600 ballots and 400 votes were cast, there should be 400 marks on the voter roster and 200 ballots leftover. If the act has errors it appears to have more or less votes with respect the number of citizens that voted, or with respect the number of ballots received minus those leftover.

Where do these errors come from? It is worth noting that Mexicans vote on paper ballots that are counted by four fellow citizens, who are chosen at random to serve as polling station officials. These citizens install the station and count as many as 2,250 paper ballots for the three elections held that day: president, senators and deputies. Each station is also monitored by representatives from each political party. Arithmetic errors occur because either the station officials miscount or misreport some ballots, or because voters fail to deposit their ballots in the right box (there are three boxes) or station (some stations are contiguous to others). Until this election, we did not know how large or how often these errors occurred but they are not entirely new. About 46.7% of the acts from the presidential election had some sort of error, whereas in 2000 51.4% of them had similar errors. The average size of these errors is ±4.36 votes, that is, about 1.35% of the votes cast in each station.

Can these errors be decisive for the election outcome? For that to be the case they should be biased in favor or against any of the candidates, that is, they should appear more often in one type of station than another. However, a statistical analysis of the distribution of arithmetic errors indicates that they were as likely to appear in polling stations won by the PAN as well as those won by AMLO's coalition. Moreover, the average size of the errors is the same in either group of voting stations. This suggests random human errors that affect similarly the leading candidates and therefore are not decisive for the election outcome. This is true even if the election had an average margin of victory of 1.8 votes per voting station because what matters is not only the size but also the distribution of errors— and they were found to be randomly distributed.

Recounting votes

Another source of uncertainty, which underlie the demand for a total recount, was whether the polling station act figures truly corresponded with the actual ballots. On this issue, a formal statistical analysis requires that a random or representative sample of precincts were recounted to assess the size and distribution of miscounting errors. Such recount would help to detect the likelihood of fraudulent alterations by station officials, randomly chosen citizens, as it were. The casuistic logic of the Election Tribunal and the very nature of the legal challenges introduced, however, did not produce a recount in a random sample but a recount in a set of challenged precincts.

These caveats aside, the evidence available allows for some partial inferences. During the district tally from IFE, some 2,864 precincts were recounted for a number of reasons; later on, the Tribunal ordered a partial recount in 11,839 additional precincts. In both cases, the precincts recounted were not randomly chosen, which resulted in a biased sample that does not allow for direct extrapolations. For instance, 66.4% of the 2,864 precincts recounted by IFE belonged to "blue districts" while only 33.4% came from "yellow districts". This recount produced fewer votes for each candidate and resulted in a slightly percentage increase in Calderon's vote margin.

If one divides the IFE recount sample into "blue and yellow" districts (that is, districts won by Calderon or AMLO, respectively) an interesting asymmetry emerges. When blue precincts were recounted, Calderon lost an average of 4.7 votes per precinct whereas AMLO lost about 1.9 votes, which results in a reduced margin of 2.9 votes between the two leading candidates. On the other hand, when yellow precincts were recounted, Calderon lost an average of 5.8 votes per precinct whereas AMLO lost 13.3 votes, which yielded an increase in the margin of victory of 7.5 votes in favor of Calderon.

This seems to indicate a number of tentative findings. First, when precincts are recounted both candidates lose votes, but the candidate with the most votes in a given precinct will lose relatively more votes after the recount. Secondly, random errors may cancel out in a random sample but not necessarily in a biased sample. Thirdly, a recount in a biased sample will produce a biased adjustment of the vote tally, which cannot be extrapolated directly to a larger recount. This means that further analysis of any of the recounts of this election should be interpreted with caution.

As of the date I write this, there is no precinct by precinct information on the results of the 11,839 precincts recounted by the Tribunal. However, we know that this sample was more biased than that of the IFE recount. 91.4% or 10,818 precincts recounted came from blue districts and only 8.6% or 1,021 came from yellow districts. Since we also know that Calderon led AMLO by an average of 76.5 votes in blue districts, it was possible to predict that the Tribunal recount would result in a decreased vote margin for Calderon without reversing the final outcome. This is what occurred in the final and definitive tally of September 5th, were the margin of victory decreased from 0.58% to 0.56%. On any event, if these recounts had produced a systematic or relatively large change in the vote tally, they would suggest some sort of fraud, but this was not the case.

Were atypical precincts decisive?

It has been argued that the criteria used by the Tribunal to annul precincts with "determinant errors" only (that is, only when the error found was larger or equal to the margin of victory of the precinct under study) amounts to ignore errors that could decide the election outcome in the aggregate. Statistically, one could apply stricter rules to precincts with errors and analyze the hypothetical results.

For instance, if not only some but all the precincts with arithmetic errors are eliminated from the tally, it turns out that the winner remains to be Felipe Calderon with an even larger margin of votes. Secondly, if we eliminate all the precincts with turnout higher than 75% (the national average was 58%) from the final tally, which implies removing as many as 4,555 precincts, it turns out that Calderon still leads but with a smaller vote margin. If the election outcome is robust to excluding precincts with errors or with high turnout, one concludes that those precincts were not decisive. Clearly, the Tribunal cannot and does not apply any such criteria without a case by case basis evidence or justification—its mission is to preserve as many votes as possible, not to cancel them without reason.

Final remarks

To summarize, statistical analysis of precinct-level data from the 2006 Mexican presidential election suggests that cybernetic, arithmetic or miscounting errors were not decisive for the election outcome. Most errors found in the precinct acts seem to be due to random human error. A recount in a representative or random sample would have been desirable to add further confidence to these conclusions, and surely remains an important area for reform.

Finally, it is worthwhile emphasizing that delegating the organization of election-day to randomly chosen citizens is a safe way to ensure impartiality that perhaps comes at the cost of random human error. It may be possible to design mechanisms to reduce errors in counting ballots of filling voting station sheets but we will hardly find a more impartial one. Further reflection and analysis of this presidential election will surely help us to assess the weaknesses and strengths of the electoral system. But it will also put in perspective to what extent some of the fraud accusations had any substance or were just part of a larger political strategy from the runner up.