Malapportionment, party bias, and responsiveness in Mexico's mixed-member system*

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Abstract

Automated redistricting in consultation with parties since 1997 rid redistricting in Mexico of the most flagrant distorsions on representation. But more subtle ones remain. Rules and practice introduce some degree of malapportionment, small in comparative perspective (Samuels and Snyder 2001), but nonetheless substantial. We inspect district maps, votes, and seats in Mexico ~~in search for~~ two forms of political ~~distorsion~~ that may arise from malapportionment: party bias and responsiveness (otherwise known as plurality bias). State-level data reveal no evidence of systematic party bias. What bias there is is of another kind, a big bonus for larger parties (or vote responsiveness) typical of plurality rule in single-member districts. Since most states distribute few seats each, the large party bonus of states' federal districts doubles the estimate with national data. Since the PRI is the largest party in most states, it receives a substantial seat bonus.

Mexico had its first population census in 1900. It has done them every decade since 1920, and every five years since 1990. Such short inter-censal periods offer relatively precise estimates of how many live in boroughs in every corner of a country with still rapidly changing demographics. This official and public data is priceless for planners of all stripes, marketers, and researchers, to name a few.

But not everyone has taken advantage of the data. Redistricters in the last decades are among them, routinely shunning fresh population data availability. Part of their

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Summary of Comments on redMexBias_macomments.pdf

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distortion

reluctance finds explanation in a Constitution mandating the use of decennial censuses, not lustrum population counts, to do their job; with no attempt to estimate population change since the census is published; and, unlike the U.S., no obligation to redistrict as soon as a new census is available. But much of the blame falls on legislators, parties, and electoral regulators who have, to larger or smaller extent, but systematically lagged behind the constitutional obligation to ensure equal representation when updated information has become available.

To get an idea of this, consider that information used to draw a new map for the 1979 congressional was nearly a full decade old upon the map's inauguration. Rural flight was probably at its peak then. That same map had missed nearly 25 years of demographic change when it was last used to translate votes into seats, in 1994. But the problem has carried over to the democratic era. The first map ~~hap~~ after transition was drawn with seven year old ~~dataHad~~ the lustrum count been used instead of the general census, the lag would have dropped to two years. And for reasons discussed below, when the 2015 midterm congressional election takes place, a decade-and-a-half gap will separate the map and actual district populations.

Malapportionment—when sparsely populated areas get the same representation as the more densely populated ones—arises as a consequence. This raises normative questions on the value of a vote in representative democracy (Balinski and Young 2001, Cox 1987, Dahl 1972). But positive ~~quastions~~ are no less important, as malapportionment may bias representative government in important ways. If some party or parties tend to be stronger in the smaller districts, they will enjoy undue influence in policy. With the PRI still playing the role of prize fighter in Mexico's countryside (Ames 1970, Magar 1994), the question of party bias ~~arsing~~ from malapportionment merits closer scrutiny.

This paper starts with a description of the redistricting process in use since 1997. Automated redistricting in consultation with parties rid Mexican districts of the most flagrant ~~distorsions~~ in representation, but problems ~~remian.~~ Next, the paper inspects one such problem: legislative malapportionment. The problem is shown to be substantive and systematic: by our estimates, in 2015 the most populated district will be four times larger than the least populated. The developments that have led to this situation are discussed. We next turn to some of its consequences for representation, with analysis of two distorsions of scholarly interest: party bias and responsiveness (or large party bias). Surprisingly, our estimates reveal no systematic party bias, but responsiveness is huge. In future incarnations, the paper will also relate the party bias and responsiveness estimates to measures of malapporionment, in search of an

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association at the state level. A discussion of how inter-election volatility may trump the effects of malapportionment will also be in order.]

Taking district map drawing out of the hands of politicians ensures a fair redistricting procedure. It does not, as Johnston (2003) notes, necessarily ensure a fair result, however.

1 Malapportionment in a mixed-member system

The lower house of Congress has been elected with a mixed-member system for decades. Such systems give voters a direct role in the election of representatives from single-member districts (SMDs), while also using some form proportional representation (PR) to improve the odds that parties will receive about as many seats as they are worth in votes (Shugart and Wattenberg 2001*a*). Mexican mixed-system rules have changed frequently, but one constant since 1988 has been the relative weight of the SMD and PR tiers, electing 300 and 200 members, respectively (Lujambio and Vives Segl 2008).

It could be argued that malapportionment in mixed-member systems is of little, if any consequence. The PR tier is, after all, specifically designed to compensate for imbalances ensuing from SMDs. This section debunks such claim.

Malapportionment matters in mixed-member systems for three reasons, at least. Compensating *parties* bears relation to, but is not the same as compensating *citizens* of more densely populated districts. Keeping these compensations distinct is important. Much of the evidence presented here, and in the scholarly literature on the effects of electoral systems, deals with party seat-vote proportionality. From the normative standpoint, however, it is the 'one person, one vote' principle—one of Dahl's (1972) preconditions of democratic government—that malapportionment violates, and no degree of party compensation will redress this imbalance. The exception would be a system with perfectly district-based parties, where party compensations translate into compensations for the district citizenry. Shift away from perfectly local parties, towards party nationalization, and party compensation stop accruing to citizens of the underrepresented districts only.

A related reason is that Mexico recently got rid of single-term limits for legislators. Ambitious deputies elected in 2018 will again be allowed to seek reelection, restoring the electoral connection (Mayhew 1974*a*) that was severed in the 1930s. The reform should reinvigorate the relation between citizens and their representatives in the SMD tier. Widespread protests and events in the past years underscore how bad this

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For MPSA?

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Perhaps incorporate the diagram from the presentation, and highlight/annotate the potential routes through which malapportionment effects this process.

is needed for the consolidation of Mexico's young democracy. The persistence of substantial variations in district size, however, acts against realizing the full potential of the electoral connection—malapportionment will introduce substantial bias when one party is stronger in small districts (as Tories were in Great Britain up to 1997, Johnston 2002).

~~And two-fifths of PR seats can be insufficient to redress even party imbalances in full—more so when the PR allocation grants seats to the overrepresented party along the others, as Mexico's arcane rules in fact do (Weldon 2001).~~ [1]

All said, malapportionment remains problematic even in mixed-systems. [2] ~~The next sections reveal pervasive malapportionment in Mexico's lower house of Congress, investigating the exted to which it distorts representation.~~

2 Redistricting since 1997

The original 300 SMD districts map adopted in 1979 was redrawn in 1997, coinciding with the first free and fair congressional election (Lujambio and Vives Segl 2008). Redistricting occurred again in 2006, and was meant to be undertaken, but aborted, in 2015. The PR tier is elected in five forty-member districts that have also changed in recent decades (Palacios Mora and Tirado Cervantes 2009). Since PR boundary lines were not redrawn in the most recent redistricting proposal of 2015—on which analysis concentrates—we leave them out of the analysis. Future inspections of previous redistricting events would do well to take them into account. From now on in this paper, by seats/districts we always refer to the SMD kind.

[3] ~~ric11~~

Mexico adopted a mixed-member electoral system for the lower house of Congress for the 1979 congressional election. Three hundred single-member districts were drawn to elect three-fourths of the chamber by plurality rule. That proportion fell to three-fifths since 1985, but the number of single-member districts has not changed. No boundary lines are drawn for the compensatory, proportional representation seats; accordingly, we leave them out of the analysis. By seats/districts, in the paper, we always refer to the single-member kind. The original district map was redrawn in 1997, coinciding with the first free and fair congressional election (Lujambio and Vives Segl 2008). Redistricting occurred again in 2006, and was meant to be undertaken, but aborted, in 2015.

We name these maps by years in order to keep them distinct. We stick to the convention of using not the date when boundaries were actually redrawn and accepted,

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Since PR is used for only two-fifths of the seats, this mechanism is generally insufficient for compensation at the party level. Further, Mexico's arcane rules for PR allocation sometimes grant additional seats to the already overrepresented party (Weldon 2001).

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but that of the first election the map was (or would have been) used. Thus, there is a "1979 map" actually drawn in 1978, a "1997 map" drawn in 1996, a "2006 map" drawn in 2004–05, and a "2015 map" drawn in 2013, but never used.

Machine-assisted mapping has been in use since 1997. Details have changed, but the broad lines have not (Trelles and Martínez 2008). We describe the three major stages of the redistricting process: the apportionment of seats to states; the design of an optimization algorithm; and the strategic assessment of computer-generated district blueprints by technocrats with the active, but limited involvement of political parties.

Apportionment. Redistricting starts by redistributing a fixed number of seats among the 32 states.[1] Restrictions, reminiscent of the U.S., apply at this stage: no state may have fewer than two seats; the sole redistributive criterion above that minimum is state population; and no district may cross state boundaries. ~~The next section elaborates the method of apportionment used and problems raised for representation.~~

Optimization. This stage adopts a set of desiderata for a new map drawn from the base geography. A technical committee, appointed by IFE's Council General, is in charge of optimization and proposing a map for assessment. The formal "cost function" devised for the 2015 map included four criteria: population balance (given a relative weight of .4 in the linear combination), municipal boundary preservation (weight .3), travelling times inside the district (weight .2), and district compactness (weight .1). Trade-offs between them would inevitably step in as district boundaries are calibrated. Assisted with computers, the process made marginal changes, repeatedly reassigning geographical blocks between districts, while systematically checking the cost. Through iteration with different random seeds, cost-minimizing district maps for each state were generated.[2] The building blocks are more than 66 thousand *secciones electorales* into which the Mexican territory is subdivided. *Secciones* are analogous to U.S. census tracts, but somewhat bigger. Median *sección* population in the 2010 census was 1,280 persons, with a maximum at 79,232.

Restrictions also apply at this stage: contiguity is a must, as no district can have exclaves; and guarantees for minority representation must be considered, not partitioning *municipios* (the lowest elected offices, similar to counties in the U.S.) with sizeable indigenous populations. IFE would tolerate population imbalance of up to 15% from mean district size (the threshold was 10% in 2006), and even deviations

[1]The Federal District, where Mexico City resides, is not a state proper, but is treated as one for the purpose of apportionment and redistricting.

[2]More refined optimization algorithms have been used in each redistricting round. The 2015 algorithm, described here, replaced a method of simulated annealing used in 2006.

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I think we mean that population balance is used both as a weight and a constraint. Perhaps it would be clearer if we moved up the next paragraph to precede this one, since weights are used to score the subset of palns *within* the constraints.

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Something to discuss in the other paper on Transparency: What do the score weights actually mean substantively? Even if one is formally weighted higher -- these are not even normalized. So choice of unit matters. So does the actual function used. So does the variance of that function across the districts.

(Also starting values, stopping criteria, whether plans are ever rejected for reasons other than those stated -- e.g. the purported criteria of not requiring party offices to move...)

Similarity between	min	25%	median	75%	max
initial 2015 proposal and status quo	0.128	0.419	0.584	0.755	1
final 2015 proposal and status quo	0.125	0.437	0.643	0.805	1
final and initial 2015 proposals	0.174	0.705	0.967	1	1

Table 1: District similarity of the 2015 map

beyond that threshold with proper "technical justification" (IFE 2013). The last item is of much importance for our argument, and elaborate it further below.

Assessment. In this stage, that we study elsewhere (Altman, Magar, McDonald and Trelles 2014), the technical committee, party representatives, and the Council General interact. The map proposal is distributed to the parties for analysis and discussion. Parties suggest modifications to district boundaries, which the technical committee accepts if they improve the score from the optimization algorithm. Revisions adopted become the starting point for a second, and final round of observations/amendments. The final plan is then presented to the Council General for formal approval. It is at this final stage that the 2015 redistricting was abandoned. The Council General opted to put the process on hold until the details of an ongoing major electoral reform in Congress became known. As a consequence, the 2015 midterm election will be held with significantly outdated districts.

3 How to read a map

A new map is a full description of district boundary changes. The common way to visualize maps is on paper. We look at them differently, with focus not in the physical lines and their relation to landmarks and geographic accidents, but in their political consequences. Putting the 2006 map and the 2015 final proposal drawings side to side reveals boundary shifts. But unless the drawing is quite data rich, or your command of political geography is outstanding, assessing even superficial effects of boundary changes visually is a challenge.

A similarity index (Cox and Katz 2002:15–7) illustrates our method, offering ground for systematic assessment of a pair of maps. Measurement identifies the parent district or single largest contributor of population to every new district. The *s*imilarity index divides the population that *p*arent and *n*ew district share in *c*ommon by their joint population: $s = c/(p + n - c)$. The range is zero (district shares no population at all with parent) to one (districts are identical). The statistic conveys an intuitive measure of how much districts changed in the new map. Table 1 describes

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Perhaps this is an opportunity to refer also to the Trelles, et. al draft paper on transparency requirements ...

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The official process, although not always followed in practice, is as follows: The map ...

Since the first term of the subtraction is a real number and the second an integer, a fraction is bound to remain. Fractions in well-apportioned systems should all be less than 1 in absolute value—once that mark is passed, a full quota is reached, and a deputy is added or subtracted. The left panel shows that this is mostly the case for Mexico, but exceptions are, and have always been present. It is also plain that the 2006 map corrected, to some extent, important distortions that the 1997 map had failed to rectify. Under-representation of Baja California, but especially of the Mexico State dropped from two and five deputies less than due (deficits of 30 percent and less than 10 in relative terms), respectively, to near parity. Over-represented Veracruz behaved near symmetrically to Baja in absolute terms (not relative). And a distortion strongly favoring the Federal District (+4 deputies) was somewhat attenuated in 2006, but never removed.

Persitent malapportionment is explained, in small part, by the allocation of two seats to small states. Relative over-representation of tiny Southern Baja and Colima was substantial, but only until recently. Population growth has made both worth their congressional seats. [1]Yet relative over-representation remains substantial in migrant-worker-exporter Zacatecas up to 2003, and in the Federal District of late. Both states have lost population fast relative to the rest, and the system's design makes rapid demographic shifts slip away from grip.

When redistricting plans are drawn, malapportionment does not exist *de jure*. It exists *de facto*. Mexico's constitution provides that every redistricting process must rely on the most recent population census available, with no attempt to estimate population change since (and, unlike the U.S., no obligation to redistrict as soon as a new census is available). Nor does it contemplate the use of lustrum counts instead. As a results, the redistricting process has built-in features explaining the persistence of malaportionment—what Johnston (2002) calls "creeping malapportionment", whereby changes in constituency size over time create smaller seats. Compared to the 2000 census populations used for the 2006 map, the projection of 2000–2005 state population shifts are off by 9.7 percent on average, with a standard deviation of 6.9 percent.

With this in mind, it is puzzling that the redistributive nature of apportionment has not pushed for the adoption of alternative methods. The seventeen states that were under-represented in 2006 jointly controlled a majority (162) of single-member districts; fourteen of them have always been below the red line indicating fair representation. [2]Does malapportionment have political consequences?

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How does the magnitude of the within-state malapportionment compare to btewteen-state. We use RRI to measure the within-state-- can we use it for between-state as well?

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This transition sentence seems out of place as we don't discuss political impact until two sections later...

	Absolute malapportionment				
Map in year	Min.	1st quartile	median	3rd quartile	max.
2006 map in 2006	< .01	3.4	6.5	12.4	54.8
2006 map in 2015	.02	4.4	9.9	18.0	147.2
2015 map in 2015	.01	1.9	4.2	8.1	50.6

Table 2: Changing malapportionment. For these statistics, each district's estimated population in 2006 and 2015 (from *seccin* 2005–2010 changes) is compared to its parent state's estimated mean district population.

malapportionment. Population balance is, after all, the criterion that weighs more in the cost function. But this criterion weighs less than the others combined in the algorithm, and appears to be trumped rather easily. The preservation of municipal boundaries, for instance, is achieved by exploiting tolerated leeway. Figure 2 shows how the imbalance tolerance band (in grey) is uniformly occupied by districts even right after a map's inception—in practice, the system does *not* push towards perfect balance. And it is notable that when estimated population shifts are taken into account (as the plot does, unlike IFE), as many 16 percent of new 2006 districts were patently *outside* the lax range of tolerance.[5]

The requirement to keep municipalities with large indigenous population within the same district may also explain exceptions. As seen in Table 2, median absolute district malapportionent of the 2006 map upon inauguration was 6.5%, the third quartile surpassing the ten point tolerance margin (then used) at 12.4% (also, Trelles and Martínez 2008). For next year's midterm election, the same descrepancies will be 9.9 and 17.9%, respectively. The abandoned 2015 map proposal did a much better job upon inauguration, with median absolute district malapportionment of 4.2% and third quartile at 8.1%.

Whether districts below and above fair representation behave differently merits closer inspection. Whether due to technical difficulties or discretion, malapportionment may be the source of meaningful distortions in democratic representation. To which we now turn to.

[5]Census data reported at the electoral *sección* level are available since 2005 only. We projected the 2005–2010 changes to 2006 and 2015 for this exercise. Since so many districts are made of full municipalities, we could use that unit to extend it to 1997.

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Can we estimate/bound how much of the malapportionment observed is explained by this requirement. And whether it has a partisan leaning?

the Green party in Chiapas 2012, where it won 3 of 12 districts. The chart shows that 9 percent of the state's vote awarded the party 25 percent of the seats, an outstanding achievement for any party. The cloud manifests a steep upwards slope characteristic of first-past-the.post systems (Taagepera 1973).[6] Points below the diagonal indicate under-representation, those above over-representation. There are notable differences among major parties: the PRI achieved over-representation in three-fifths of election-states between 2006 and 2012, the PAN in two-fifths, and the PRD in one-fourth only.

With such setting, the possibility that districts are granting undue advantage to the PRI merits closer inspection. A priori, reasons to suspect IFE of cooking districts to favor one party or another are lacking. Major parties, after all, permanently influence the election regulator, ambition counteracting ambition (Estévez, Magar and Rosas 2008). But that those who draw the district lines can distort a fundamental link of the democratic process is well established in the literature (Altman and McDonald 2011, Balinski and Young 2001, Cox and Katz 2002, Engstrom 2006, King 1990, Otero 2003, Rossiter, Johnston and Pattie 1997). Has the insidious gerrymandering reared its ugly head in Mexico? This section estimates majority and party effects in the proposed districts and the status quo. Majority effects are huge, partisan effects negligible.

5.2 Two Classes of Distortion

Undue advantage is known, in the specialized literature, as partisan bias, and is one goal that strategic redistricters pursue. It is not, however, alone: scholarship highlights district responsiveness, also know as majoritarian bias, as another goal. These ought to be distinguished (this paragraph draws heavily on Cox and Katz 2002, ch. 3). Partisan bias helps the beneficiary buy seats with fewer votes than others. Because seat distribution is a constant sum game, bias in favor of someone always implies bias against someone else. One way of introducing party bias in district lines is with the conventional redistricting strategy known as packing: group your adversary's voters in few districts, wasting votes to win unnecessarily safe seats, raising the price of victory. Responsiveness, on the other hand, is the feature granting a seat bonus to large parties. Maximal responsiveness occurs within each single-member district in isolation: the winner takes all, the rest nothing. The same could be achieved in

[6] Adding the excluded PR seats would level the slope considerably. Doing this would be easy with national aggregates. It is not evident how to carry it with state aggregates, since PR seats are awarded in five second-tier districts joining together several states each.

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There is generally a range of responsiveness... Choice of this range can be made to advantage a larger party based on normal vote... is the normal vote the same in each state? Is it symmetric for parties?

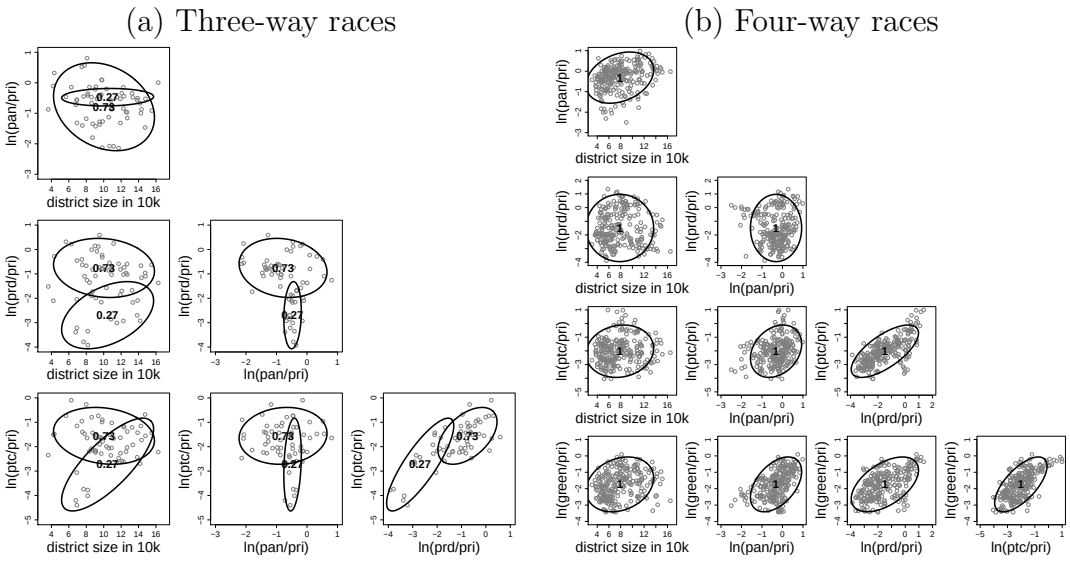

Figure 6: Components and mix in the 2009 election. Panels report the log-ratio of party votes, using the PRI as reference to overcome the compositional nature of the data. Circles represent the multi-variate normal distributions that will be combined towards the estimated joint density. Numbers are the relative weights of the components.

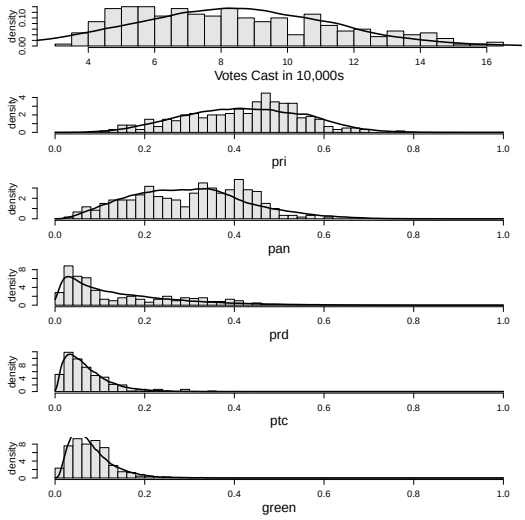

Figure 7: Fit of the finite mixture for 2009. Histograms report actual district party vote shares, lines are the marginals of the estimated 2009 election joint density.

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Can we explain in this and the following figures how estimation uncertainty is represented? (And do we need error bars in places?)