Where's the bias? A reassessment of the Chilean electoral system

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Abstract

This paper presents exploratory data analysis of Chilean electoral results from 1989 to 2001 to show that contrary to the conventional wisdom, the 'binominal' electoral system does not benefit the second largest coalition. Rather, it benefits the two largest coalitions at the expense of the smaller lists, as is the case in almost all electoral systems. Previous analyses have erred by extrapolating predictions that are correct at the district level into the aggregate multidistrict setting without accounting for the fact that there is considerable variation on how well lists perform across different districts. Using simulations I show that the variation of vote shares across districts is, in fact, the driving force behind this result.
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1. Introduction

Chilean political institutions are one of the best real world examples of deliberate and controlled institutional design. For this reason, Chile is sometimes regarded as the proof that it is possible to design institutions that suit one's need and that are also resilient enough to survive substantial changes in other background conditions. The distinguishing feature of the Chilean democratic transition is that is was totally 'contained' by the institutions of the previous regime (Valenzuela and Siavelis, 1991, p. 29). The set of political institutions that were handed over by Pinochet's regime were designed both 'to protect the economic legacy' of his government and 'to prevent the reemergence of the dynamic of polarization and instability that characterized the early 70s' (Siavelis, 1993, p. 1).

One of the most peculiar aspects of Chilean political institutions is the binominal electoral system. It has become a widely accepted stylized fact that the Chilean electoral system favors the coalition that finishes second while hurting the coalition that obtains the first place in popular vote. Since the right wing coalition has finished second and the center-left coalition has finished first in all four legislative elections of the post-Pinochet area, this distortion can be called a 'pro-right' bias.

The goals of this paper are twofold. First, data is presented in support of the view that the alleged pro-right bias does not exist, or at least not in the way it is described in the literature. Second, and foremost, it presents an explanation as to why the Chilean electoral

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systems fails to produce the expected effects even though there exists a plausible mechanism for which there is ample support in the literature.

The paper proceeds as follows. The next section outlines the main features of the binominal system, and what I regard as the conventional wisdom about present in the literature. The subsequent section presents electoral data to support the claim that the conventional wisdom finds no empirical support with respect to the mechanical effects of the Chilean electoral system. In Section 3, I present and elaborate on the argument that variation in vote shares across districts is the forgotten link in the argument, and accounts for the difference between the expected and actual aggregate electoral results. A brief conclusion follows.

2. The conventional wisdom

2.1. The binominal system

Until recently, Chile had two different systems for defining the composition of its legislative branch. Nine of its Senators were appointed through a variety of non-electoral mechanisms for eight years terms. These Senators were dubbed *designados* or *institucionales*, and constituted the most visible constitutional legacy of the authoritarian regime. These method of selecting legislators has recently been abolished, and the present paper focuses on the electoral system proper, by which the remaining Senators, as well as all the members of the Lower Chamber, are elected.

Chile elects its 120-member *Cámara de Diputados* in 60 two-member districts. The 36 elected Senators are similarly elected in 18 two-member circumscriptions.[1] The uniform magnitude of 2 ($M = 2$) in all districts gives the system its name — binominal — and also its most distinguished implications, which are discussed in the following sections.

Parties and independent candidates can set up their own lists or join in pacts with other parties. Any list, however, can run only a maximum of two candidates per district.[2] Candidates are elected in

an open list system, by which voters cast their vote for the candidate but the votes are pooled by list. The Chilean law explicitly stipulates that if a list obtains more than twice the number of votes of the runner up list it elects two candidates, otherwise the top two vote receiving lists elect one candidate each.[3] This method corresponds to electing the candidates by proportional representation, allocating the seats in each district to the lists using the d'Hondt formula. Furthermore, if a list wins only one seat, the candidate within that list that received the most votes is elected.

It has long been pointed out that most electoral systems allocate a disproportional number of seats to the larger parties (Rae, 1967). It also widely known that in proportional systems smaller magnitudes are associated with a more disproportional distribution of seats relative to votes and that among all PR seat allocation formulas d'Hondt is the one that gives a greater advantage to the larger parties (Rae, 1967; Taagepera and Shugart, 1989; Lijphart, 1999). It would then come as no surprise that one of the most widespread criticisms of the binominal system is that it skews the distribution of seats. However, as I will shortly discuss, the *alleged* effects of the binominal system go beyond the usual favoring of largest parties that is reported by the classical works on electoral systems.

2.2. The origins of the binominal system

Chile was a democracy for most of the 20th century. Prior to the 1973 coup, Chile elected its legislature by proportional system with 28 districts and magnitudes that ranged from 1 to 18. The binominal system is an institutional novelty specific to the current democratic period that began in Chile in 1989.

The reasons that led to the adoption of such system have been scrutinized by many scholars. It was allegedly crafted to benefit the parties on the right (Siavelis, 1997; Scully, 1997), to rearrange electoral preferences by forcing a reduction in the number of parties (Siavelis, 1997), and to induce moderation and stability by consolidating the center of the political spectrum (Guzman, 1993; Rabkin, 1996; Magar et al., 1998). The literature offers mixed assessments of the binominal system's track record in achieving the latter

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[1] Later in the paper I refer to both circumscripciones and distritos as districts.

[2] This limitation gives rise to important intra coalition dynamics that can be regarded as "psychological" effects of the electoral system (Duverger, 1959), for they have to do with strategic anticipation of the system's mechanical effects. In this paper I focus exclusively on the mechanical effects of the Chilean electoral system. For an interesting analysis of the effect the binominal system in helping Concertación overcome internal disputes, see Carey and Siavelis (2005).

[3] Ley Constitucional Organica n.18700, Article 109 bis.

two goals.[4] However, there seems to be a broad agreement that the binominal system was a success in favoring the authoritarian regime's political heirs – the right of the political spectrum (Siavelis, 2001; Siavelis, 1997; Scully, 1997; Fuentes, 1993; Valenzuela and Siavelis, 1991).

Navia (2002), questions part of this established wisdom. While he agrees that the Pinochet regime deliberately chose a set of rules that would further his future political interests, he also calls attention to the constraints limiting his ability to chose these rules, to the unintended consequences that did not benefit the designer, and to the fact that Pinochet's crew overlooked a series of options available to them that could have helped them better distort electoral preferences in their favor. On the issue of district magnitude, Navia's main argument is that rather than crafting a system that benefited the second largest coalition, Pinochet sought to minimize the cost of an electoral defeat. This is certainly a departure from most of the previous literature, and for that reason I will return to this Navia's claim further along this paper.

2.3. Expected effects of the binominal system

The binominal system has been in use in Chile since its return to democracy in the late 80's. During this time, Chilean party politics has been remarkably stable, especially in comparison with many other Latin American countries. Four legislative elections (1989, 1993, 1997 and 2001) and three presidential elections (1989, 1993, 1999) were held in the period and two broad

and stable pre-electoral party alliances have dominated Chilean politics in all of them.

On the eve of democratization the anti-Pinochet segments of Chilean politics coalesced into the center-left *Concertación de Partidos por la Democracia*, which campaigned vigorously to win the 1988 plebiscite that forced Pinochet to step down from office. While its has experienced some changes in its composition, the centrist Christian Democrats (PDC) and the left of center Socialists (PS) have been the anchors of coalition. *Concertación* has remained the most important force, winning all three presidential elections and the majority of elected[5] seats in Congress in every opportunity.

The major right-wing parties have also competed electoraly as a stable block, even though the coalition ran under different names in each election.[6] Still, in all elections the *Unión Demócrata Independiente* (UDI) and the *Renovación Nacional* (RN) have been the coalition's core. In this paper, I refer to this block as *Alianza*, or simply the 'right'. The UDI and the RN incorporated Pinochet's political heirs as well as new more 'democratic' conservative elements. Although less electoraly successful, *Alianza* has been systematically closing the gap relative to *Concertación*, with the last election showing an almost 50-50 split in the electorate.

The literature on the subject shows a very coherent interpretation of the effects of Chilean electoral institutions on its most important competitors. In this respect, Siavelis points out that 'while not garnering a majority, the parties of the center-right benefited by receiving a disproportionate number of legislative seats when compared with the proportionality indices of the parties of the *Concertación* Alliance' (Siavelis, 1997, p. 344), and in another article concludes that 'it is hard not to admit that the system's designers succeeded in over-representing the right' (Siavelis, 1999, p. 226). In the context of an electorate that has historically been clustered in three distinct ideological sectors (left, center and right) with roughly a third of the voters in each, Fuentes argues that the 'binominal system tends to hurt severely the first *tercio* (third) and to favor significantly the second most popular *tercio*', while excluding

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[4] On the goal of rearranging of the party system, Scully argues that 'it is unlikely that a new cleavage has emerged with sufficient force to reorganize the basic contours of Chilean political landscape (…) which represents a major source of continuity underlying the dynamics of party competition' (Scully, 1997, p. 122). Valenzuela and Siavelis (1991) point out that underneath the apparent two block competition pattern, the multiparty nature of the Chilean electorate persists. With concurrent remarks, Fuentes (1993) argues that the traditional 'three cluster' structure of the Chilean electorate persists even after the binominal system was introduced. With regards to strengthening the center and inducing moderation, Scully pointed out that despite the proliferation of party labels, the center has now occupied a relevant coalition making position (Scully, 1997, p. 136) and Guzman claimed that the binominal system induces coalitions and pushes the parties to position of the median position (Guzman and AuthorAnonymous, 1993, p. 307). Magar et al. (1998) contest this idea with a spatial model that shows that the equilibrium strategy for the candidates on each major coalition is to cluster away form the median voter. Thus, there is no centripetal incentive in the Chilean Double-Member district.

[5] Note that since not all members of the Senate were elected, this does not mean that Concertación has always had a majority in the Senate.

[6] The names of the right-wing coalition were Democracia y Progreso in 1989, Unión por el Progreso de Chile in 1993, Union por Chile in 1997 and Alianza por Chile in 2001.

or almost excluding the last segment (Fuentes, 1993, p. 270). Scully adds that 'the regime adopted an electoral formula tailored to its supporters on the right' (Scully, 1997, p. 125) and Valenzuela and Siavelis (1991), based on 1989 results, pointed out that that the system had been successful in 'overrepresented the right,' although they acknowledged that there was no guarantee that this would hold in future elections (Valenzuela and Siavelis, 1991, p. 32). As a result, it has become a relatively well known stylized fact that the Chilean electoral system favors the right wing or the second strongest coalition.

This ingenious system was designed under the assumption that the right would inherit the roughly 40 percent of the vote received by Pinochet in the 1988 Plebiscite. One mechanism by which the system is said to favor the right is by the apportionment of districts. Districts were drawn after the plebiscite, so that the government could use its results to craft districts to favor the parties in the Right or (Siavelis, 2001, p. 33; Fuentes, 1993, p. 273). By over representing conservative less populated areas, it assured a lower vote-per-seat ratio in the areas of traditionally stronger support for the authoritarian government.

The main argument, however, derives not from district drawing, but from the combination of the seat allocation formula and low district magnitude. Since in order for the largest list to win the second seat its share of votes must have been at least twice as large as the runner up's share, the result should be that the first and second lists obtain the same number of seats under most circumstances. This system should artificially equate the two largest lists because the first lists' vote advantage is 'wasted' in almost every district. Potentially, two lists with respectively 66% and 34% of the vote will have the same number of seats in the house. Under the expectation that Pinochet's political followers would retain over 40% of the votes, they stood to gain from such system.

3. Where's the bias?

The most basic piece of evidence, and the one that motivated this research in the first place, was the observation that despite what several authors have suggested the Chilean electoral system does not obviously favor the right in elections for the lower chamber. If the district level rationale were reproduced in the national level data, a wide range of electoral results should become a 50-50 split terms of seats.

However, as data in Table 1 show, this has not been the case.[7]

Both *Concertación* and *Alianza* have systematically obtained higher seat shares than vote shares and in three of the four elections, *Concertación* received a greater absolute benefit from the electoral system than *Alianza*. In fact, if one measures the distortion of the electoral system by computing the difference between seat shares and vote shares for each list[8] both *Concertación* and *Alianza* were favored at the expense of the smaller lists, but it is not possible to identify any systematic difference between the two favored lists. The result is basically the same if a measure that weights the distortion by the vote share is computed. Larger lists still appear to have systematically been favored relative to the smaller lists. The relative distortions of the two larger lists are highly associated with each other and with the vote share of the other lists, which implies that the two larger lists are favored in a similar way by the electoral system, and also that the size of the benefit they receive increases with the vote share of the other lists.

The best piece of evidence in support of a pro-right bias and against my claim is that *Alianza* receives an average boost of 11.49% while *Concertación's* average relative distortion is 9.66%. I regard it as very week evidence. This difference between the relative distortion rates of the two largest lists is not statistically significant and in no election did this difference in distortion jeopardize *Concertación's* majority in the lower chamber. In addition, in the last election the electoral system produced an artificial majority by raising *Concertación's* seat share past 50% even though its vote share fell short of that threshold.

Another issue to look at is whether Pinochet's rules worked 'better' in the first election with their effect fading along the years. The fact that the right received its largest seat share boost in the 1989 election supports

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[7] In this table, and in the rest of this paper, I use the lists and not the parties as the unit of reference. The main reason for this choice is that the conventional arguments about the binominal system are made in terms of lists, and not parties. Another important reason, however, is that since each list can only run two candidates in each district no party presents candidates in all districts. The decision of which candidates to run are subject to intense intra-coalition bargaining and are one of the interesting non-intended consequences of the binominal system. I cannot focus on these processes in the present paper, but it suffices to say that this dynamics affect the electoral returns of the parties, which make the party level meaningless in the present analysis.

[8] This measure is discussed in (Lijphart, 1999, p. 157).

Table 1
Votes shares and seat shares in the Chilean *Camara* elections

	1989		1993		1997		2001	
	Votes	Seats	Votes	Seats	Votes	Seats	Votes	Seats
Concertacion	51.5	57.5	55.4	58.3	50.5	57.5	47.9	51.7
Alianza	34.2	40.0	36.7	41.7	36.3	39.2	44.3	47.5
Others	14.3	2.5	7.9	–	13.2	3.3	7.8	0.8

such claim. The idea of fading effects, however, does not account for 1989 also being was the election in which *Concertación* enjoyed its largest benefits from the electoral system.

3.1. Bias through the system's majoritarian character

These data are presented graphically in Fig. 1, with the additional bit of information being that the lists included in the "other" category are presented separately. The solid diagonal line that bisects the graph indicates perfect correspondence between vote shares and seat shares. Points above the diagonal represent lists that have received a higher seat share than vote share, while points bellow represent lists that were 'hurt' by the electoral system. Note that all of *Concertación's* and *Alianza's* points are located the upper area
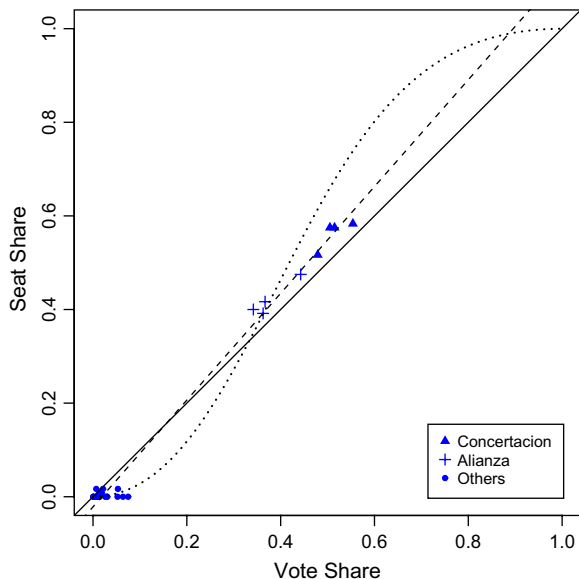

Fig. 1. Seat share and vote share by coalition: 1989–2001. *Notes:* the solid line shows a perfectly proportional system. The dashed line is the slope of a simple OLS regression of seat shares on vote shares. The dotted curve plots the "responsiveness" of the electoral system, as estimated in a restricted model (King, 1990).

indicating that these lists have consistently received more seats than they would in a perfectly proportional system. It is also noticeable that most of the smaller and independent lists are located in the lower half of the graph.

Few analysts would disagree that Chile's combination of constant low magnitude and d'Hondt seat allocation formula is very peculiar. Although many add that this leads to also very peculiar electoral results, it is not clear how atypical the effects of the binominal system really are.

At least since Rae's seminal 1967 work, in which he laid out explicit analytical arguments and conducted the first cross national empirical analysis of electoral results, some simple regularities about electoral systems have been known. Among them, and relevant to the present discussion, is the fact that electoral systems in general restrict smaller parties' chance of winning seats and tend to favor the larger parties (usually the ones that get more than 20% of the votes). These effects are common to all electoral systems, but they tend to be stronger in majoritarian rather than in proportional ones. In Rae's data set, proportional systems usually allocated 1.07% of seats for each 1% percent of vote, while majoritarian systems seat to vote share ratio was found to be 1.2%/1%.

The dashed straight line in Fig. 1 is the regression line. Its slope of 1.14 confirms the notion that the larger parties are favored vis-à-vis the smaller ones. The size of this effect may be closer to the relationship found in majoritarian systems than in proportional systems, but in no way stands out as abnormal. In fact, since the relationship between magnitude and proportionality is increasing with a declining rate (Rae, 1967, p. 117), and magnitude is considered the most important determinant of proportionality (Rae, 1967; Taagepera and Shugart, 1989), it seems natural that the binominal system should have effects that resemble a majoritarian system. Among these effects, Rae had already pointed out that it is often the case that majoritarian systems favor the two largest parties more than do proportional systems. In fact, under Taagepera and Shugart (1989) criteria, the Chilean is 'late rise'

system, which implies suggests a strong bias against the smaller lists.[9]

In comparison with other Latin American countries, the Chilean system is also not an outlier (Table 2). For comparable elections in the same period, slopes for the regression of seat share on vote share in nine Latin American countries vary from 1.03 to 1.17. Among countries that use the d'Hondt allocation formula, the rule that smaller magnitudes lead to larger slopes is generally true. Chile does present one of the largest benefits for the larger lists, but this would be expected given that most other countries in the table adopt PR systems with higher magnitudes than Chile. The only exception is Argentina, which has a slope even larger than in Chile despite having higher average magnitude. It should be noted, however, that out of the 24 Argentine electoral districts, 10 have a magnitude of 5. Since half of the lower chamber is renovated every election, half of these districts elect two deputies in each election, and on these years function very much like the Chilean binominal system.

More recently, King and Browning (1987) and King (1990) have developed methods that allow to estimate the responsiveness (ρ) and bias (λ_j) of electoral systems. The former is the extent to which the electoral systems depart from proportional representation ($\rho = 1$), while the latter is a parameter that represents the bias towards or against a specific party. In their terms, an electoral system that favors the largest vote getter ($\rho > 1$) can still be fair, as long as there exists partisan symmetry ($\lambda = 0$). Party symmetry is assured as long all parties receive the same seat share given a certain vote share.

I estimated the "responsiveness" of the Chilean electoral system as $\rho = 1.24$ in an unrestricted model, that allows for party specific bias, and $\rho = 1.90$ in a model that assumes no party bias. As with more simple measures of bias, these places Chile roughly in between the European proportional and majoritarian systems for which these values where estimated by King (1990). The restricted model ρ is shown in the dotted curve in Fig. 1.

As for the party bias proper, the λ's for the Chilean case indicate a very small partisan bias in favor of *Alianza* relative to *Concertación*, and a much larger bias against smaller parties. Given the small number

Table 2
Lower chamber electoral system in selected countries

Country	Slope	System	Formula	Average magnitude	Years
Colombia	1.03	PR	Hare	4.88	90/91
Uruguay	1.03	PR	d'Hondt	99	89/94/99
Brazil	1.06	PR	d'Hondt	18.68	90/94/98
Peru	1.06	PR	d'Hondt	120	95/00
Venezuela[a]	1.11	Mixed	mixed	1/other	93/98
Ecuador	1.12	PR 2 tier	Hare	2.9/12	92/96/98
Chile	1.14	PR	d'Hondt	2	89/93/97/01
Argentina	1.15	PR	d'Hondt	6.24	97/99/01
Bolivia	1.17	PR	S. Lague	14.44	89/93/97

System, formula and average magnitude data obtained from Jones (1995) and Jones (1997). Slopes calculated by regressing seat share on vote share by list in the years indicated.
[a] Venezuela used a system with single member districts and compensatory state and national districts.

of observations, however, these estimates fall way short of statistical significance.

All said, to the extent that there are losers from the binominal system, these are likely to be the smaller parties, and not either one of the two main lists. The fact that the Chilean system benefits the largest lists roughly in proportion to their electoral success is not the same as the claim that the second largest list is favored.

3.2. Bias through malapportionment

It has also been argued in the literature that *Alianza* was favored by gerrymandering that made urban districts bigger and thus giving less weight to areas where *Concertación* tends to have greater support. Although there is considerable variation in the number of voter per districts, there is no evident bias against *Concertación* or in favor of *Alianza*.

I found that the correlation between each lists' vote share and the size of the district is very small and not significant.[10] Furthermore, sweeps and splits[11] are roughly equally distributed along the whole range of variation in the size of the districts, as can be seen in Fig. 2. In fact, similar results had already been obtained by Navia (2002), who claimed that at least on what refers to redistricting Pinochet's institutional design back-fired (p. 16).

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[9] Taagepera and Shugart (1989) argued that electoral systems can be classified by the point in which parties begin to have a favorable seat to vote ratio. Although the Chilean case is problematic in the sense that it does not present any list in the middle range of the graph, one can still determine that the regression line crosses the perfect proportionality line at a vote share of 15.4.

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[10] Due to lack of district level registered voter data I used the total number of votes cast as a proxy for district size. Very similar results hold if the correlations are calculated separately for each election.
[11] Sweeps refer to districts where either lists elects the two candidates and splits to district where different lists each elects one.
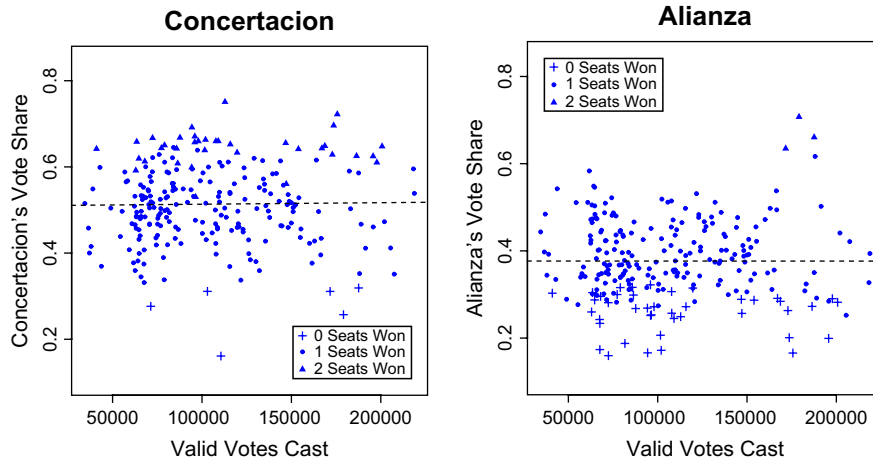
Fig. 2. Vote shares, seats won and district size: lower house. *Notes:* Each observation is a district-year, for a total of 240 observations. Correlation between size of district and vote share is −0.0004 for *Alianza* and 0.0159 for *Concertacion*, which are substantively and statistically indistinguishable from zero.

In addition, each seat in the *Cámara* cost roughly the same amount of votes for each major coalition. Although *Alianza*'s average seat cost measured in votes is slightly lower than *Concertación*'s, the difference is not significant[12] and in two last two elections *Concertación*'s seats were actually 'cheaper'.

4. Why doesn't the system produce the expected results?

The data above suggest that the Chilean Electoral System does not deviate significantly from patterns found in other country's electoral systems, and does not provide a noticeable benefit to the right. The fact that these data contradict a very plausible mechanism pose by which the second largest list should benefit from the electoral system is a potentially interesting puzzle. In this section I explain why the binominal system doesn't yield the pro-right results that were expected.

The argument is that variability in the lists' vote share across districts is an important and forgotten aspect of the puzzle. I make this argument in three stages. First I build on Navia's analysis of the process of institutional design in Chile to show that accounting for this variability the binominal system was not necessarily the

best *ex ante* choice available to its designers. Next, I present another simulation that further illustrates the effects of the variation in vote shares across districts. In the end, I return to the data and test an implication of the argument on data from races for the Senate.

Navia (2002) acknowledges that the design of an electoral system is necessarily done in an environment of uncertainty. However, considering what the designers of the Chilean electoral system sought to accomplish he argues persuasively that the district magnitude choice was optimal even though the Pinochet regime could have done a better job in aspects such as district drawing. The argument put forth in the fourth chapter of his dissertation is that based on the information available at the time, which was basically the results of the plebiscite which granted Pinochet 43% of the vote, the choice of an electoral system with $M = 2$ was the safest strategy available to the outgoing regime. Given the uncertainty about whether the opposition to the military regime would coordinate successfully into one block, Pinochet followed an 'insurance' strategy: expecting to be a minority, the two member district was the one that most actively prevented the formation of a over-whelming opposition majority.

In order to justify this claim Navia presents a very interesting simulation of seat shares that would be obtained under different district magnitudes and different number of parties, holding Pinochet's party vote share fixed at 43%. The varying number of parties reflects Pinochet's uncertainty regarding what the opposition would do, but his expectation that his supporters would successfully coordinate under one party or coalition. From this analysis, $M = 2$ emerges as the safest strategy.

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[12] Alianza's average seat cost in vote is 47 569 while Concertación's is 48 487. The hypothesis that the average costs of seat across lists are the same cannot be rejected. The one tailed test of the hypothesis that Concertación's seat cost is greater than Alianza's seat cost yielded a *p*-value of 0.34. This comes as no surprise given the small number of observations.

Basically, Navia shows that under the worst case scenario — with an unified opposition — district magnitude of 2 would give the highest seat purchasing power to Pinochet's 43% vote share[13] while making it 'very difficult for any party to easily win control of a majority of seats in every district' (Navia, 2002, Chap. 4).

However, there is one important hidden assumption in this rationale. In order to make his case, Navia considers what occurs in one district and then extrapolates his conclusion into a multidistrict setting. If dealing with a multidistrict system, such an assumption amounts to assuming that the same vote shares are observed in every district. It is evident that nobody would expect this to be true, but this is the same rationale found in all of the analyses of the Chilean electoral system I have reviewed.

My claim here is simply that to ignore the variation of vote shares across districts is not a trivial simplification of reality, and directly affects the analytical results. Aggregation of districts plays a determining role in the final electoral figures and distribution of power. *Concertación's* mean vote share across districts considering all 240 observations obtained by aggregating the results of the four elections is approx. 52% and *Alianza's* mean vote share is approx. 38%. If these vote shares were the same in all districts there would be a split in every district and the system would, in fact, benefit the opposition. However, this is obviously not the case. Treating each party's vote shares as distribution across districts rather a single value allows us to account for the fact that each list performs differently across districts.

Fig. 3 shows what this distribution looks like. Since the two larger coalitions garner the vast majority of the votes available, the distribution of the district level returns pooled across the four post-Pinochet elections are almost complementary and display very similar standard deviations.[14] Fig. 3 also shows a beta distribution fitted to the data by maximum likelihood.[15]

It is a straightforward fact that lists perform differently in different districts, but does the fact that vote shares vary across districts matter? The intuition for the positive answer to this question stems from the observation that *Concertación* was more likely to cross the threshold needed to obtain a sweep than to fall bellow the requirements of electing one candidate, while *Alianza* was more likely to fall bellow the requirements for electing one candidate than to elect two.

If the dispersion of vote shares across districts is included in Navia's simulations the options available to Pinochet, different results are obtained. Working with Navia's assumption that Pinochet expected his political followers to keep the 43% vote share from the 1989 plebiscite, and assuming that the vote share across districts distributed according to a beta distribution a mean of 43%, it is possible to allow the standard deviation of this distribution to vary and then observe the effects of the dispersion of the votes.

Table 3 shows Pinochet's expected vote share under the worst case scenario for him, which would be to compete against a united opposition. The second column shows Navia's results without taking variation into account. The contrast with the subsequent columns is very interesting. As the dispersion of the vote shares across district grows, $M = 2$ ceases to be the optimal strategy. While with no or low dispersion $M = 2$ performs at least as well as any other M, when the standard deviation reaches 10 percentage points $M = 2$ falls to 5th place among the 10 exemplified options. The differences are obviously small, but enough to say that at from the perspective of an institution designer there was no clear choice. More importantly, however, this analysis also shows that variation in vote shares across districts affects the results one expects to obtain based on a single district case.

The idea that $M = 2$ was an 'insurance' policy can also be contested. Table 4 shows that $M = 2$ would produce the greatest seat share loss were the vote share to fall 5%, while not securing the highest increases in seat shares if the vote share increased by the same amount. These results would be even worse if the variation in vote shares were greater.

The main argument of the paper is perhaps best exemplified in another simulation, whose results are presented in Fig. 4. In this exercise, I analyze how votes translate into seats under three scenarios that differ solely with regards to the dispersion of votes across districts. In all cases, the competing lists' vote shares across districts are beta distributed, with mean equal to their national level vote share (The appendix provides more details).
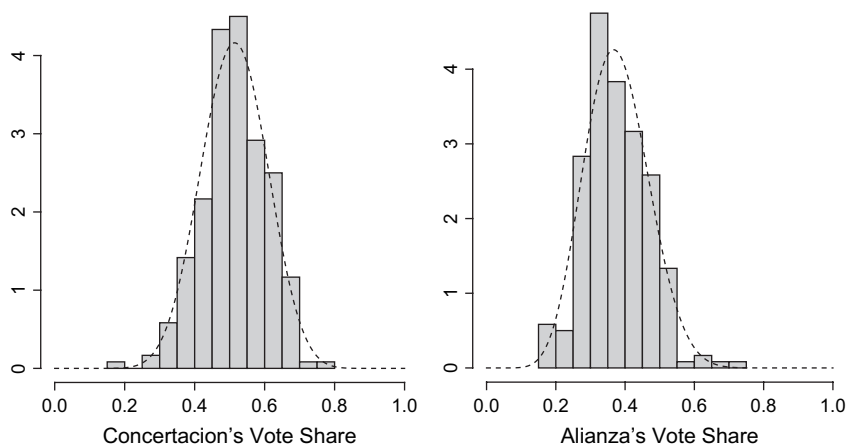
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[13] To be faithful to the argument, magnitude of 2 is a weakly dominant strategy in that it performs at least as well as any other district magnitude for any given number of opposition parties. In the specific case of a united opposition, magnitude 2 yields the same seat purchasing power as magnitudes 4 and 6. In this case it has the advantage of also inducing a reduction in the number of parties, which was also in Pinochet's interests.

[14] Concertación's standard deviation was 9.3 while Alianza's was 9.2. It was impossible to reject the hypothesis that the two lists standard deviations are the same, at a significance level of 0.95, for the whole sample. The same holds if each election is taken separately, except for the 1989 election where Concertación's vote share varied significantly more across districts.

[15] Since the possible vote shares in each district are bounded between 0 and 1, the beta distribution is a more appropriate modelling tool than the normal distribution.

Fig. 3. Distribution of district vote share by list: 1989−2001.

When there is no variance across districts (sd = 0), which is what the pre-existing literature assumes, the resulting aggregate vote share is the same as the expected result at the district level. In this scenario without variance, there is an interval between vote share of approximately 0.33 and 0.5 where a party would be favored. Similarly, if a party garnered between 0.50 and 0.66 it would receive a smaller seat share than its vote share.

However, this step function, characteristic of the 'one-third/two-thirds' argument reviewed earlier, fades away as variance increases and the interval in which these distortions occur diminishes progressively. At realistic variance levels − which in the Chilean case is just under s.d. = 0.1 − such areas of distortion do not exist. In fact, the system is close to perfectly proportional in the interval between 40% and 60% of the

vote. With even higher variances the mapping of votes shares into seat shares becomes a straight line, with slope just above 1, reverting to the result common to other electoral systems.

A complete picture of the mechanism emerges if one now turns to the Senatorial races. For the Senate, there are not 60 but only 19 binominal districts. Moreover, with the exception of the founding elections of 1989, only half of the elected seats are renewed each election year, which means that there were elections in only nine districts in 1993 and 2001 and in 10 districts in 1997. With fewer and larger districts, there is less variation of vote shares across them, and more importantly, much less room for the effects of this variation to be felt. For example, assuming that *Concertación's* vote shares are normally distributed around 51% with

Table 3
Expected seat share of Pinochet's party accounting for variance of vote shares across districts

Magnitude	Navia[a]	sd = 5	sd = 10	sd = 15
1	0.00	8.27	24.44	32.26
2	**50.00**	**48.77**	41.86	39.30
3	33.33	36.09	40.45	**40.64**
4	50.00	43.07	41.23	**41.25**
5	40.00	41.16	41.60	**41.60**
6	50.00	41.81	41.83	**41.83**
7	42.86	42.09	**42.00**	**42.00**
8	37.50	42.07	**42.13**	**42.13**
9	44.44	42.24	**42.22**	**42.22**
10	40.00	42.30	**42.30**	**42.30**

Notes: Assumes (i) vote share beta distributed with a mean 43% and varying standard deviations (ii) an united opposition party garnering the remaining vote share (iii) seats distributed by d'Hondt seat allocation formula.

[a] This column corresponds to sd = 0 and was obtained from Table 4.2 in Navia (2002).

Table 4
Effects on seat share of hypothetical changes in vote share

Magnitude	Seat share with 43% of votes	Alternative scenarios			
		−10% votes	−5% votes	+5% votes	+10% votes
1	24.44	−19.08	−12.29	17.66	37.30
2	41.86	−18.51	−8.49	6.10	11.25
3	40.45	−12.78	−6.22	6.72	13.77
4	41.23	−12.40	−6.25	6.27	12.51
5	41.60	−11.98	−6.01	6.00	12.00
6	41.83	−11.66	−5.84	5.83	11.67
7	42.00	−11.43	−5.71	5.71	11.43
8	42.13	−11.25	−5.63	5.62	11.25
9	42.22	−11.11	−5.56	5.56	11.11
10	42.30	−11.00	−5.50	5.50	11.00

Notes: Assumes (i) vote share beta distributed with a means of 38%, 43% and 48% and standard deviation of 10 percentage points (ii) an united opposition party garnering the remaining vote share (iii) seats distributed by d'Hondt seat allocation formula.
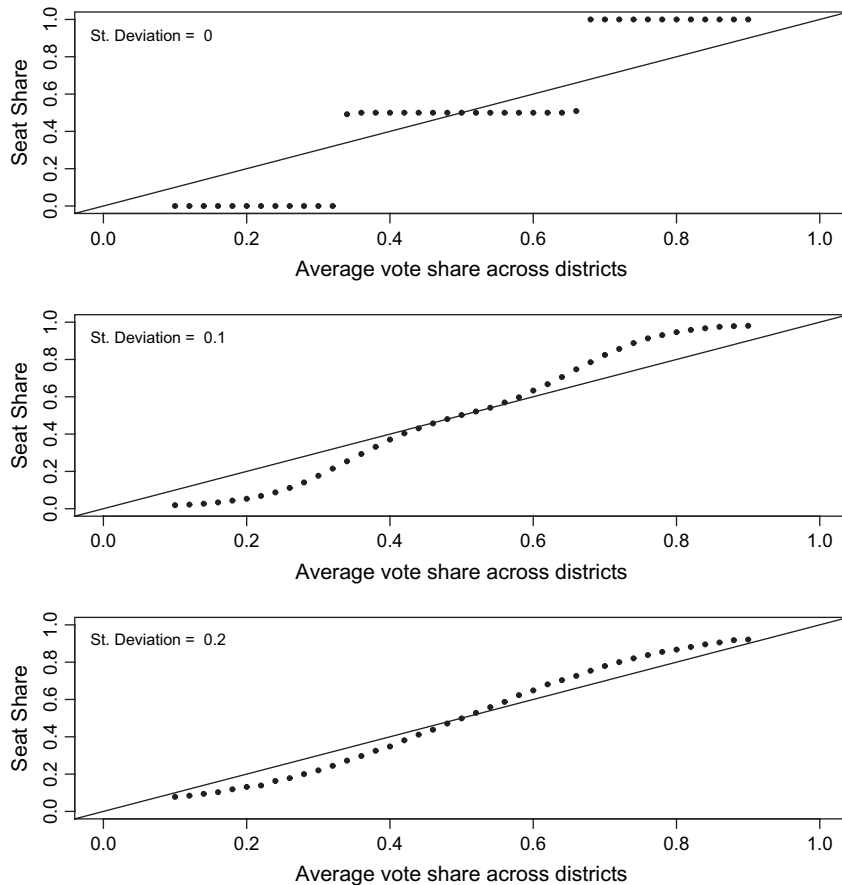
Fig. 4. Simulated effect of variance across districts on seat shares.

standard deviation of just over 9 percentage points in both houses means that in roughly 5% of the districts *Concertación* is going to be above the threshold to sweep a district. In the race for the *Cámara* that that would translate into roughly 3 districts, whereas, in the Senate races that is not enough for a single sweep.[16]

The bottom line is that since there is less variation, the Senate races look a lot more like the single district analysis. It comes then as no surprise that by most measures it is possible to identify an advantage to the right wing coalition.[17]

In addition, the one result that doesn't change is that for both houses there no association between district size and vote share.[18] For this reason, I am confident that the pro-right bias in the Senate is in fact driven by the smaller dispersion of results and not simply the consequence of smaller and more backward districts being favored by the equal magnitude, as tends to be the case in other equal magnitude Senates around the world. It is interesting to note, however, that none of the authors reviewed about the pro-right bias mentioned that it should hold only in the Senate, and all analyzes use examples from the *Cámara* to illustrate their point.

5. Concluding remarks

This paper sought to two different but related goals: (i) Show that the widely acknowledged pro-right bias

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[16] The actual lower standard deviations of vote shares across districts in Senate elections in comparison to the ones observed in elections for the Cámara further strengthen the differences between the two races.

[17] Concertación's average senate seat costs almost 20% more in terms of votes. Both absolute and relative distortion figures are considerably higher for Alianza and difference is statistically significant at the 0.01 level.

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[18] Both list's measures of association between vote share and size of district are very close to zero and non-significant, although the direction is the one that would be predicted by the conventional wisdom: positive for Concertación and negative for the opposition.

in the Chilean electoral system was not empirically verified; and (ii) discuss why the plausible and expected effect did not hold. After extensively reviewing the data I believe to have successfully shown that the pro-right bias does not exist in *Cámara* elections, at least with respect to the electoral system's mechanical effects.

Previous analyses have inappropriately extrapolated district level mechanism to make predictions about aggregate electoral results. Taking the variation in vote share obtained across districts into account changes the predicted effects of the electoral system. Simulation results show that unrealistically low variance levels the conventional wisdom about the effects of the Chilean electoral system are correct. However, as this variance level increases the system becomes much more proportional. Furthermore, the existence of a pro-right bias in the Senate, where the variation across districts is smaller, further strengthens the argument that variance plays an important role.

The main implication for real world politics is that a system that benefits the two main players has a strong potential for creating collusion among them. This is especially true in Chile, where other political groups have been excluded to the point that there now exists 'habitual winners and permanent losers' in Chilean politics (Gómez Leyton, 2005).

Therefore, it is not clear whether it is in *Concertación's* interest to reform the binominal system, as it attempted to do in the early 90's. After all, from *Concertación's* point of view, the binominal system has provided powerful incentives to overcome internal organization issues (Carey and Siavelis, 2005), protected its left flank, and on occasion, even boosted its legislative seat share. One could argue that it has hurt *Concertación* in the Senate, but that effect was considerably overshadowed by the existence of the designated Senators, which constituted a more visible and pressing concern. As a result, even when the end of the *institucionales* allow for a *Concertación* majority in the Senate, thus making reform possible, it will take some other motivation besides narrow self interest for reform to happen.

Acknowledgments

Appendix

The data from the four post-Pinochet elections in Chile (1989, 1993, 1997 and 2001) and were obtained from the Chilean Electoral Service website. Electoral results from other Latin American countries used in Table 2 were compiled from several sources. Both sets are readily available from the author upon request.

For the simulation of the effects of the variation of vote shares across districts, the national vote share of an hypothetical coalition was allowed to vary and at small intervals between 0.1 and 0.9. At each of these vote share levels, 60 vote shares (one of each electoral district) were randomly drawn from a beta distribution, with mean equal to the vote share[19] and a pre-set variance level σ.

A simplified electoral formula was then applied to each of the 60 vote shares to determine whether the hypothetical list obtained 0, 1 or 2, seats. I then computed the total number of seats, as well as the seat share each list obtained in that random draw. The "expected seat share" was computed by repeating this procedure a large number of times for each vote share level, and taking the average of the realized vote shares. In order to capture the effect of the variation of vote shares across districts on the expected seat share, the whole procedure was repeated for $\sigma = 0$, $\sigma = 0.1$, and $\sigma = 0.2$. The results for each of these dispersion levels are shown in Fig. 4.

The beta distribution is a good modelling tool for this problem because it is bounded between 0 and 1 and extremely flexible. However, contrary to what happens with the normal distribution, its mean and variance are not its defining parameters. Thus, in order to perform the random draws mentioned above, it was necessary to re-parametarize the distribution, and compute the α and β that preserved the standard deviation of interest at each level of vote share. This was done by using the first and second central moments of the beta distribution (DeGroot and Schervish, 2002, p. 306), as follows:

$$E(Y) = \frac{\alpha}{\alpha + \beta} \tag{1}$$

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[19] Note that this amounts to making the assumption that the average vote share across districts equals the aggregate vote share nationwide. This is not a very demanding assumption for two reasons: (1) it is very close to what is observed empirically; and (2) I have shown that there exists no systematic relationship between the size of the district and the performance of either of the main coalitions.

and

$$Var(Y) = \frac{\alpha(\alpha+1)}{(\alpha+\beta)(\alpha+\beta+1)} - E(Y)^2 \qquad (2)$$

Eq. (1) was re-written to obtain β as a function of α and $E(Y)$

$$\beta = \frac{\alpha[1 - E(Y)]}{E(Y)} \qquad (3)$$

then substituted into Eq. (2) and equated to zero. This yielded

$$\frac{\alpha(\alpha+1)}{\left(\alpha + \frac{\alpha[1-E(Y)]}{E(Y)}\right)\left(\alpha + \frac{\alpha[1-E(Y)]}{E(Y)} + 1\right)} - E(Y)^2 - Var(Y) = 0 \qquad (4)$$

The distribution from which the draws were made was defined by solving Eq. (4) for α and then computing β.

The simulations presented in Tables 3 and 4 follow the same logic. All simulations were performed in *R*, and the code is available upon request.

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