Malapportionment and ideological bias in Chilean electoral districts

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Abstract
Chile's unique two-member district legislative elections were long criticized for the sharp seat thresholds the system imposed and for malapportionment. Both characteristics are widely regarded as having been adopted to favor the ideological right over the left. The electoral reform of 2015 replaced almost all the two-member districts with higher magnitudes, but it reduced malapportionment much less, and the Chamber of Deputies and Senate remain among the most malapportioned legislative chambers in the world. Using a new measure of district-level ideological preferences based on presidential and municipal elections, however, this analysis finds no evidence that malapportionment produced ideological bias in elections since 2000 under the pre-reform system, nor that it will produce any bias in the new, post-reform districts.
Introduction
Chile completed a landmark electoral reform in May 2015, abandoning its unique system by which all legislators, deputies and senators alike, were elected in two-member (a.k.a. binominal) districts. In the new system, district magnitudes range from three to eight in the Chamber of Deputies and from two to five in the Senate. Critics of the pre-reform, binominal system long held that it was biased in favor of Chile’s ideological right, both because of the limited number of seats in each district, and because of malapportionment, which is discrepancy between the share of population in a district and the share of legislative seats it elects.

In this paper, I examine malapportionment as a potential source of bias in Chilean elections. Specifically, I document the levels of malapportionment in both chambers of the Chilean Congress, the Chamber of Deputies and the Senate, under the old binominal system and in the new, post-reform districts. I examine whether whether malapportionment produced ideological bias in recent elections and whether it should be expected to do so in the post-reform system. Using a new measure of district-level ideological preferences based on Chilean presidential and municipal elections, I find no evidence that malapportionment produced ideological bias in elections since 2000 under the pre-reform system, nor that it will produce any bias in the new districts.

Ideological bias under the binominal system
The binominal system’s origins in the military dictatorship of General Augusto Pinochet engendered skepticism about its fairness, and critics of the system have long argued that it generated bias in favor of the ideological right (Scully 1997, Fuentes 1999, Navia 2005), the main sources of which were regarded to be:

- **Seat Thresholds:** With two-member districts and the d'Hondt formula, the first seat is awarded to the largest list, and the second to the second-largest list, unless the largest list more than doubles the vote total of the second list. If the distribution of votes across lists is such that one coalition consistently places first, but rarely doubles the second-place coalition, the second-place coalition can convert its vote support into representation more efficiently than the first-place coalition – a rarity in the world of electoral systems (Rae 1967).

- **Malapportionment:** There was inequality of population across districts, with districts that leaned toward the ideological right initially favored with more legislators per population than districts that leaned left (Rojas and Navia 2005).

Most of the debate over bias in the Chilean system focused on whether and how seat thresholds affect the conversion of votes to seats by the main coalitions that dominated Chilean elections from re-democratization in 1989 through the last elections held under the binominal system in 2013. Notwithstanding some contributions that express skepticism about the extent to which the binominal system favored the Chilean right over the left (Carey 2003, Zucco 2007), most analyses concluded that the binominal system was adopted to generate exactly such a bias and was effective in doing so (Scully and Valenzuela 1997, Siavelis 1997, Polga-Hecimovich and Siavelis forthcoming).

Analyses of malapportionment were somewhat less contentious. Siavelis (1997 and 200), Rojas and Navia (2005), Auth (2014), Zapata Larrain (2014), and Polga-Hecimovich and Siavelis (2015) all connect malapportionment to the motivations of the electoral system designers from the
Although the Pinochet government had already settled on the *binominal* system, it undertook to re-draw the two-member districts after the 1988 plebiscite that rejected an extension of Pinochet’s presidency. Under the revised map, districts that supported Pinochet in the plebiscite were allocated more Chamber deputies per capita than were districts that supported the "No" vote (Zapata Larrain 2014).

Although malapportionment may have favored the right in the early post-transition elections, however, and despite the fact that malapportionment itself grew more pronounced over time, both Rojas and Navia (2005) and Zucco (2007) found that by the early 2000s, changes in voting behavior had eliminated the correlation between the population of a given Chamber district and the vote shares of the two major coalitions. These analyses, however, did not estimate the level of bias in Senate elections, where malapportionment was even more pronounced and where bias from the "original sin" of the system’s design might therefore be expected to be more enduring.

**The 2015 reform**

Some key elements of Chilean legislative elections remain intact from the *binominal* to the post-reform system. Legislators are elected from lists nominated by political parties, or by alliances that can include candidates from more than one party, and independents. The lists are open, meaning that voters indicate a preference for an individual candidate. Votes for all candidates within a list are tallied, and seats are awarded first to the lists using the d'Hondt divisors formula, then candidates within lists that captured seats are elected in order of their individual preference votes. The main change in 2015 is in the structure of electoral districts. Table 1 illustrates the district structure of Chilean Chamber and Senate elections under the *binominal* and the post-reform systems.

<table>
<thead>
<tr>
<th></th>
<th>Chamber</th>
<th>Senate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Districts</strong></td>
<td>Pre-Reform 60</td>
<td>Post-Reform 28</td>
</tr>
<tr>
<td><strong>District Magnitude</strong></td>
<td>2</td>
<td>3 – 8</td>
</tr>
<tr>
<td><strong>Total Seats</strong></td>
<td>120</td>
<td>155</td>
</tr>
</tbody>
</table>

| **Number of Districts** | Pre-Reform 19 | Post-Reform 15 |
| **District Magnitude**   | 2       | 2 – 5  |
| **Total Seats**          | 38      | 50     |

By increasing district magnitudes, the reform raised the number of distinct seat thresholds in most districts, dramatically reducing the prospect that the nationwide distribution of loyalties could translate consistently into bias in seat distributions. The post-reform system remains substantially malapportioned, however, so the matter of bias through malapportionment under the new rules warrants renewed attention.

The malapportionment remaining in the new system reflects the political bargains necessary to pass any electoral reform. Between 1990 and 2014, would-be reformers offered 26 electoral reform proposals in Chile but never assembled the super-majority support required to dispense with the *binominal* system (Anonymous 2015, p.1). In 2015, with every potential vote in support critical to passage, individual legislators whose electoral prospects could be jeopardized held leverage to set the allowable parameters for reform. One of these was that the existing districts must be the building blocks for new districts, so as not to "orphan" incumbent legislators. Another was that, even the least-populated districts, magnitude would not decline in Senate districts, and would *increase* by at least one seat for the Chamber. The cartographers
also sought to avoid drawing new districts that would pit incumbents from the same party against one another (Anonymous 2015, pp.17-21). The Bachelet administration went to great lengths to assure legislators that their reelection prospects would not be damaged, producing simulated outcomes based on recent elections to show that 90% of incumbents would be reelected under the proposed rules (Anonymous 2015, p.18). The constraints on breaking apart preexisting districts and the need to protect incumbent legislators' reelection prospects limited the degree to which the reform could reduce malapportionment in Chile.

**Measuring Malapportionment**

The standard measure of malapportionment, from Samuels and Snyder (2001) is:

\[
MAL = (1/2) \Sigma |s_i - p_i|
\]

where sigma stands for the summation over all districts, \(s_i\) is the share of seats allocated to district \(i\), and \(p_i\) is the share of the population residing in district \(i\). Samuels and Snyder (2001) measured MAL for elected national legislative chambers around the world as of the late 1990s. Chile ranked as severely malapportioned, with its Senate ninth most malapportioned among upper chambers, and its Chamber of Deputies the eleventh most malapportioned, among the 78 countries Samuels and Snyder examined.

As Rojas and Navia (2005) previously documented, malapportionment increased through the 1990s, as populations in more densely populated, urban districts grew more rapidly than in less populated ones. Continuing this trend, malapportionment in the Chamber of Deputies rose further in the first decade of the 2000s.\(^1\) The 2015 reform substantially reduces malapportionment among Chamber districts, with MAL dropping from .17 to .11, but the Chilean Chamber remains among the most malapportioned lower chambers in the world. Senate malapportionment, moreover, at MAL = .32, is unchanged by the 2015 reform.

Figure 1 plots district magnitude (DM) against population for the twenty-eight new Chamber districts (top panel) and fifteen new Senate districts (bottom panel). Note that, in the Chamber, there are many districts with higher populations but fewer seats than corresponding districts with fewer people and more seats (any dot below and to the right of any other). It is possible to have substantial malapportionment even without such inversions, but their existence is particularly striking.\(^2\)

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\(^1\) Post-reform MAL is calculated from data provided by the Observatorio Político Electoral at the Universidad Diego Portales, courtesy of Patricio Navia, with population data from the most recent, 2012 national census. Pre-reform Chamber MAL is calculated from data drawn from the 2002 census, matched to Chamber districts on Wikipedia (http://en.wikipedia.org/wiki/Electoral_divisions_of_Chile). Pre-reform Senate MAL is calculated based on total voters per district rather than population, by aggregating up the total votes cast in each Senate district from the 2001 and 2005 elections as a proxy for the relative district populations.

\(^2\) For example, using the d'Hondt formula of successive divisors to apportion the 155 seats across the new districts by population would retain MAL=.03, much more in line with lower chambers in most democracies worldwide, but with no seat-population inversions (data and figure available from author).
Despite the fact that the 2015 reform increased the number of Senate seats, reduced the number of districts, and so increased the magnitude of many districts, the Chilean upper house will be as malapportioned as it was before the reform, and slightly more malapportioned than it initially was the 1990s. There are no cases of more populated districts being given fewer seats than less populated ones, as in the Chamber, but the Santiago Metro region’s nearly 7 million inhabitants are dramatically underrepresented with only five senators, the same number as the Talca or Temuco regions, each with a population under 1 million. Even maintaining the current minimum of two seats for each new district, malapportionment could be dramatically reduced by redistributing seats from the mid-sized districts to the Santiago Metro region, with the effect of more than doubling the capital’s seat total of five.³

**Measuring district ideology**

To determine whether the apportionment of seats confers ideological advantage, I need a measure of voter preferences at the district level. Legislative election results have been

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³ Using a pure d'Hondt formula to apportion seats in the post-reform Senate would not be feasible as the districts are currently configured, as each of the least populated four districts would warrant no representation at all.
systematically imperfect metrics of district partisan preferences during the binominal era because the major coalitions allocated their two nominations within each district in negotiations that involved their multiple component parties, with parties forfeiting the right to nominate in some districts in exchange for favorable slots in others (Carey & Siavelis 2005). Rather than use legislative election results, then, I rely on data from presidential contests and from municipal elections to measure district-level ideology.

For this purpose, any Chilean elections have potential advantages and disadvantages. Municipal elections impose the fewest constraints on voters because district magnitudes are higher for municipal councils, reducing the imperative for alliances to ration nominations or for voters to vote strategically. But municipal elections may turn on local issues. Presidential elections embody the national left-right divide, but the contest for a single office maximized strategic constraints on voter choice. Fortunately, the results of this analysis do not hinge on which elections we examine. I measure district ideology three different ways, based on:

- second-round presidential elections, coding votes as either left or right;
- municipal elections, coding parties as left or right according to their participation in national alliances; and
- municipal elections, coding parties according to their ideology scores from Baker & Greene’s (2011) seminal article and database, and calculating a weighted district ideology score.

In the interest of simplicity, I present the results from presidential elections here, but the analogous results using both municipal election-based measures, as well as alternative model specifications, are available in a web-based appendix.

I begin with the four Chilean presidential contests that proceeded to a second round pitting a single candidate from the center-left against one from the center-right. Because minor candidates, who can split the vote one or the other side of the spectrum during a first-round election have been eliminated, the run-off elections provide a simple and clean measure of district preferences between left and right. Four presidential elections resulted in run-offs, listed below with the leftist candidates first and the winning candidate italicized:

- January 2000 – Ricardo Lagos (Party for Democracy) vs. Joaquin Lavin (Democratic Independent Union)
- January 2006 – Michelle Bachelet (Socialist) vs. Sebastian Pinera (National Renovation)
- January 2010 – Eduardo Frei (Christian Democrat) vs. Sebastian Pinera (National Renovation)
- December 2013 – Michelle Bachelet (Socialist) vs. Evelyn Mattei (Democratic Independent Union)

To measure district ideology, I begin with data on presidential votes at the level of comuna, the smallest administrative sub-unit in Chile.\(^4\) Vote tallies at the comuna level can be aggregated up to the level of the pre-reform, binominal districts, and the post-reform, multi-member districts

\(^4\) There are 346 comunas, grouped into 54 provinces, which themselves are grouped into 15 regions.
for both the Chamber and the Senate. For each presidential run-off election, I calculate the vote tallies for each candidate in each comuna, using data from the Chilean Servicio Electoral website (Servicio Electoral de Chile 2015a). Then I match those data with other data on the composition of the pre- and post-reform Chamber and Senate districts to aggregate tallies from the comuna level up to the level of each of the four types of districts (Servicio Electoral de Chile 2015b, Observatorio Político Electoral 2015; Senado de Chile 2015). I tally up all the votes cast in each type of legislative electoral district for all four leftist candidates and all four rightist candidates across the set of run-off elections, then calculate a the overall leftist vote share as a single, district-level measure of ideology. Tallying across elections reduces the potential impact of election-specific idiosyncrasies (e.g., the local appeal of a specific candidate) that might otherwise distort the district-level estimate. Summaries of the district-level leftism statistics across the four elections, three of which were won by the leftist candidate and one by the rightist, are shown in Table 2.

Table 2. Leftist share of two-party vote in presidential run-off elections, 2000-2013

<table>
<thead>
<tr>
<th></th>
<th>Chamber Districts</th>
<th>Senate Districts</th>
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<tbody>
<tr>
<td></td>
<td>Binominal</td>
<td>Post-Reform</td>
</tr>
<tr>
<td>Median</td>
<td>.59</td>
<td>.57</td>
</tr>
<tr>
<td>Minimum</td>
<td>.31</td>
<td>.43</td>
</tr>
<tr>
<td>Maximum</td>
<td>.72</td>
<td>.65</td>
</tr>
</tbody>
</table>

**No evidence of ideological bias**

Figure 2 plots district leftism, on the Y-axes, against how well represented the district was in the binominal Chamber (top panel) and Senate (bottom panel) based on population during the 2000s. Linear best-fit lines with 95% confidence intervals are imposed on the scatters. Distinct that are over-represented relative to population are further to the left on the X-axes, and under-represented districts (with greater population per representative) are to the right. Thus, an upward-sloping line would indicate that malapportionment produces bias in favor of the right, and a downward slope would indicate bias in favor of the left.

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5 Using a loess, rather than a linear function does not alter the results (see online appendix).
Figure 2. Leftism by apportionment in the *binominal* Chamber and Senate

The best-fit lines are flat. Based on the election results since 2000, there is no evidence of any correlation between the ideological preferences of voters in the *binominal* districts and how over- or under-represented the districts were in the Chamber or in the Senate.

Figure 3 shows analogous scatterplots for the post-reform districts. There is a slight upward slope to the best-fit line for the post-reform Chamber, suggesting a mild pro-rightist bias from malapportionment in the new Chamber districts, but the relationship is not even close to statistically significant (p=.56 in a bivariate regression). For the Senate, the best-fit line is, again, completely flat. Note that the Santiago Metro region continues to stand out for its severe under-representation.
Figure 3. Leftism by apportionment in the post-reform Chamber and Senate

**Conclusion**

Chile's old, *binominal* system was often decried as favoring the right. The 2015 electoral reform eliminated the most controversial source of bias, the unique set of seat thresholds inherent in two-member district competition. It also reduced the second potential source of bias, malapportionment, somewhat, although the legislative politics of reform prevented its elimination entirely and substantial malapportionment remains in the post-reform system.

Using a new measure of district ideology, this analysis finds no evidence that malapportionment produced ideological bias under the old system, nor any reason to expect it will produce such bias in the new one. The absence of ideological bias does not necessarily mean malapportionment is innocuous. In both chambers of the Chilean Congress, the preferences of voters in some districts still carry far more weight than the preferences of voters in other
Nevertheless, the apportionment system adopted in 2015 does not appear to be stacked in favor of either left or right. To sum up, the principle of vote equality – or "one person, one vote" – continues to be violated in Chilean legislative elections, but there is no evidence that malapportionment will skew electoral outcomes across districts according to their ideological predispositions.
References


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