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Here's the bias! A (Re-)Reassessment of the Chilean electoral system☆

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ABSTRACT

Most scholars of the (now abandoned) Chilean legislative electoral system, known as the "binomial system", have noted the many ways it was designed to benefit the ideological right. However, Zucco (2007) challenges this conventional wisdom by arguing that there is no bias through the electoral system's majoritarian character, no bias through malapportionment, and that designers could have designed a system to better benefit the ideological right. This paper uses *comuna* level electoral returns and simulations from Chile's 1988 plebiscite to show that the system was indeed designed to 1) reduce the number of parties in the Chilean party system and 2) minimize electoral losses and maximize electoral gains of the political right. It further argues that, 3) it would have been difficult to design a legislative electoral system to better over-represent the ideological right given the constraints and political context of the time. The analysis strongly supports the rationality of electoral engineering to benefit designers and their allies, even under sub-optimal conditions of limited time and resources. Though the system was abandoned in 2015 in favor of a moderate proportional representation system, it is important to set the record straight in terms of electoral engineers' intents and purposes.

The Chilean legislative electoral system from 1989 to 2013, known as the binomial system, is among the most analyzed in Latin America (e.g. Fuentes, 1993; Rabkin, 1996; Scully and Valenzuela, 1997; Siavelis, 1997; Dow, 1998; Magar et al., 1998; Carey and Siavelis, 2005; Garrido Silva and Navia, 2005; Navia, 2005; Carey, 2006). This is both because of the unique competitive dynamics it produced and the reality that the outgoing military regime had free rein to design and implement the type of election system it wanted upon re-democratization in 1989. These facts have led a series of scholars to note the many ways the system was designed specifically to benefit the military's party allies on the political right and disadvantage the left (Scully and Valenzuela, 1997; Siavelis, 1997; Fuentes, 1999; Navia, 2005; Rojas and Navia, 2005).

However, in an *Electoral Studies* article, Cesar Zucco (2007) "reassesses" the claim of electoral design to favor the right. He intimates that those who have pointed to the biases inherent in the Chilean legislative electoral system are themselves biased, with the underlying suggestion that analysts' arguments have been shaded by the reality that the right is the purported beneficiary of the electoral advantage.[1] Zucco calls it a "widely stylized fact" that the binomial system favors the coalition that finishes second while hurting the winning coalition, saying that, "Since the right wing coalition has finished second and the center-left coalition has finished first [in the first four legislative elections] of the post-Pinochet area (*sic*), this distortion can be called a 'pro-right' bias" (Zucco, 2007: 303).

Zucco advances a two-pronged argument to make this point: 1) the pro-right bias did not exist, and 2) the system ultimately failed to produce the benefits claimed by earlier analysts. The author also asserts two ancillary arguments claiming that the right did not benefit from malapportionment of districts (2007: 308), and that if forces supporting the right were so bent on providing an advantage for it, "the binomial system was not necessarily the best *ex ante* choice available to its designers" (2007: 309). While Zucco does advance the study of Chile's binomial system and reach some intriguing conclusions, his analysis suffers from a number of problematic assumptions and leaps of logic.

The purpose of the present paper is to reassert the conventional

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[1] As Zucco does, we focus throughout the paper on the electoral system for the Chamber of Deputies, not the Senate.

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wisdom that the system was indeed designed to benefit the political right. It does so by examining Zucco's claims of proportionality and limited malapportionment and employing previously unreleased disaggregated electoral returns from Chile's 1988 plebiscite to show that it would have been difficult to design a legislative electoral system to better over represent the ideological right. The paper proceeds as follows. We begin with a discussion of the origins and basic dynamics of the election system. The second section then explains the conventional wisdom regarding the binomial system's origins and design, as well as Zucco's refutation of those claims. We go on to analyze those claims in depth, beginning with analytical flaws (some shared by Zucco and other proponents of the conventional wisdom), and then moving on to theoretical assumptions and empirical missteps in Zucco's analysis, where we refute claims concerning the design, outcome, and relative desirability of various electoral reform options, as well as the methodology he employs. Finally, we go beyond Zucco's argument to provide additional evidence of purposive electoral engineering to benefit the right by gerrymandering. All of this evidence points to systematic efforts by the military and its allies to design the system with the specific aim of favoring the right. In short, there was a bias, but it was a design bias in favor of the ideological right.

This debate is not purely academic. Though Chilean elites passed a reform of the electoral system in May of 2015, adopting a proportional representation system that will take effect for the 2017 congressional elections, it remains essential to have a grasp of both the intentions of the binomial system's original design and its function. This is especially true since the current system was specifically designed to remedy the binomial system's perceived shortcomings. It is important then to understand its origins, the effect it was intended to have on the party system, and the outcomes it produced. Moreover, it is imperative to set the historical record straight with respect to the military's overall effort to establish a tutelary democracy in Chile, of which the binomial system was an integral part. Rather than an innocuous instance of electoral reform aimed at enhancing stability, the binomial system imposed by the military and its allies on the right represents one of the most extreme instances of electoral and institutional engineering among Third Wave democracies.

1. Chile's electoral system

Unlike most democracies where representative actors decide the electoral "rules of the game", Chile's binomial system was imposed under dictatorship. After a seventeen-year military regime, authorities led by dictator Augusto Pinochet ceded power following a plebiscite on his continued rule in 1988. Yet despite the victory of opposition forces in the plebiscite, Pinochet and his military advisors had substantial leverage to impose a constitution and electoral system of their design (Pastor, 2004). The constitution, though subsequently reformed, provided veto power for the right and supported it in other significant ways (Siavelis, 2000). The legislative electoral system, for example, was widely considered part of this package of institutional engineering.

It is well documented in the military government reports on the country's constitutional future that Chile's old proportional representation (PR) system would be abandoned given its propensity to allow the representation of many parties. This multipartism was a reality that Pinochet and his supporters repeatedly underscored had led to unnecessary division and partisan conflict, and which had been partly responsible for the 1973 crisis of democracy (Pastor, 2004: 50). As early as 1978, the full Commission for the Study of the Constitution reported that, "the electoral system ought to result in the effective expression of majorities through uninominal districts or polynomial districts that elect the same number of deputies" (cited in Pastor, 2004). The result was the binomial system for Chile's lower house.

This system established two-member districts with open lists, as voters indicated a preference for one or another candidate on their preferred list. Though voting was candidate-centered, in determining the winner, the total votes for both candidates on any list were first pooled before distributing seats to lists. Seats were then awarded to individual candidates based on their rank on their list. The system used the D'Hondt method, which in two-member districts functionally provided that the first-place list could win both seats in a district only if it more than doubled the vote of the second-place list. If it did not, each of the top two lists won one seat.

Essentially, then, within the context of a pattern of two-alliance or two-party competition, the binomial system establishes strong thresholds at 33.3% and 66.7%. Because Chile has been characterized by competition between two major coalitions (the center-left *Concertación* and the right wing *Alianza*[2]) these thresholds have indeed prevailed—to a greater or lesser extent depending on proximity to them, as we will argue below—since the return of democracy.

2. The conventional wisdom and its refutation

These thresholds are just one of the mechanical effects of the binomial system that some scholars have claimed as the basis for a right wing bias. For the advocates of a bias, the systematic favoring of the right begins with the very design of the districts. They claim that the government used the plebiscite results to craft districts favoring parties on the right, and to over-represent conservative, less populated areas to ensure a lower vote-per seat ratio in the areas of traditionally stronger support for the authoritarian government (Siavelis, 1997, 2000).

However, the most important assumption of the conventional wisdom is that the military designed the binomial system to take advantage of its electoral thresholds. Armed with knowledge of the results of the 1988 plebiscite from *comunas* (the equivalent of municipalities) across the country, where Pinochet was defeated by a margin of 55%–43%, officials determined it would be quite difficult to design an election system with uninomial districts in which the right could fare well. Indeed, such a system presented the prospect that the right would be shut out of congress. However, advocates of a right wing bias note that given the 33.3% and 66.7% effective thresholds, the binomial system provided an ingenious solution to Pinochet's problem (Fuentes, 1993; Scully and Valenzuela, 1997; Siavelis, 2000, 2002; Navia, 2005). It resolved the conflict between his desire for a low magnitude system that would limit the number of parties, and a system that would (at least initially) exaggerate representation for the right or limit its potential losses. With the binomial system, the higher vote-getting center-left Concertación lists would have to double the vote of the center-right Alianza lists to have any hope of gaining a congressional majority. In this way, according to the conventional wisdom, electoral reformers relied on these thresholds combined with gerrymandered districts to effectively allow the right to garner nearly 50% of the seats with only 35–40% of the vote.

In his article, Zucco (2007) challenges each of these assumptions by: 1) showing that the right wing coalition did not benefit from the binomial system more than the left wing coalition between 1989 and 2001; and 2) showing that the military could have designed an

[2] Since its formation in 1989 the coalition has gone by various names. Though officially called the *Coalición por el Cambio* today, it was known as the *Alianza por Chile* from 2000 to 2009, and is usually referred to as the *Alianza*. Similarly, since 2013 the *Concertación* coalition has gone by the name of *Nueva Mayoría*.

electoral system that would have better advanced the interests of the ideological right. We offer counterarguments to his assertions. First, we argue that Zucco bases his claim regarding the lack of bias on problematic assumptions, employing analysis and simulations with important analytical flaws. Second, while Zucco claims that there is no empirical evidence to back the assertion that electoral engineers relied on malapportionment of electoral districts to benefit the right-wing coalition (Zucco, 2007: 308), we provide data to the contrary using district-level returns from the 1988 plebiscite (Chateau and Rojas, 1989) and heretofore previously unavailable electoral simulations used by military planners. Finally, we counter Zucco's claim that the military regime could have adopted a "better" electoral design for the right than the binomial system. This assertion ignores certain practical political limits which would have prevented the right from adopting the system Zucco asserts would have been optimal. In essence, we challenge the core of Zucco's arguments by asserting, without normative bias, that the military and its allied reformers set out with the intention, purpose, and conviction to benefit parties of the right, that the system benefitted the right, and that reformers could not have picked a "better" system (i.e. more beneficial for parties of the right) given the particular political and party context and practical constraints of the time.

3. Analytical and theoretical assumptions

Many scholars of the Chilean electoral system, from Zucco to advocates of the conventional wisdom such as Navia and Siavelis, fall prey to important analytical flaws. However, while Zucco is correct to point out the flaws in previous scholars' arguments, there are some embedded in his own. We deal with each of these in turn.

3.1. Simulations based on theoretical vote distributions

The most significant shortcoming in previous analyses of the binomial system design is a failure to model based on the 1988 plebiscite returns. It should be obvious that electoral system analyses must consider the empirical priors available to institutional designers—here, electoral results from the 1988 plebiscite, disaggregated by comuna—instead of theoretical vote distributions. While not broadly divulged, these data are recorded and freely available in Jorge Chateau and Sergio Rojas' FLACSO-Chile working paper (1989). Yet neither Siavelis (1999), Navia (2003), Zucco (2007), nor any others we have surveyed use disaggregated electoral returns from 1988 to support their claims for or against types of electoral system design. Siavelis (1999), Navia (2003) and others bias their simulations by failing to assume variance in vote shares across districts when running their simulations, instead assuming the right's national share of 43% across districts (and the left's 57%). Zucco, in turn, applies a beta distribution of variance—similar to a normal distribution when the range of data is restricted to outcomes between 0 and 1—around a mean of 43% for the right across the 60 districts. This latter methodological decision is theoretically defensible in the absence of electoral returns and preferable to assuming a lack of variance, but nonetheless differs significantly from the actual electoral data used by electoral engineers and recorded in Chateau and Rojas (1989).

In either case, institutional designers in Chile did not create the legislative electoral system from theoretical distributions of votes, but returns from each of Chile's then-335 comunas. Furthermore, the military regime itself aggregated these comunas into the current 60 districts, and was therefore able to consider a number of configurations before settling on the actual setup. In practice, then, electoral engineers were clearly not settling on a district magnitude for normally distributed vote shares around a common mean, but dealing with highly skewed distributions they themselves created.

As the histogram of the 1988 plebiscite results—disaggregated by the current district alignment and separated by ideological tendency—shows in Fig. 1, and the measures of central tendency in Table 1 attest, actual distributions by ideological group are quite distinct from previous assumptions. The left's vote share is negatively skewed (Fig. 1) with a mean of 53% across the current 60 districts, but a maximum (63.8%) within 11 points of that mean and a minimum dipping nearly 20 points below it (Table 1). Conversely, the right's vote share is positively skewed (Fig. 1), with a mean of 44% and a minimum within 11 points and a maximum reaching over 20 points above (Table 1). In both cases, the standard deviation from the mean is 7.6 percentage points.

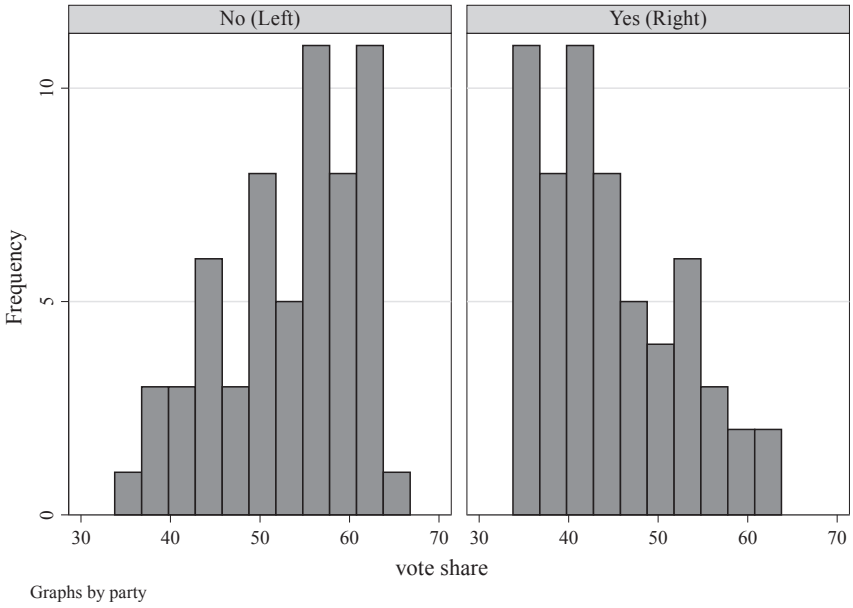


Fig. 1. Histogram of vote shares from 1988 plebiscite across subsequently formed binomial districts.

Table 1
Measures of central tendency for 1988 district-level results of congressional elections, by coalition.

	Mean	SD	Min	Max
Yes (Right)	44.40	7.61	33.78	63.04
No (Left)	53.23	7.64	34.80	63.78

Table 2
Vote cost per seat won by each coalition, 1988–2009 (1988 figures are simulated assuming current districts, two left-right coalitions, and no change in vote).

	Party	Votes	% Share	Seats	% Seats	Cost per seat
1988	Left	3,967,579	54.71	60	50	66,126
	Right	3,119,110	43.01	60	50	51,985
1989	Concertación	3,499,713	51.49	69	58	50,720
	Alianza	2,332,358	34.18	48	40	48,591
1993	Concertación	3,733,276	55.4	70	58	53,333
	Alianza	2,471,789	36.68	50	42	49,436
1997	Concertación	2,927,692	50.51	69	58	42,430
	Alianza	2,101,392	36.26	47	39	44,710
2001	Concertación	2,942,989	47.9	62	52	47,468
	Alianza	2,720,195	44.27	57	48	47,723
2005	Concertación	3,417,207	51.76	65	54	52,572
	Alianza	2,556,386	38.72	54	45	47,340
2009	Concertación	2,934,378	44.35	57	48	51,480
	Alianza	2,874,674	43.45	58	48	49,563

These numbers provide evidence that the outgoing military government rationally engaged in strategic district delimitation that initially resulted in a vote distribution that was radically different between coalitions. The implication of this gerrymandering is that simulations based on a normal or beta distribution, while theoretically justified, will be biased. Chilean electoral engineers were not basing their design on simulated parameters assuming normally distributed vote shares across districts, but simultaneously setting the district magnitude and shaping the districts to maximize gains and minimize losses.

3.2. Use of an electoral "sweet spot" in correlations and analysis

Zucco makes other problematic assumptions in simulations of various electoral systems, basing his analysis on what we call an electoral "sweet spot." In his Table 3, for example, Zucco claims that $M = 2$ ceases to be the optimal choice as dispersion of the vote takes place. This claim reasonably holds at the average distribution around the mean of 43% that he uses. It is a well-known and often analyzed fact that the binomial system produces powerful thresholds within the context of two-party or two-coalition competition at 33.3% and 66.7%. While a number of analysts simulate results based on a 43% vote for the right based on the notion that it received this percentage in the 1988 plebiscite, the number also happens to be something of a sweet spot with respect to the sensitivity and insensitivity to vote shares under the binomial system. This is the case because the binomial system produces little difference in seat shares until these thresholds are approached.

By assuming a 43% vote share, these simulations only approach the margins of the "sour spot" where the binomial system is sensitive to shifts in vote. In particular, Zucco argues that the binomial system is actually insensitive to change, providing simulations where the right's vote share increases or decreases by 10%, bringing the right's vote share to 33% and 53% respectively, and nearing the crucial threshold at the lower end of the spectrum. He comes nowhere close to the upper end of the spectrum (with a transfer of 10%) and even less close to the lower *or* upper thresholds with transfers of 5% (38% and 48%).

However, if one assumes that the right might drop below 43%, but always stays around 33% (without dropping below 33% in a significant number of individual districts due to gerrymandering), $M = 2$ becomes a better choice. This will become quite clear below in our analysis of cost in votes per seat. As the right (or the second largest electoral force in the context of two coalition competition) approaches the lower threshold of 33% but does not drop below in a significant number of districts, the cost per seat in votes becomes progressively lower.

3.3. Non-seat maximizing institutional engineers

In his work, Zucco shows that the binomial system did not significantly benefit the right wing coalition more than the left wing coalition from 1989 to 2001, then follows this by showing how military designers could have designed a system better suited to maximize their gains. In our view, this is akin to suggesting that Pinochet's government had a monopoly over the design of the new electoral system, yet constructed one that did not best suit its own interests. We wish to re-emphasize that the institutional engineers from the outgoing government were absolutely seat-maximizing actors.

In positive political theory, agents are often assumed to be self-interested actors rationally pursuing their goals. Under this standard assumption, it is naïve to assume that the Pinochet government would not have stacked the deck in its favor as it exited office. Other scholarship on electoral system design supports this view. Boix (1999), Benoit (2004, 2007), and Wills-Otero (2009) all explain that the adoption of new electoral systems are dictated by circumstances but predicated on the assumption that political parties seek to maximize representation. Boix argues that the choice of electoral system is a strategic calculation made by the dominant party or parties, conditional upon their ideological position and strength. Specifically, "the selection (and preservation) of different electoral rules can be traced to the strategic decisions made by the current ruling parties, foreseeing the coordinating consequences of different electoral systems, to maximize their representation in parliament" (Boix, 1999: 621). This logic is echoed by Benoit (2007), who assumes that a change in electoral institutions will occur when a political party—or coalition of parties—supports an alternative which will bring it more seats than the status quo electoral system and also has the power to effect through fiat that institutional alternative.

All of these conditions were present in 1988 Chile. Unforeseen circumstances, such as the surprising "no" vote in the plebiscite, raised the specter of a new balance of power unfavorable to the political right. At the same time, the military still possessed enough power to unilaterally impose its will in terms of institutional design. It only makes sense, then, that the outgoing government drew up districts and structured rules to maximize its congressional representation under this new, yet-undefined constellation

Table 3
Results of 1988 plebiscite and number of electors per district.

	Avg. Number of registered voters	Number of districts	Total registered voters 1988
Districts where the "Si" won	97,846	15	1,467,690
Districts where the "No" won	132,007	45	5,940,303
Total Districts (60)	123,467	60	7,407,993

of power. Any other interpretation willfully ignores this calculus or runs the risk of appearing disingenuous.

It is important to note, however, that established wisdom does not assume that the political right actually benefitted, or continued to benefit, from the binomial system the entire time it was in place. In the twenty-five years of its existence, both the left and right fought alternatively to change the system's district magnitude and design, or to maintain the status quo, always based on which design was politically expedient for each coalition or party. This also makes sense, since as Benoit addresses, electoral systems should cease to change when no party or group of parties with the necessary power perceives a potential seat gain by doing so.

Assumptions aside, we have also uncovered empirical confirmation that the right specifically sought a self-benefitting electoral system design. Interviews with a key actor involved in the creation of the binomial system confirmed that institutional designers were instructed by military authorities to structure a system to favor parties of the right. In the words of this actor, "we would have been fools not to" (Anonymous, 2012).[3] Indeed, some of the most important evidence regarding electoral engineering favoring the right is the various proposals for redistricting analyzed by the regime.

We obtained previously unreleased copies of the simulations performed by regime officials proposing different configurations of electoral districts authored by the *Oficina de Planificación Nacional* (ODEPLAN), the former Ministry of Planning. Though the documents bear the authorship of ODEPLAN, they were never publically released, and passed to us with a request that the person providing them remain anonymous. The documents use the comuna-by-comuna results of the 1988 plebiscite as a baseline, combining them in distinct configurations to create the 60 electoral districts. Three sets of simulations are compared: the Original Proposal, the Ministry of Interior Proposal, and the ODEPLAN Proposal.

Any doubt that the specific intention of reformers was to benefit the right should be put to rest by these documents. The introductory paragraph states:

> This analysis of electoral system sensitivity determines the risk involved for three alternative projects of district distribution … including the risk for *government parties* (our emphasis added) that the loss of 5%, 10% and 15% and the gain of 5% and 10% would mean for the governing parties (ODEPLAN, 1989).

The document goes on to specifically reference the necessary electoral thresholds the right needed to reach to maximize its representation based on the plebiscite results, noting that the documents seek to determine which districting plan "would achieve the most significant 'margin of security,' understood as the difference between 33.3% (the minimum vote necessary to obtain one deputy) and the percentage of vote that the 'Yes' forces won in the plebiscite" (ODEPLAN, 1989).

3.4. Unlimited resources, and complete and perfect information

We also disagree with Zucco's claim that if the government had possessed sufficient time, personnel, computing power, and most importantly, information regarding voter behavior, it could have designed an electoral system more beneficial for the right (2007: 309–312). These expectations are untenable. Assumptions of complete and perfect information can be useful in constructing theoretical models and making predictions, but empirical realities inevitably fall short of many of these expectations. As in all real-life situations—and as Zucco recognizes—the Pinochet government did not enjoy complete and perfect information, high degrees of computing power, or an extended period of time to reach its decision. There were practical limitations to the access and computing power available for electoral simulations. Electoral engineers were instructed to ensure all simulations were kept secret until settling on the final electoral formula, and could not bring to bear the limited computing power that existed at the time, located primarily in university labs, and particularly at the University of Chile. Electoral engineers performed all simulations with small computers of limited power beyond the sight of the Chilean public and academics within the Ministry of Interior (Anonymous, 2012). Navia (2003) also notes a number of constraints limiting the government's ability to choose the electoral rules, and as a result of limited information regarding voters' preferences, the unintended consequences that resulted from this system choice.

Analyses of the Chilean electoral system must consider both the context of the Chilean transition and the competitive dynamic of the party system as well. Several constraints limited institutional designers. Officials were concerned about the proliferation of political parties in designing the new system, as they saw the roots of Chile's democratic breakdown in the polarized competitive dynamic of the pre-authoritarian multiparty system. Consequently, beyond a mere theoretical exercise, Zucco's claim that the military officials could have better favored parties of the right had they adopted a system with a larger district magnitude is not really relevant because the military was loath to even consider such a system given its tendency to allow the proliferation of parties. Moreover, gerrymandering was restricted in some places since electoral engineers were ordered to abide by certain restrictions in drawing districts (summarized in Section 4.2), such as respecting historical regions, keeping comunas whole, keeping comunas within an electoral district contiguous, and creating "roughly similar" district populations.

Furthermore, the design of the electoral system was a contentious affair between different factions of the government, and the binomial system had already been discussed and analyzed as a way to balance the virtues of a majoritarian system with the exigencies of maintaining advantages for the right even before the plebiscite. At the outset of the design process in the 1980s the civilian advisory known as the Council of State, headed by former conservative President Jorge Alessandri, recommended a Chamber with single-member districts requiring a second round vote in the case of no majority and a Senate with two-member circumscriptions—with the exception of Valparaíso and Concepción, which would elect three, and the Metropolitan Region of Santiago, which would elect six. Nonetheless, even though the left favored a PR system, there was no universal agreement (even on the right) that Chile's traditional PR system should be abandoned, and a variety of systems were proposed throughout the 1980s. The first iteration of the binomial system was proposed in 1984, well before the 1988 plebiscite (and contradicting the notion that its adoption was a panicked response to Pinochet's defeat). This represents an additional constraint on institutional design, since electoral engineering amounted to providing the greatest benefit for the right within the constraints imposed by the binomial system (Pastor, 2004).

Of course, despite "very week (*sic*) evidence" (Zucco, 2007: 306) of a pro-right bias, subsequent elections reveal a fundamental limitation of electoral design and even complete information: although institutions can be manipulated to benefit one group in

[3] Interview with anonymous representative of binomial system design team who for political reasons asked to remain unnamed, Santiago, April 17, 2012. The authors of this article are also in possession of the previously uncirculated simulations used by the binomial system design team that substantiate al the interviewees' claims. Translation by the authors. The translation of the word "fool" was made substantially less colorful for an academic audience.

the short-term, longer-term behavior is much more unpredictable. Given the limited information of the 1988 plebiscite, the binomial system was an appropriate electoral design to achieve the government's objectives of limiting the number of parties in the party system and maximizing the right's representation—although the latter point only applied when the right was comparatively weaker than the left, as in 1988.

Finally, the success of the binomial system in achieving the goals for which it was designed was also subject to unpredictability. The application of different district magnitudes as proposed by Zucco (e.g. M = 7) overlooks the impossibility of foreseeing, 1) that parties would coalesce as they did, and 2) different vote shares for each party, since many would have presented candidates in districts from which they were precluded by coalition negotiation. The government possessed information regarding past voter behavior, but obviously much less on the future. Under these circumstances, the binomial system did a laudatory job in achieving at least some of the Pinochet government's goals.

4. Empirical claims that the binomial system does not favor the right

Zucco states that, "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" (Zucco, 2007: 306). While this may prove to be true (although we do not believe so), this motivation overlooks what outcomes the electoral system was *designed* to produce, not what resulted. In this sense, Zucco's analysis refutes a straw man, arguing that the electoral system did not overwhelmingly favor the right over time. Further, when the author examines proportionality, malapportionment, and cross-district vote variation, these three analyses resort to post-1988 waves of electoral data (1989, 1993, 1997, and 2001). Consequently, they do little to prove the military had a different intention than maximizing the electoral representation of the right. We focus on issues of proportionality, malapportionment, and *ex ante* choice.

4.1. First claim: the binomial system is no less proportional than other electoral systems

One of Zucco's most important arguments is that the binomial system is no less proportional than other PR systems (Zucco, 2007: 307–308). Following work by Rae (1967) and King (1990), the author compares proportionality and electoral system responsiveness for other Latin American electoral systems, most of which use some form of PR with larger magnitudes. Nonetheless, the assumptions are problematic.

First, the data presented for Chile in the study rely mainly on measures of proportionality at the coalition-level and not parties. It discards party-level analysis by contending that the sample is too small. However, basing proportionality on parties instead of coalitions yields different, less proportional results.[4] Zucco's analyses of seat allocation, for example, conveniently show that the binomial system is proportional. While this is fairly true at the coalition level (Carey, 2006), political parties should be the analytically appropriate units of analysis.

However, more critically, even if parties are the unit of analysis, measures of proportionality are equally deceiving. Chilean parties are often awarded candidacies within coalitions based on their past electoral performance and perceived strength (with respect to the percentage of the vote they received in municipal and legislative elections). However, if these candidacies were not ceded to smaller parties obligated to share lists, these parties would never be able to win within the context of the binomial system and proportionality would be much lower. In essence, even at the party level, the binomial system only appeared proportional because parties negotiated proportionality for a number of reasons related to presidential electoral coalitions, coalition maintenance, and to facilitate cooperation in congress. In reality, of course, Chile is a multiparty system, which affected the incentives of parties and the operation of the binomial system—and facilitated the establishment of coalition lists in the first place (Gamboa, 2006).

Second, even leaving this consideration aside, Zucco mistakes the mechanical effect of the electoral system for the dynamic of party competition, essentially ignoring the political context. The dynamic of coalition formation in the post-authoritarian period has made for a manufactured proportionality that is a product of party negotiations—not the dynamics of the binomial system. The system may have produced close to proportional outcomes, but this is the case because parties negotiated seats shares based on their relative size and power. Mechanically, the binomial system will exclude parties that do not reach a negotiated agreement for inclusion on a joint list (Siavelis, 2002; Navia, 2005). Indeed, the system consistently denied seats to small, unaligned parties. The non-aligned Communist party has achieved upwards of 7% of the national vote (in the 1997 Chamber of Deputies elections) without representation in congress. Similarly, despite receiving 5% of the vote in 2001 and 2005 it received no seats. Had it allied with the Concertación and negotiated a slate of seats for itself (as did other parties with similar level of support) it could have reached a roughly proportional level of representation. However, in consistently choosing to break ranks, the party was shut out of legislative representation. Indeed, as a powerful testament to this argument, after being shut out of congress in every election since the democratic transition, the Communist Party reached an agreement with the Concertación in 2009 that allowed the allied presentation of its Chamber of Deputies' candidates. As a result, the party was successful in winning three seats, despite having received only 2% of the vote (a much weaker performance than when it won no seats). Such is the power of electoral lists. In large part, then, the binomial system's proportionality is negotiated and not mechanical, nullifying more general claims about the proportional tendencies of the electoral system per se.

Third, while electoral system responsiveness is certainly a valid measure of the proportionality of electoral systems, the cost per seat for coalitions is also important. Table 2 presents a breakdown of vote cost per seat for both dominant coalitions since the return of democracy (we do not present cost per seat for parties, which is wildly disproportional for the reasons elaborated here). The data are instructive. In all but two elections the cost per seat for the Concertación was substantially higher than that of the Alianza. To begin with, this means that simulations of the 1988 elections—the electoral projections used by electoral engineers in designing the system—had an extraordinarily high cost per seat for the Concertación.

Further, although the vast majority of electoral systems

[4] There is an additional irony to the use of coalitions to measure proportionality, which also points to express system design to favor right wing parties. The original proposal for binomial reform proscribed pacts. Indeed, the provisions allowing pacts were introduced at the behest of the parties of the right after the emergence of a major fissure that divided the sector into two. After this division neither of the resultant parties was assured it could muster the votes alone to pass the binomial system's thresholds. Allowing pacts would permit the sector to have the votes of *both* parties summed in determining the number of seats won against the Concertación, and intra-list competition would determine the victor on the right's lists. In essence, this prevented the divided right wing parties' seemingly irreconcilable political differences from spoiling the results or affecting the intended outcome of the binomial system (Gamboa, 2006).

worldwide tend to favor large parties at a proportional rate as they increase in size and penalize them as they decrease in size (Rae, 1967; Lijphart, 1990; Jones, 1993), this one does not—and was not designed to. Zucco addresses the arguments made by opponents of the binomial system, claiming the right did not receive electoral benefits. However, notwithstanding the fact that the right did receive such benefits, as we show below, the literature Zucco criticizes actually argues that this system benefits the largest *coalitions* (plural), and particularly and disproportionally, the second largest coalition based on the size and distribution of the electorate for the right in 1988. Additionally, our contention is that the system's bias is even more severe than the one Zucco tries to delegitimize.

Zucco is correct to note the previous analysts should have been clearer in saying second highest polling list would be favored by the binomial system (given the distribution of the 1988 electorate) rather than "the right". However, most critics of the binomial system acknowledge this, adding that the right merely happens to be the second highest polling list. Zucco is equally unclear in his analysis, as he shifts between talking about the "right" and the "second largest coalition" as indiscriminately as the authors he criticizes. Even if the system had not benefitted the right in practice, this says nothing about its purpose.

Finally, and ironically, as the winning coalition's margin of victory increases, seats tend to become more rather than less expensive. Again, this makes the binomial system an outlier among the world's electoral systems. Rae's pioneering work suggests that following the rule that applies in most election systems, the largest party should be relatively favored in relation to the second largest, particularly under the D'Hondt method (Rae, 1967: 33). In Chile it is not. In sum, rather than a curious feature of the system, these data present additional evidence of a self-conscious strategy of bias in favor of the second largest electoral force—in this case, the ideological right.

4.2. Second claim: there is no bias through malapportionment

Zucco also dismisses the widely held claim that there is a bias tied to the malapportionment of districts. Nonetheless, there is a bit of conflation of malapportionment (the ratio of elected voters per representative) and gerrymandering (an attempt to provide political advantage for particular interests or parties by manipulating district boundaries) in both Zucco's article and much of the literature being debated here. Zucco's main claim deals more with malapportionment. He acknowledges that there is considerable variation in the number of electors per district, but contends that there is "no evident bias" against the Concertación or in favor of the Alianza (2007: 308). Nonetheless, he provides scant verification to substantiate this claim, which the numbers simply do not support. We find convincing evidence for malapportionment.

First, using the same legislative data as Zucco, Rojas and Navia (2005) convincingly demonstrate that rural districts have had fewer voters per legislator in the post-plebiscite elections, effectively over-representing them. Since it is rational for parties to attempt to maximize the number of representatives per vote (or minimize the opposition's support per vote), this negative expected relationship between vote share and district population is logical.

Second, Fig. 4 reproduces Zucco's scatterplot of number of votes against vote share for each ideological bloc according to the 60 current districts; however, following Rojas and Navia (2005), it displays the 1988 results. The dashed line denotes the national mean for that party, while the curving solid line represents the best-fit quadratic approximation of the relationship between the two variables. Clearly, the right's support is concentrated in less-populated districts, and its support falls and district population grows. Conversely, the left's support is relatively weaker in rural or less-populated areas and grows with district population. Statistical analyses also demonstrate significant correlations between district population and vote share for both the right and the left. The right has a coefficient of −0.432, significant to $p < 0.0006$, and the left has a positive coefficient of 0.459, significant to $p < 0.0002$. While we acknowledge that less-populated rural areas are more likely to naturally lean right, these data do support our expectations of the dominant party rationally drawing boundaries to best concentrate (or de-centralize) its support.

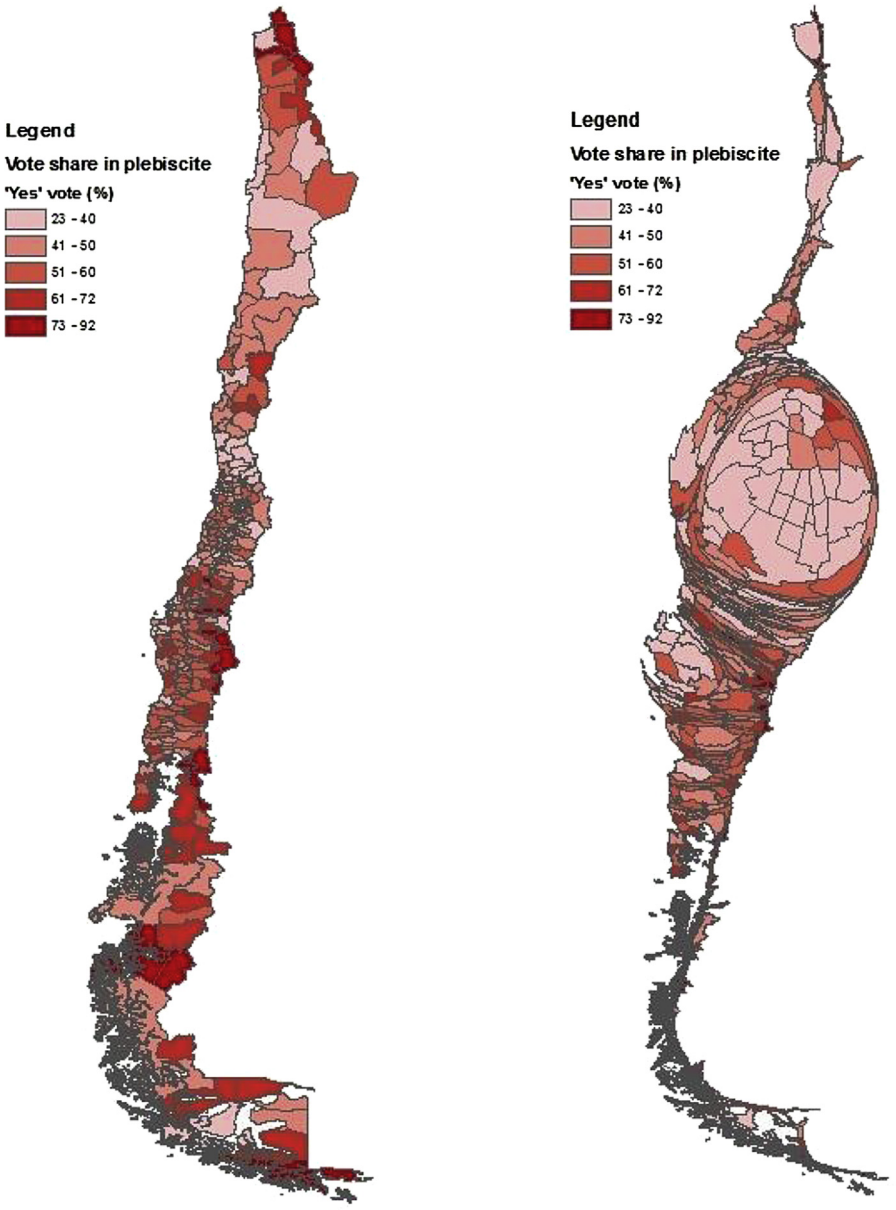
Using the data employed by military electoral engineers, multiple measures demonstrate a clear intent at providing an advantage to the right through malapportionament. As the maps of the plebiscite results show in Figs. 2 and 3, the ratio of elected voters to representative is much higher in left-leaning districts than right-leaning ones. In these figures, the maps on the left depict actual district boundaries, while the cartograms on the right adjust district size by applying the Gastner-Newman diffusion-based contiguous algorithm to weight districts by comuna voting totals from the plebiscite. This distorts map geometry, but allows the space to retain its boundaries and configurations, conveying the information of the population variable. The cartogram shows Chile with a bulging midpoint (Metropolitan Santiago and Concepción), and thin upper- and lower-sections that encompass the sparsely populated rural parts of the country.

In the basic map, it appears that the right performs quite well, and the left rather weakly. However, in the voter-weighted transformation map, the right's support essentially disappears, while the left's balloons. This is because, of course, the right vote is stronger in rural areas in the far north and the southern half of the country, than in metropolitan Santiago, Valparaíso, or Concepción—an outcome that appears notable on the basic map, but is minimized when taking population into account. The "no" vote representing the left performed the best in Santiago and the comunas of the mid-north whose economies are driven by unionized copper mining. The numbers also support this visual evidence of malapportionment.

Unlike the results from 1989 to 2001, the 1988 district-level returns show statistically and substantively increased seat shares for districts that voted "Sí" (in favor of Pinochet) in the plebiscite. Table 3 shows the average number of electors in districts where the "Sí" won is 97,846, while it is 132,007 for districts where the "No" won. The table also recounts the total number of districts where each option triumphed and the number of total electors included (Joignant and Navia, 2003). Indeed, it is striking that according to simple population count, Joignant and Navia find that the *Región Metropolitana*, by far Chile's most populous, should have been entitled to 45 of the 120 seats in the Chamber of Deputies. Yet it received only 31. It does not seem coincidental that as the region with the lowest "Sí" vote (41%), it became the most underrepresented.

Zucco does not deal explicitly with gerrymandering, or other scholars' treatment of it within the binomial system. However, our intention here is not solely to counter Zucco's argument on its own terms, but also to support the more general claim that the binomial system was purposively designed to favor the right, providing as much evidence as possible. In this sense, it is also clear that congressional districts in Chile were gerrymandered to produce a more favorable outcome for the right.

We have uncovered strong evidence that electoral engineers continued to gerrymander once they settled on the unavoidable $M = 2$. Clear evidence of gerrymandering with an effort to produce positive outcomes for the right is omnipresent in the government simulations (ODEPLAN, 1989). As we note below, system designers were not given carte blanche to design any system they chose. The baseline instructions clearly established that any system adopted

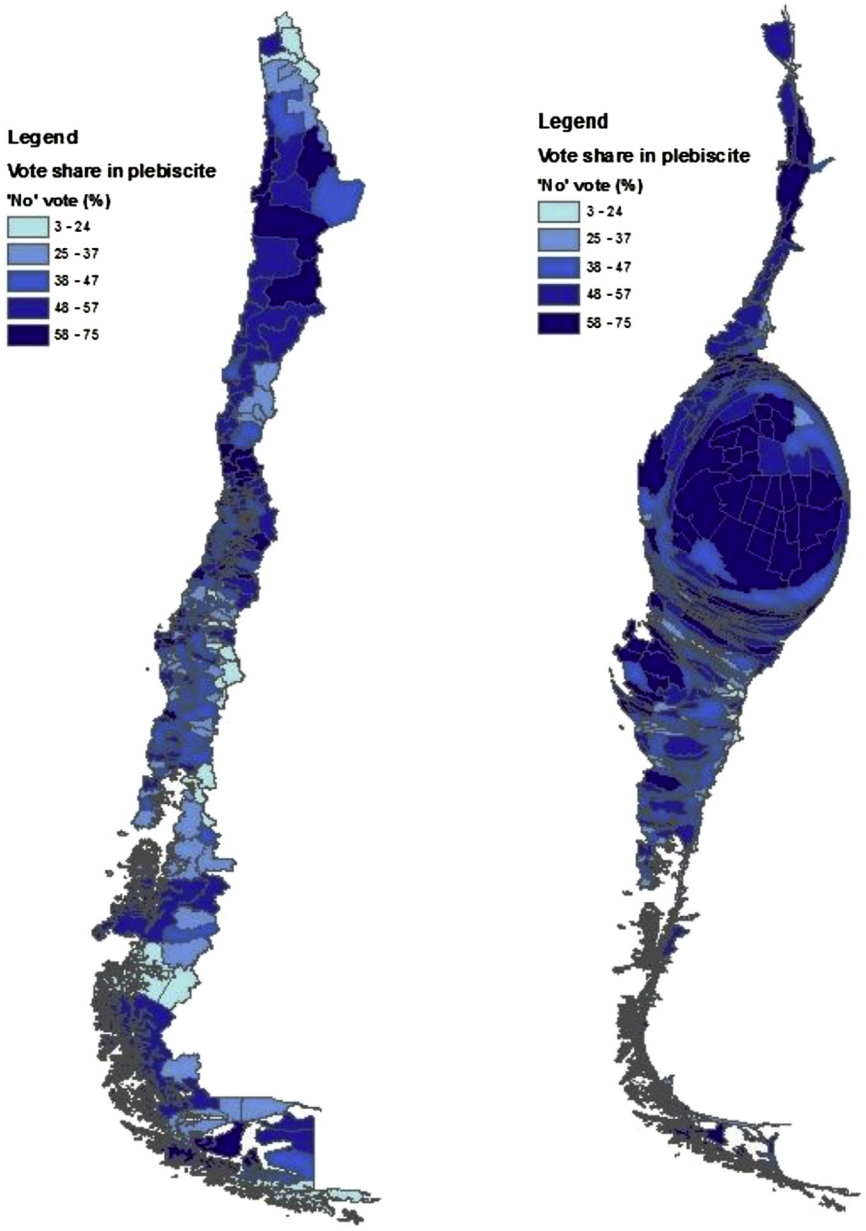


Note: Alto Bio Bio, Chiguayante, Chol Chol, Concón, Hualpén, Padre Hurtado, Padre Las Casas, and San Rafael communes were all created after 1988. They are coded according to the communes from where they were split.

Fig. 2. 'Yes' vote in 1988 plebiscite; real map versus population-weighted cartogram.

had to limit the proliferation of parties and minimize representation of the left. Electoral designers were further instructed that they had to follow certain guidelines in combining the country's basic electoral units (comunas) in order to devise electoral districts. In particular, designers were told to 1) respect historical regions; 2) respect the boundaries of historical comunas (i.e. not break them up); 3) maintain contiguity of all comunas in an electoral district; 4) avoid wildly dissimilar populations across districts; and 5) maximize the right's electoral fortunes in the final configuration of districts (Anonymous, 2012). As explained above, Zucco's analysis assumes that electoral designers were unconstrained in their choices.

Given the M = 2 setup, designers were faced with the next phase of providing benefits for the right, which they did in drawing up districts. Indeed, the ODEPLAN documents provide results from three different scenarios, providing additional evidence of a systematic gerrymandering to favor parties of the right. ODEPLAN designers began by calculating the right's representation for different district configurations based on an equal voting pattern (the "Same" column in Table 4). They then ran the same simulations for the right receiving 5%, 10%, and 15% fewer votes in each of these districts, as well as 5% and 10% more in the same districts. We summarize these simulations in Table 4, with our own simulations of the districting plan ultimately adopted included at the end. Note

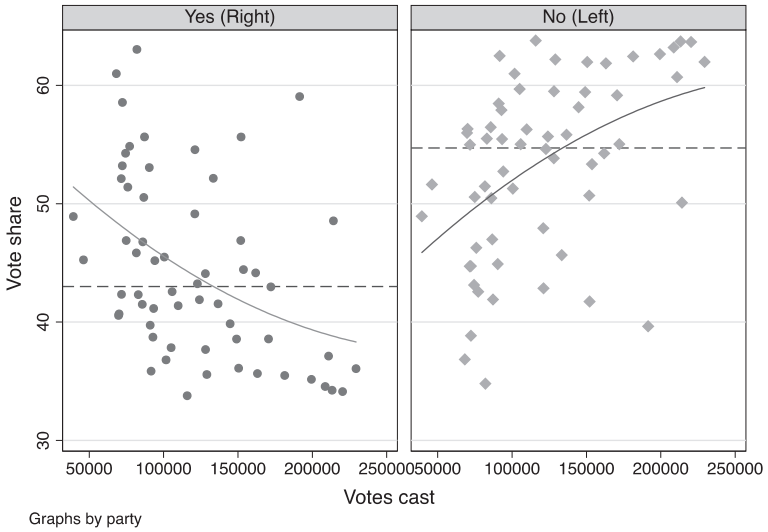


Note: Alto Bio Bio, Chiguayante, Chol Chol, Concón, Hualpén, Padre Hurtado, Padre Las Casas, and San Rafael communes were all created after 1988. They are coded according to the communes from where they were split.

Fig. 3. 'No' vote in 1988 plebiscite; real map versus population-weighted cartogram.

that ODEPLAN's district aggregation actually maximizes the right's representation in five of the six scenarios, with the chosen plan maximizing representation in only two (as a result of the districting concerns expressed below). Still, all configurations yield relatively similar results.

District gerrymandering was not just undertaken with respect to rural areas and areas that supported the "Sí" vote. A simple look at the distribution of vote shares by district supports the notion of gerrymandering related to how proximate district vote shares were to the system's electoral thresholds. In contrast to Zucco's Fig. 3 (2007: 311), our Fig. 1 shows distributions for district-level data for only 1988 instead of 1989–2001. Assuming no change in vote share by ideological bloc, the current district alignment applied to the 1988 plebiscite results reveal the right with no districts under the "sour spot" of 33.3% and the left with no districts over the other "sour spot" of 66.7% (see Fig. 1, above). That is to say, despite a national average of 43% for the right and 57% for the left, the districting pattern chosen and consistent vote patterns would have produced roughly equal representation for each coalition bloc in the lower house in a two-coalition system. Clearly, this benefits the second-largest coalition, and at least in 1988, the second-largest coalition was the right.



Notes: Dashed lines represent total mean vote share. Solid lines are the quadratic prediction of the fitted plots. Correlation between size of district and vote share are substantively and statistically significant values of -0.4323 for the Right (p<0.0006) and 0.4589 for the Left (p<0.0002).

Fig. 4. Vote shares and votes cast in current districts, lower house, 1988 plebiscite.

Table 4
Simulations of legislative seats won by the right under three districting proposals and current alignment from 1988 plebiscite results, lower house.

	Same	−5%	−10%	−15%	+5%	+10%
Original Project	59	58	50	45	60	63
Ministry of Interior	58	56	48	44	60	60
ODEPLAN	60	60	50	46	60	63
Implemented Plan	60	57	49	45	61	62

Note: "5%" does not refer to 5% above the existing vote *share* for the right, but rather 5% more of the existing "Sí" votes. For the left, this implies a concomitant gain of 5% of those right votes and not simply 5% more of its previous total.

The non-normally distributed pattern provides additional evidence of gerrymandering. The right clearly did not want to "waste" its support by having some districts with 55% support and others with 25%, but rather draw up districts where it would be right above the electoral sour spot of 30–40%, which could be possible by constructing districts with a small standard deviation from their 1988 national mean of 43%. Unfortunately from its perspective, its mean support in the 1989 elections was not 43% as it had been in the plebiscite, but a meager 34%. By contrast, the Concertación's vote spread shows that the party "wasted" a lot of support from 40 to 60%. In that coalition's ideal world, its (much stronger) support in the binomial system would probably be bimodal. Under this distribution, the party would have a couple of districts with no support at all, and the rest of the votes bunched up past the 66.7% threshold. This is obviously not the case. Instead, support is bunched up close to 60% in a lot of places without surpassing 66.7%. In other words, although the Concertación won both seats in nine districts, in only one case did it win both seats outright without needing the second party to earn less than 33.3%. Contrary to Zucco's claim, all the data and simulations presented here suggest a substantial bias favoring the right in the apportionment of districts.

4.3. Third claim: the binomial system was not the best choice ex ante

Zucco's final claim is that the military could have better benefitted the right by choosing a different electoral system, and in particular, one with a larger district magnitude rather than the binomial system. The problem with this argument is that it assumes that electoral designers had a *tabula rasa* on which to completely build a new electoral system. Several sets of constraints acted upon institutional designers and limited the range of options on the table, and many of the options Zucco specifically discusses, especially those designs that entail larger district magnitudes.

First, this claim ignores both the context of the Chilean transition and the competitive dynamic of the party system. As noted, government officials were concerned about the proliferation of political parties and the potential power of the left, both of which they viewed as the roots of the polarized competitive dynamic of the pre-authoritarian multiparty system that led to democratic breakdown. A larger district magnitude system would simply not have been on the military's menu of options. Yet Zucco suggests that the optimal district magnitude to favor the right would have been M = 7. With such a system, small parties could have won without forming alliances and Pinochet's goal of squelching the left and reducing the number of parties would have been contravened. Even the Communist Party would likely have been able to win seats without an alliance. Interestingly enough, a large magnitude system might also have permitted a splintering of the then fractious right—something Pinochet obviously sought to avoid.

Second, the simulations of other electoral options are fraught with difficulties. In contending that the binomial system was not the best choice *ex ante*, Zucco presents a series of simulations in Table 4 (2007: 310) based on the same national vote share from the plebiscite (43% for the right) and employing different district magnitudes. The table shows that the most efficient choice in terms of seat share for the right was the two-magnitude system (41.86% of seat share) until simulations reach a magnitude of 7 (which increases the right's seat share to 42%). Despite the fact that the advantage for the right is minimal, Zucco's argument ignores an extraordinarily important contextual point and one rationale for electoral reform: limiting party system fragmentation. Perhaps the right could have enjoyed marginal gains with a larger magnitude—increasing the district magnitude to a perfectly proportional 120-member district would only have given the right 43—but the

difference between a district magnitude of 2 and 120 represents a difference of only 1.14% of seat shares. Electoral engineers were certainly astute enough to know that a 1% increase in representation that might come with a higher M was not worth the real risk that a more permissive PR system could entail, while also ignoring Pinochet's stated goal of reducing the number of parties.

Zucco's simulations are also less than convincing on another account. He contends that, "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 fifth place among the exemplified options" (Zucco, 2007: 310). While this is true, the right's 41.86% of seat shares with M = 2 could only increase to a maximum of 42.3% in the best circumstances with a magnitude of 10. He acknowledges that, "The differences are obviously small, but enough to say that from a perspective of an institution designer, there was no clear choice" (Ibid.). To the contrary, it seems clear that a miniscule increase in representation was not worth the risk of a higher M.

Thus, the ideal way to balance the reduction of the number of parties with concrete benefits for the right was magnitude of 2. If authorities opted for a system with magnitudes of 3, 4, 5, or 6 they would have received fewer seat shares and risked the fracturing of the right into two parties and/or lowering the threshold of victory for parties of a unified center-left.

In short, with one exception, other magnitudes were simply not on the table. Reformers did consider a simple majority M = 1 system which would have provided incentives for the unification of the right and the center-left. Such a system was rejected because regime electoral system architects knew that with a level of support of about 40% the right would systematically be excluded from congress if it faced a unified center-left. Indeed, Navia (2003) shows that with magnitudes of 1, the right would have been virtually shut out of congress. This simple reality is a profound testament to the underlying goals of electoral reform and who it was designed to favor.

5. Conclusion

Analysts of the Chilean legislative electoral system were correct in noting that the binomial system was designed in an attempt to benefit particular constituencies, and especially the ideological right (Scully and Valenzuela, 1997; Siavelis, 1997; Fuentes, 1999; Navia, 2005). Using heretofore private Chilean government documents and comuna level returns from the 1988 plebiscite on continued military rule, we show that this electoral system had mechanical effects that electoral designers clearly understood and employed in an attempt to maximize the representation of the ideological right and limit party fragmentation. What is more, claims by Zucco that in practice the Chilean system was relatively proportional and well apportioned are flawed, overlooking the negotiated nature of that proportionality and the cost of votes per legislative seat for each ideological bloc.

We conclude that electoral system design is at least a two-pronged process involving district boundary design as well as setting district magnitude undertaken by a seat-maximizing authority. We show that the Chilean legislative system was indeed designed to 1) reduce the number of parties in the Chilean party system, and 2) minimize the electoral losses and maximize the gains of the political right. We also show that, 3) it would have been difficult to design a legislative electoral system to better over-represent the ideological right given the constraints and political context of the time. This analysis strongly supports the rationality of electoral engineering to benefit designers, even under sub-optimal conditions of limited time and resources. In contesting many of Zucco's claims, we highlight the flawed logic of drawing conclusions from post-plebiscite electoral data and theoretical distributions of plebiscite returns while also drawing attention to a number of theoretical and empirical defects in those claims.

It is imperative to have a grasp of both the intentions and effects of the Chilean binomial system since the return of democracy, especially in light of its 2015 abandonment and replacement by a moderate proportional representation system. Indeed, the new system was designed to remedy the manifold shortcomings of the binomial system. Analysts need to know these shortcomings in terms of both the illegitimacy of the binomial system's origin as well as its consequences for representation and accountability. Finally, in order to set the historical record straight it is essential to understand the military's motivations and efforts to change the party system, manage its transition out of power, and engage in electoral engineering to favor its ideological party allies.

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