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A dynamic model of the invalid vote: How a changing candidate menu shapes null voting behavior

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ABSTRACT

Existing scholarship attributes invalid voting to independent variables that are largely time invariant (e.g., levels of education, political institutions). Yet, rates of invalid voting vary widely across countries and over time. In this paper, I argue that dynamic features of political competition (e.g., the number of candidates competing) affect invalid voting in presidential elections in predictable ways. High *levels* of candidates should have a positive association with invalid voting, as voters frustrated by the status quo opt out of the process when political options are confusing or objectionable. Yet, positive *change* in the number of candidates ought to reduce null voting, as the entry of more candidates presents new options over which to cast valid ballots. I test these expectations, and find support for them, in multivariate analyses of aggregate electoral data from the Latin American region for 1982–2015.

1. Introduction

Around the world, individuals regularly absorb the time and travel costs associated with voting and then choose to spoil their ballots or leave them unmarked—that is, they cast "invalid" votes. Although these invalid ballots are tallied, final electoral results are usually determined using only *valid* ballots. High rates of "against all" voting signal citizen discontent and hold the potential to undermine electoral mandates, particularly in close elections.[1] Understanding what leads individuals to cast blank and spoiled ballots is an important step to clarifying support for policies, governments, and political systems. This topic is particularly relevant to parts of the world in which invalid votes frequently exceed the margin of victory in presidential contests.

To date, most models of invalid voting have focused on contextual factors that change slowly, if at all: political institutions and demographic features of populations (e.g., levels of education, ethnicity). While useful in understanding cross-national variation, such factors fail to illuminate the dynamics of cross-election changes in invalid voting levels. To address this short-coming, I introduce and test a model focused on shifting features of political competition. Features of political competition influence voting behavior around the world: Scholars have demonstrated that party fractionalization and the closeness of elections affect voter turnout (see Jackman, 1987; Blais and Dobrzynska, 1998; Blais, 2006); that polarization increases partisan affiliation and issue voting (Dalton, 2008, 2011); and that the tone of campaign ads and media coverage can be (de)mobilizing (Kahn and Kenney, 1999). Yet, existing studies of invalid voting have focused on mandatory vote laws, electoral disproportionality, district magnitude, bicameralism, and personalized voting systems in seeking to explain invalid vote rates.[2] These institutions shape the relative costs of (not) voting (e.g., mandatory vote laws make abstention costly), and may affect voters' perceptions of an election's stakes (Kouba and Lysek, 2016) or their feelings of efficacy (Mcallister and Makkai, 1993; Power and Roberts, 1995; Power and Garand, 2007). However, the laws governing political institutions change rarely, while rates of invalid voting vary substantially across election type and over time. In contrast, features of political competition change across election cycles and thus provide important theoretical and empirical leverage for understanding why rates of invalid voting vary over time.

This paper advances the general argument that features of political competition affect the prevalence of blank and spoiled ballots by changing inclinations among the public to cast a protest vote.[3] Specifically, I argue that change in the structure of political competition – represented by change in the number of candidates competing – affects voters'

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[1] While some invalid votes in Latin American democracies are cast by accident, recent studies show that most invalid voting in executive races is intentional and signifies protest of the specific choice set present at election time rather than democracy, itself (e.g., Cohen, 2017).

[2] Scholars have used the number of parties as a proxy for the effect of electoral disproportionality (Mcallister and Makkai, 1993, 25) and district magnitude (Power and Roberts, 1995; Power and Garand, 2007) on invalid voting. It is unclear that the number of candidates contesting an election is a good proxy for these political institutions in presidential elections, which are highly disproportional and have a district magnitude of one.

[3] This argument belongs in the family of arguments advanced by other scholars (e.g., Carlin et al., 2015) linking the structure of political competition to political participation.

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perceptions that available choices represent their preferences. When the choice set expands to become more inclusive, invalid voting will decrease as citizens feel they have more and better options. When the choice set becomes limited, in contrast, individuals will tend to cast invalid votes with greater frequency as a means to protest these newly evident limitations. A key aspect of this argument is that the *level* of candidates competing is distinct – and has differentiable consequences – from *change* (expansion or contraction) in that level from one election to the next.

I test the resulting expectations using aggregate electoral data from presidential elections in 17 Latin American democracies, and first-past-the-post mayoral elections in Peru.[4,5] I focus on Latin America because invalid voting varies around a comparatively high mean in the region. The analyses demonstrate that, while the effective number of candidates competing in presidential contests has a positive association with invalid vote rates, positive *change* in the number of relevant candidates results in lower rates of invalid voting. In short, the evidence is consistent with the argument that voters view a broadening choice set as a positive change from the perspective of political representation. Holding the level of candidates constant, expansions of the menu of options draw citizens away from the choice to nullify their votes. As a whole, the theoretical perspective and statistical analyses advanced in this paper demonstrate the importance of incorporating dynamic features of political systems—that is, features that *change*—in order to better understand both invalid voting and voter behavior, generally.

Rates of invalid voting in Latin America are among the highest in the world: since 1980, more than 5.5% of all ballots cast in presidential elections—and more than 8.5% of those cast in legislative contests—were left blank or spoiled across the region. These average figures conceal important national and cross time variation. Fig. 1 presents rates of invalid voting in presidential contests across Latin American countries from 1982 to 2015. Horizontal lines within each shaded box signify the median value of invalid voting for each country, and shaded boxes represent the 25th to 75th percentile of observations. Whiskers signify the upper and lower bounds of an approximately normal distribution of observed invalid vote rates within each country, and dots signify outlying observations. Rates of invalid voting vary substantially over time within some countries (in Brazil, for example, rates of invalid voting in presidential elections during this time period fluctuate from a low of 4.7 to a high of 19%)[6] and are much more tightly clustered in others (for example, invalid vote rates in Costa Rican presidential contests fluctuate between just 2 and 3% during this time period).

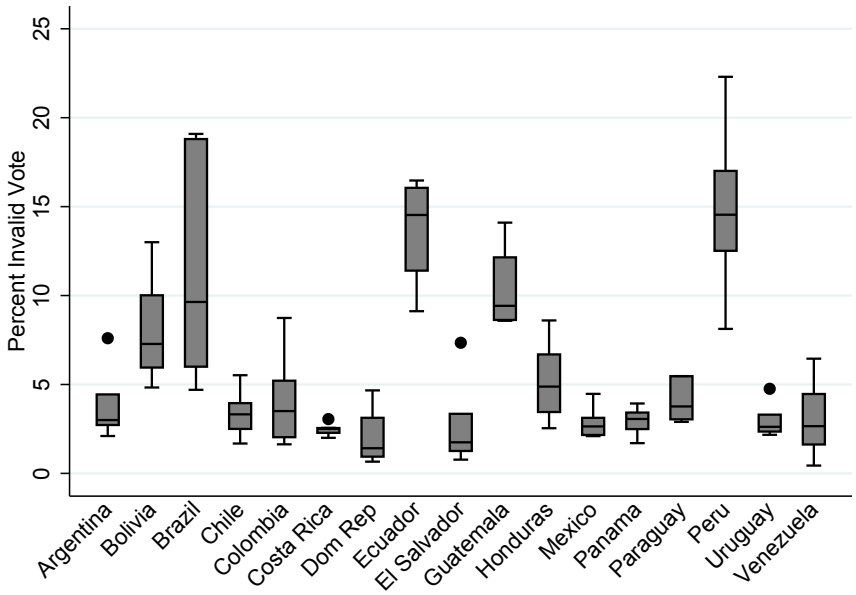

Fig. 1. Percent Invalid Votes in Latin American Presidential Elections, 1980–2015.
Figure shows the distribution of invalid vote rates from first or single round elections.

2. The number of candidates and invalid voting

Across the world, voters regularly go to the polls and invalidate their votes by leaving their ballots blank, mismarking the ballot paper, or writing in the names of candidates who are not legally recognized.

Because invalid ballots are usually tallied and then excluded from the final vote count,[7] scholars exclude invalid votes from statistical models of vote choice as a matter of course,[8] news media regularly exclude null votes from final tallies of election results, and political practitioners often treat the phenomenon as a residual behavior.[9]

[4] Because Nicaragua does not provide invalid vote totals for all the years studied, it was excluded from analysis.

[5] With few exceptions (see Carlin, 2006; Kouba and Lysek, 2016; Cohen, 2017), existing studies have focused their attention on explaining invalid voting in legislative contests. In doing so, scholars frequently aggregate data over wide subnational variation in key independent variables (e.g., district magnitude, the number of competitive candidates) and use national level averages. Latin American presidents are elected by a single, national district, making national-level analysis appropriate for these elections. By assessing the relationship between political factors and invalid voting in presidential races, this paper serves as a corrective to misattribution of these average values.

[6] Electronic voting was gradually introduced in Brazil from 1996 to 2002, arguably eliminating ballot invalidation as the result of voter error. Indeed, rates of invalid voting in Brazil's presidential elections declined precipitously following the initial implementation of electronic voting, from 19% of all votes cast in 1998 to 6% of votes in 2002. However, there is still substantial variation in invalid voting under electronic voting: while only 4.7% of all ballots were invalidated in 2006, invalid votes more than doubled to 9.6% of all votes cast in the 2014 presidential election.

[7] In many Latin American countries, elections are automatically nullified if the proportion of invalid ballots crosses a certain threshold—usually an absolute or super-majority of all ballots cast. While national elections have been cancelled in this way (e.g., Colombia's 2014 elections for the Andean Parliament), such occurrences are rare.

[8] Examples abound, among them, two recent books on Latin American Politics (*The Latin American Voter* and *Latin American Elections*), which exclude invalid votes in their assessments of voter behavior.

[9] Statement based on personal interviews with sitting legislators, gubernatorial and mayoral candidates, and campaign officials in Peru conducted from 2013 to 14. With few exceptions (concentrated among niche party operatives), practitioners viewed invalid votes as a principally accidental behavior, and the voters who cast them as not worth the effort of mobilizing.

Indeed, much political science scholarship argues that invalid ballots are cast in error by illiterate, innumerate, or confused voters who have mechanical difficulties marking the ballot (Mcallister and Makkai, 1993; Nicolau, 2015; Pachón et al., 2017; Power and Garand, 2007).[10]

The proportion of invalid votes was larger than the margin of victory between first and second place presidential candidates in 27.4% of Latin America's first or single-round presidential elections since the Third Wave transitions of the 1970s and 80s. That is, invalid votes held the potential to alter electoral outcomes in more than a quarter of the region's presidential elections from 1982 to 2015. If such a large portion of ballots are invalidated in error, this represents an important failure of electoral technology. However, some recent evidence suggests that a significant portion of ballots in high-salience elections are invalidated intentionally (see Cohen, 2017; Moral, 2016). In combination with high observed rates of invalid voting, this suggests that invalidating the ballot represents a real option for many Latin American voters; as such, excluding blank or spoiled ballots from analyses of electoral behavior in the region constitutes an omission of a relevant electoral option. Further, high levels of invalid voting can weaken leaders' mandates, or can be interpreted as a sign of flagging democratic legitimacy (see Booth and Seligson, 2005; Grönlund and Setälä, 2007; Linz, 1990; but see Rosema, 2007).

The core argument I advance in this paper is that, in order to understand how invalid voting behavior changes over time, features of politics that change must be incorporated into models of the phenomenon. When features of competition change in ways that limit the competitiveness of elections or diminish the representativeness of the political space, this should foster feelings of discontent among voters, leading to increased invalid voting in the aggregate. Conversely, when competition changes in ways that make politics more competitive or representative, this should cultivate feelings of inclusion and urgency among the voting public, resulting in lower rates of invalid voting.[11]

Some extant research provides initial support for a focus on features of political competition. A few scholars have suggested that the available menu of options can lead to higher rates of invalid voting, as voters who cannot find a sufficiently representative candidate or view the race as uncompetitive are more likely to cast invalid ballots in protest. For example, Brown (2011) shows that Nevada voters in the 1990s and early 2000s were more likely to select the “None of the Above” option in races where only one major party competed. Similarly, Driscoll and Nelson (2014) argue that the poor information environment and limited competitiveness of the 2011 Bolivian judicial election resulted in high invalid vote rates.[12] Features of competition that affect voters' perceptions of an election's stakes can also condition their decisions to cast invalid votes. In their cross-regional study of Latin America and Eastern Europe, Kouba and Lysek (2016) argue that when an election is less competitive, the stakes of the election are lower and the costs associated with casting a protest-motivated invalid vote therefore decrease, leading to more invalid voting in the aggregate, and vice versa. Similarly, Uggla (2008) shows that invalid voting in legislative elections occurs more frequently when the largest party is dominant, that is, when voters' choice set is limited. Some also note that organized campaigns promoting invalid voting appear regularly in Latin American elections, either as an expression of or fuel for widespread discontent with party offerings. In studying Mexico's 2009 legislative elections, for example, scholars identified the presence of a null vote campaign, which organized those expressing “against all” sentiment into a voting bloc, as key to understanding the notable increase in invalid voting in that case (Alonso, 2010; Cisneros, 2013). I extend beyond this emerging field of research on the influence of party competition dynamics on null voting by building a model that incorporates both the levels and change in one key factor, the effective number of candidates competing, to increase our understanding of the conditions under which we are more or less likely to observe high levels of invalid votes.

2.1. The menu of candidate options

The following sections draw on psychology and consumer choice scholarship to derive expectations about the effects that the size of choice sets versus change in those choice sets will have on invalid voting behavior. First, I discuss the relationship between the number (that is, the level) of candidates competing and invalid vote rates. On average, theory and evidence indicate that large choice sets will be associated with refusal to choose due to frustration and confusion. In the context of elections, this suggests a positive relationship between the size of the candidate choice set and invalid voting. Next, I turn to the relationship between change in the number of candidate options and invalid vote rates. Key to this section is the argument that *increasing* choice sets tends to provoke consumer satisfaction and engagement, as this expands the diversity of options, while individuals faced with decreasing choice sets express more discontent. Transporting this logic from consumer choice to political choice, I argue that broadening choice sets will be linked to low invalid voting, while narrowing choice sets will yield higher invalid vote rates.

2.1.1. Size of the candidate menu

The size of choice sets has been shown to affect a variety of human behaviors, from the selection of luxury jams (Iyengar and Lepper, 2000) and prizes (Haynes, 2009) to voter turnout (Gallego, 2009) and candidate selection (Cunow, 2014). While studies from marketing, psychology, and political science reach mixed conclusions about how choice sets affect consumer and voter behavior, most scholars suggest that large choice sets lead more individuals to opt out of decision making. Although individuals often report that they *prefer* to choose from large choice sets (see, e.g., Haynes, 2009; Kahn and Lehmann, 1991), having many options *in practice* can obstruct the decision-making process. Market psychologists refer to this as “choice overload” or the “paradox of choice”: while many individuals *prefer* to have more options in theory, they are better able to select options – and are more satisfied with their choices – when the choice set is limited (Diehl and Poynor, 2010; Schwartz, 2004).[13] While having some choice results in greater consumer satisfaction, the presence of too many options[14] generates stress over decision making, which can lead consumers to defer or refuse to make decisions (Chernev, 2003; Iyengar and Lepper, 2000). Brought into the domain of elections, these frameworks suggest that the presence of many candidate options will translate into more invalid voting by increasing the difficulty of decision making.

[10] Especially in compulsory vote systems, some scholars argue that individuals who would prefer not to turn out cast spoiled ballots as a means to abstain from the ballot box (Hirczy, 1994; Gray and Caul, 2000; Zulfikarpasic, 2001).

[11] The micro-logic underlying these predicted macro-level relationships is centered on protest-related motivations because recent evidence indicates that most null votes in high-salience elections are cast to signal voter discontent (Carlin, 2006; Uggla, 2008; Moral, 2016; Cohen, 2017). However, it is possible that some of the predicted increase is driven by increasing voter confusion, which in theory will move in tandem with protest motivations.

[12] The congressional super-majority held by the ruling MAS party limited the opposition's power in the candidate vetting process and assured that candidates favored by MAS would be selected to run (see Driscoll and Nelson, 2014, pp. 3–5). The authors also find that intentional invalid voting was highest among political sophisticates (those with more education) and non-MAS party members, consistent with protest motivations of invalid voting.

[13] Regardless of the actual differentiation of products in larger choice sets, consumers also *perceive* more variety when presented with a large number of options (Van Herpen and Pieters, 2002; Mogilner et al., 2008).

[14] Marketing and social psychology studies (i.e., Dhar, 1997, Iyengar and Lepper, 2000) suggest that saturation occurs when the number of options passes six, while one political science study (Knack and Kropf, 2003b) finds that saturation occurs at eight candidate options in the United States.

Information costs are relatively higher when many candidates compete. While a voter can gather information about two or three candidates with relative ease, the costs of learning about ten, fifteen, or twenty candidates are undoubtedly higher, which can lead to frustration and confusion among voters (see Blais and Dobrzynska, 1998; Kostadinova, 2003).[15] The electoral equivalent of choice deferral or refusal to choose under high information costs is abstention or, especially under mandatory vote laws, invalidating one's ballot.

Consistent with the argument that complex or confusing choice sets lead to high levels of ballot invalidation, studies from the United States and Brazil have shown more voter roll off[16] in down-ballot elections with higher levels of candidates competing, longer ballots, and complex ballot items (see Bowler et al., 1992; Cunow, 2014; Wattenberg et al., 2000; but see Knack and Kropf 2003a).[17] These invalid votes may be cast by accident, with voters unable to mechanically navigate complex or long ballots, or consciously, in frustration. Studies of blank and spoiled voting in high saliency contests reach conclusions that are generally consistent with this argument linking high numbers of candidates to high invalid vote rates.[18] Cunow (2014) presents experimental and observational evidence suggesting that, in legislative contests, Brazilians are more likely both to invalidate their ballots and to abstain when many candidates compete. He attributes high invalid voting and abstention to increased satisficing to accommodate the time and cognitive costs of seeking information when the number of candidates is high.[19] In a second study, Moral (2016) shows that the presence of many distinct options in European legislative elections is associated with high invalid voting among less politically sophisticated respondents under mandatory voting. In other words, those who are unable to bear the informational costs of learning about the available options are more likely to opt out of selecting a candidate (although those who know more about politics are slightly more likely to cast *valid* ballots, see Moral, 2016, p. 7).[20]

Choice overload is most often observed for decisions over which study participants do not hold prior preferences, and about which they have relatively little information (Scheibehenne et al., 2010). Executive elections may therefore present a hard case for observing choice overload. In deciding whether to participate in elections, voters usually make some assessment of the available candidate options; many turn out with plans to vote for a specific candidate (Blais, 2004).[21] Even in this premeditated candidate selection, the options voters consider may be limited. Politicians invest heavily in building name recognition prior to Election Day, airing ads in print, radio, television, and online with the aim of transmitting their name and message to the public. Incumbents, candidates with more resources, and those favored by media owners may dominate news coverage, drowning out messaging by minor candidates (see e.g. Boas and Hidalgo, 2011; Boas, 2013). For all but the most engaged voters, then, the information environment likely constrains the candidates under consideration over the course of the campaign. If choice overload is observed in presidential elections, it is perhaps most accurately tested among a limited set of *relevant* or *competitive* candidates that earn above an arbitrary threshold of the vote. That is, when the number of *competitive* candidates is high, choice overload and as a result, invalid voting, should be more likely.

In short, based on prior work linking the size of choice sets to behavior, I derive the following hypothesis:

H1. A greater number of relevant candidates contesting a presidential election will be associated with higher levels of invalid voting.[22]

2.1.2. Change in the candidate menu

The above discussion explicitly refers to *levels* of candidates. Yet, in discussing the relationship between the number of candidates and voting behavior, it is important to consider the dynamic nature of these relationships: The number of candidates contesting presidential elections changes over time. Fig. 2 shows this variation graphically: The effective number of candidates competing changed by more than 0.5 (half a "relevant" candidate) in 56.4% of Latin American presidential elections from 1982 to 2015.

The number of candidate options can shift in one of three ways over time, with different implications for voter behavior. First, the number of candidates competing may increase from time *t-1* to time *t* – that is, the choice set may expand. Voters may associate an increase in the number of candidates competing between time *t-1* and time *t* with increased representativeness of the choice set, regardless of the content of candidates' programs.[23] Studies from the consumer choice literature find that individuals who perceive expansions in the size of product displays also perceive greater choice – independent of the actual variety of the goods in that display (Broniarczyk et al., 1998; Kahn and Wansink, 2004). Indeed, political scientists often associate a large number of candidates with greater representation of the political space, regardless of variation in candidate positions (see, e.g., Cox, 1997; Norris, 1997). Given that consumers prefer larger choice sets (Schwartz, 2004), increases in the available choice set *relative to past contests* may lead voters to feel better represented by the menu of candidates available to them on Election Day. Feeling that the options are more representative should encourage voters to choose from the available alternatives, resulting in relatively low rates of invalid voting.

Second, the choice set may contract, that is, the number of candidates competing at time *t* may be smaller than it was at time *t-1*. Decreasing choice sets could yield positive outcomes for decision-making in the voting booth. Scholars have shown that, on average, choice quality (measured by the willingness to make a choice and satisfaction with one's decision) is higher when the number of options is small because the cognitive load is relatively lower (Cunow, 2014;

[15] Voters can mitigate the costs of gathering information by using heuristics to organize the political space, although the presence of many candidate options changes the heuristics that voters use. Less sophisticated voters rely on less reliable cues (i.e., ethnicity or gender), while high sophisticates use more reliable heuristics (e.g., ideological or issue cues; see Tversky and Kahneman, 1986, Lau and Redlawsk, 2001, Cunow, 2014).

[16] Voter roll off occurs when individuals cast valid votes for high saliency races (presidential or legislative contests) but opt not to select candidates in down-ballot races (e.g., water commissioner).

[17] Even when voters use cognitive short cuts (see Footnote 15), the mechanical task of finding and selecting one's preferred candidate on the ballot is more challenging when the number of options is high, as voters must distinguish among a wide array of party names and symbols. Reynolds and Steenbergen (2006) find that ballots with colors, symbols, and photographs – which are more common in less developed contexts – do not change voters' ability to correctly mark the ballot (but see Pachón et al., 2017).

[18] Mcallister and Makkai (1993) use the number of parties as a proxy for electoral disproportionality in legislative elections, while Kouba and Lysek (2016) use the effective number of candidates contesting presidential contests to measure an election's stakes. Neither theorizes about the direct effect the number of options has on invalid voting.

[19] Consistent with studies of choice in marketing noted above, Cunow (2014) finds that voters report more satisfaction with their choice and with the candidate selection when faced with many options (pp. 69–71).

20Scholars consistently show that individuals with prior knowledge of and preferences over commodities are better able to make satisfying, high quality choices when there are many versus few options available (see Chernev, 2003; Mogilner et al., 2008; Scheibehenne et al., 2010).

[21] Blais (2004) notes that voters in less stable party systems (like many in Latin America) are more volatile in their decision making.

[22] I assess possible nonlinearities in the relationship between the level of candidates and invalid vote rates empirically in a series of robustness checks reported in Appendix Table A6. Results are mixed, but do suggest possible ceiling effects, with invalid voting remaining stable after the number of candidates surpasses a threshold. Evidence of non-linear relationships varies across measures of the number of candidates competing; I find no evidence of a non-linear relationship between the effective number of candidates and invalid voting.

[23] Coverage of the ideological space need not increase for voters to believe that it has. This argument is thus focused on public *perceptions* of representativeness, not the *reality* of distinctions across candidates.

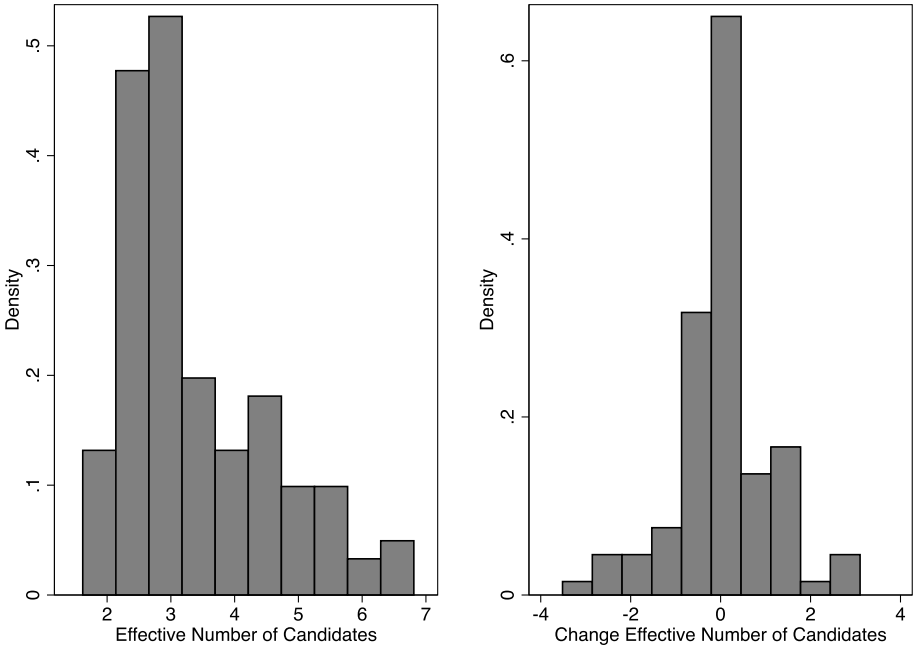

Fig. 2. Variation in the effective number of candidates in latin american presidential elections.

Schwartz, 2004).[24] Yet, while decreasing the options from which consumers must choose leads them to perceive the decision making task as less difficult, the benefits of a decreased choice set may be limited. For example, Chernev (2003) shows that identifying an option that corresponds with a consumer's preferences when the number of options decreases is more difficult than in expanded choice sets (p. 181). Further, consumers prefer to have more choice, and those faced with fewer options at time *t* as compared to *t-1* are less satisfied with their options (Botti and Hsee, 2010; Broniarczyk et al., 1998).[25] To the extent that selecting a candidate is similar to other decisions, contractions in the candidate menu may yield dissatisfaction with the choice set and, in particular, the perception that the choices are insufficiently representative. Increased dissatisfaction and decreased ability to identify a "best" option as the number of candidates decreases should therefore be associated with relatively high invalid vote rates.

Third, the number of candidates competing may remain stable over time. Stability in the number of options may lead some to view their options as insufficiently representative, as the choice set is not expanding to include their preferences, resulting in relatively high invalid voting. Others might find themselves better able to form preferences and to use meaningful heuristics to navigate the decision environment when the number of options is stable over time, resulting in relatively low invalid voting.[26] In the aggregate, it is not clear that the absence of change in the number of candidates competing will yield any consistent trends in invalid vote rates.

The above discussion assumes that the vote-eligible public is able to perceive changes in the number of options available. Certainly, voters are not equally likely to perceive an increase of one candidate from time *t-1* to time *t* in a country with three candidates competing in the current period (a 50% increase) as in a country with twelve candidates on the ballot (an 8.3% increase). And even if voters were to perceive both of these candidate increases, the results for perceptions of representation are less clear: the addition of a single candidate likely makes a larger difference for voter perceptions where the level of candidates competing is small. To correct for this type of issue, scholars studying sensory perception have argued that change should be measured relative to magnitude (e.g., Marks, 1974), and this method has been applied to assessing the impact of changing store display sizes (see Broniarczyk et al., 1998).[27] I follow this example, by assessing the effects of change *relative* to the size of the choice set.

In sum, as voters are provided with a relatively greater number of candidates to choose from, they should – on average – feel better represented by those options. An increase in the number of candidates at time *t* versus time *t-1* should serve as evidence of a more representative choice set for voters, on average, and be associated with lower rates of invalid voting. In contrast, a decrease in the number of candidates competing at time *t* versus time *t-1* should serve as evidence of a decreasingly representative space and be associated with higher rates of invalid voting. The effect of shifting options should be larger where the shift represents a large change relative to the size of the choice set. These expectations can be expressed as follows:

H2A. Independent of the number of candidates, positive change in the relative number of relevant candidates will result in lower levels of invalid voting in presidential elections.

[24] Indeed, if most invalid votes are cast in error, a shrinking choice set should be associated with lower invalid vote rates, as the decision task becomes easier for low-knowledge voters.

[25] Expectations of satisfaction with choice sets differ from actual satisfaction with decisions. Botti and Hsee (2010), for example, find that consumers anticipate greater satisfaction when the options available to them increase, but that these positive affective outcomes do not materialize, on average.

[26] Voters may respond to alternative political features (e.g., trends in polarization) when the number of candidates is stable over time. For example, if polarization increases when the number of candidate options is stable, this might lead to feelings of increased representation and, potentially, result in relatively low levels of invalid voting. Due to the small number of cases in which the number of candidates competing does not change and limitations in the availability of measures of polarization, I do not assess this expectation here.

[27] Broniarczyk et al. find that, while consumers do not notice relatively small (less than 25 percent of the choice set) decreases in the available options, consumers *do* notice decreases of fifty percent or more. They further find that consumers associate decreases in the *number* of options with a decrease in the *variety* of options available – regardless of actual changes to the variety of items presented (see pp. 168, 172, 175).

H2B. Independent of the number of candidates, negative change in the relative number of relevant candidates will result in higher levels of invalid voting in presidential elections.

the effective number of candidates competing at time *t*. Positive values signify expansion in the candidate menu, while negative values signify contractions in the number of relevant candidates (See Table 1).[29]

Table 1
Descriptive statistics.

	Observations	Mean	Standard Deviation	Minimum	Maximum
Percent Invalid Vote	117	6.07	4.97	0.44	19.09
Effective Number of Candidates	117	3.39	1.17	1.62	6.81
ΔEffective Number of Candidates (%)	100	−0.03	0.32	−1.56	0.57
Margin of Victory	113	0.13	0.11	0.003	0.58
ΔMargin of Victory	76	−0.005	0.17	−0.57	0.44
Incumbent	116	0.18	0.39	0	1
Concurrent	117	0.81	0.39	0	1
Second Round	117	0.15	0.35	0	1
Freedom House Democracy	114	6.66	2.07	0	10
Ln (GDP per capita)	108	8.06	0.66	6.69	9.19
ΔLN (GDP)	105	0.02	0.04	−0.10	0.12
Urbanization	117	67.18	15.34	37.9	95.2
Literacy	117	87.78	8.38	60.73	98.55
Compulsory	122	1.63	0.96	0	3

3. Cross national aggregate data analysis

3.1. Data and measures

I test the above-noted propositions using multivariate regression analysis of cross-national presidential electoral data from 17 Latin American countries from 1982 to 2015. The dependent variable in these analyses, *Percent Invalid Votes,* captures the percentage of all votes left blank or spoiled in each first or single-round presidential contest, and ranges from 0.44% (Venezuela in 2013) to 19.09% (Brazil in 1998). I collected invalid vote data from each country's Electoral Management Body (EMB) when possible, and supplemented these data with information from Nohlen (2005) when original source material was not available.

I follow past studies assessing the effect of the number of relevant candidate options on voter behavior. To do so, I generate a measure of the *Effective Number of Candidates* (H1) by applying Laakso and Taagepera's (1979) formula for the effective number of parties to the vote shares of presidential candidates.[28] I collected vote share data from official electoral returns from EMBs when possible. When the "other candidates" category appeared in election archives, I searched alternative sources for information identifying the number and vote shares of candidates in this category. If this information was unavailable, I counted "others" as one party. The *Effective Number of Candidates* ranges from 1.6 (Paraguay in 1989) to 6.8 (Ecuador in 2002), with an average value of 3.4 relevant candidates in presidential elections over the period studied here.

To test the contention that shifts in the number of relevant candidates affect rates of invalid voting (H2A, H2B), I include a measure of the difference in the effective number of candidates from time *t-1* to time *t* as a proportion of the effective number of candidates competing in the current period. As discussed above, variation in the numbers of competitive candidates in Latin American presidential elections over time raises the question of whether voters are able to perceive changes in the number of options. I therefore calculate the change in the number of relevant candidates as a proportion of the new total: (EFN Candidates$_t$-EFN Candidates$_{t-1}$)/EFN Candidates$_t$. A value of 1 indicates that the change in candidates from time *t-1* to time *t* has a 1:1 ratio with

In addition to these main independent variables, I follow existing studies of invalid voting and control for features of countries and elections that have the potential to influence blank and null voting, including demographic features of populations linked to voters' education and therefore their ability to correctly mark the ballot (urban population, adult literacy rates, logged GDP per capita), to their likelihood to protest (Freedom House democracy scores, recoded so that higher values signify higher democratic quality) and to their likelihood of turning out (mandatory vote laws).[30] I further control for features of competition that others (Kouba and Lysek, 2016; Uggla, 2008) have argued affect the stakes associated with casting an invalid ballot: the presence of a second round electoral contest, the margin of victory between the first and second place candidates, concurrent elections, and the presence of an incumbent candidate.[31]

3.2. Results

Below I present the results of statistical models assessing the effects of *levels* vs *change* in the number of options on invalid vote rates in Latin American presidential elections. I find that both levels of and change in the effective number of candidates explain a substantial portion of the variance in observed rates of invalid voting in presidential elections. The estimated relationships between levels and change in the number of relevant candidates competing are consistent even when relevant demographic, institutional, and "stakes" variables used in existing

[28] Effective Number of Candidates = $1/\Sigma p_i^2$.

[29] Because the effective number of candidates is a non-linear transformation of vote totals, it is not a direct translation of the market research theories presented in section 2.1, linking change to the total choice set. While I believe this decision is theoretically justified (see discussion in section 2.1.1), I also assess the extent to which other measures of the size of the choice set perform in the same way as the effective number of candidates. Appendix Table A6 shows results for models using the absolute number of candidates, those winning 0.5%, 1%, and 2% or more of the vote, and the natural logarithm of the number of candidates. In all model specifications, the sign of the levels variable is positive and relative is negative, and in 3 of 6 models, the change variable reaches standard levels of significance (in 4 of 6, the variable is significant with $p < 0.10$). These results suggest that the model presented here is robust to many, though not all, measures of the number of candidates. The effective number of candidates is correlated with the absolute number of candidates competing at rho = 0.36.

[30] Details about all independent variables are available in Appendix Table A1.

[31] Models including measures of candidate differentiation from the Varieties of Democracy, polarization from the Parliamentary Elites of Latin America datasets, and the presence of a null vote campaign are presented in Table A7.

Table 2
OLS regression analyses: Percent invalid votes.

	Static	Dynamic	Dynamic Model + Controls
Effective Number of Candidates	1.51**	1.73**	1.32*
	(0.42)	(0.56)	(0.48)
ΔEffective Number of Candidates (%)		−5.61**	−3.65*
		(1.58)	(1.57)
Margin of Victory			3.86
			(2.92)
Incumbent			0.19
			(0.73)
Concurrent Elections			1.57
			(0.94)
Second Round			0.79
			(1.56)
Freedom House Democracy			−0.37
			(0.29)
LN (GDP)			4.19
			(4.73)
Urbanization			−0.17+
			(0.09)
Literacy			−0.03
			(0.13)
Compulsory			1.09**
			(0.20)
Year	−0.12*	−0.11*	−0.05
	(0.05)	(0.05)	(0.10)
Constant	246.28*	211.97*	88.74
	(97.81)	(94.32)	(157.06)
Fixed Effects	N	N	Y
Observations	117	100	87
R-squared	0.17	0.23	0.84

Year controls (and country fixed effects in Model 3) are included but not shown. Robust standard errors clustered by country. +p < 0.10, *p < 0.05, **p < 0.01 (two-tailed).

studies are included as controls.

The data are structured as a panel, with observations nested in countries across time. Due to the limited number of country-year cases, I estimate the models using OLS regression with robust standard errors clustered by country and control for year (the models shown here are consistent with time-series corrected estimations, see Appendix Tables A2 and A3). Because the number of observations is small (n = 87 in the dynamic model), the likelihood of committing Type II error and failing to reject the null hypothesis when it is false is inflated in these analyses. I err toward accepting Type II error by using standard thresholds for statistical significance, though I provide sufficient detail for the reader to consider alternative interpretations of the results. Results are presented in Table 2.

I find a strong positive relationship between the effective number of candidates competing and invalid vote rates, as predicted in H1. A baseline model that does not include control variables predicts that the invalid vote rate will be 7.9 percentage points higher when the level of relevant candidates is at its maximum (6.8) versus its minimum (1.6). A more moderate shift of one standard deviation in the effective number of candidates around the mean is associated with a 3.2 percentage point difference in invalid voting (2.99% versus 6.19%).

Model 2 introduces change in the effective number of candidates at time *t* versus time *t-1* as a proportion of the relevant number of candidates competing at time *t*. As predicted by H2A and H2B, the coefficient for change in the effective number of parties is negative. That is, a decrease in the effective number of candidates is associated with higher levels of invalid voting, while an increase in the effective number of candidates competing results in lower levels of invalid voting. Substantively, doubling the effective number of candidates competing from time *t-1* to time *t* is associated with 2.8 percentage points less invalid voting, while halving the number of relevant candidates from one election to the next is associated with 2.8 percentage points more invalid voting. More moderate changes (+/− one standard deviation from the mean) still have notable effects: an increase in the effective number of candidates competing is associated with about 1.67 percentage points less invalid voting, while decreasing the number of candidates is associated with about 2.34 percentage points more invalid voting on average. Including the change variable does not alter the effect of the level of the effective number of candidates. This variable is still positively associated with invalid voting, and the positive coefficient is not attenuated. If anything, the relationship between the effective number of candidates and invalid voting is *stronger* when the difference in the effective number of candidates is controlled for.

Model 3 incorporates a range of additional demographic and contextual control variables used in previous studies of invalid voting and country fixed effects to assess the robustness of this finding. As in Models 1 and 2, the relationship between the effective number of presidential candidates and invalid vote rates is positive and significant, although the coefficient is somewhat attenuated in this specification. Consistent with H2A and H2B, and with the results in Model 2, the proportion of change in the effective number of candidates has a negative and significant association with invalid vote rates. When the effective number of candidates is halved at time *t* versus time *t-1* (that is, when the proportion variable takes the value of −0.5), invalid vote rates are estimated to be about 1.8 percentage points higher. When the effective number of candidates increases substantially (when the proportion variable takes the value of 0.5), the model predicts 1.8 percentage points less invalid voting. While many of the theoretically relevant control variables are not statistically significant, mandatory voting has a strong positive relationship with levels of invalid voting, as does the margin of victory between first and second place candidates.

Because the level and change in the number of competitive candidates work at cross-purposes, I present two examples below – from the 2009 Ecuadorian election and the 2002 Costa Rican election – that demonstrate how the level of competitive candidates and change in the number of candidates work together to improve predicted invalid vote rates.

In Ecuador's 2009 election, the choice set contracted substantially. Following his election in 2006, President Rafael Correa used oil revenues to invest heavily in social programs and rewrote the constitution in 2008. These actions were divisive among the Ecuadorian public and, for many, the 2009 election served as a plebiscite on Correa's performance in the prior period (Bowen, 2010). Programmatic party platforms were ill defined, and Ecuador's traditional parties (often criticized by Correa during his presidency) did not field candidates in 2009 (Bowen, 2010). This confluence of factors led to a substantial contraction in the number of relevant candidates competing: Whereas 5.2 relevant candidates competed for the presidency in 2006, there were only 2.7 effective candidates in 2009 (proportionally, a decrease of 0.98). In a first for Ecuadorian politics, Correa won the 2009 election outright in the first round.

Accounting only for the level of relevant candidates competing (Model 1) yields an expected invalid vote rate of 3.97% in this contest, illustrated in Fig. 3 as a linear prediction. This estimate is 9 percentage points lower than the observed invalid vote rate, 13% (denoted by a hollow circle in Fig. 3). Accounting for change in the number of relevant options (Model 2, represented by a black circle) improves the model's performance substantially, increasing the estimated invalid vote rate to 9.16%. Including relevant control variables and country fixed effects (Model 3, denoted by an X) improves the estimation even further, yielding an estimate of 11.3% – only 1.7 percentage points below the observed value.

In contrast to the Ecuadorian case, the choice set expanded substantially in Costa Rica's 2002 presidential election. In assessments of the 1998 presidential contest, scholars noted declining satisfaction with democratic politics among Costa Rican citizens, manifested in increased voting for minority parties and declining voter turnout (Seligson, 2002). The 2002 election continued this trend, and was unusual as it

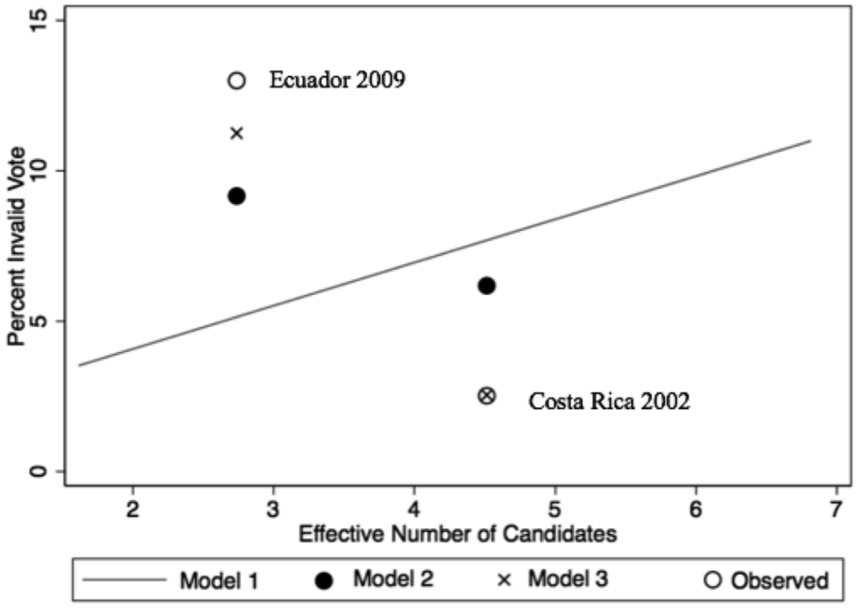

Fig. 3. Estimated versus Observed Values of Invalid Voting. Linear prediction calculated using observed range of effective number of candidates and estimated coefficient from Model 1. • s represent estimates from Model 2 (*change*), Xs represent Model 3 estimates (*change and additional theoretically relevant controls*), and hollow circles are observed values.

marked both the first election since 1949 in which a run-off contest was necessary to determine the winner, and the first time a third party gained a substantial portion of legislative seats (Wilson, 2003). In this election, which some argue marked the incipient decline of Costa Rica's two-party system, the number of relevant options competing increased substantially, from 3.36 effective candidates in 1998 to 4.51 effective candidates in 2002 (proportionally, an increase of 0.25).

This increase in the choice set was associated with a decline in invalid voting in Costa Rica, from 3% to 2.5% (this observed value is denoted with a hollow circle in Fig. 3). Accounting only for the level of relevant candidates competing (Model 1, represented by the linear prediction) in that contest yields a predicted invalid vote rate of 7.52%, five percentage points higher than the observed value. Incorporating change in the number of relevant candidates competing (Model 2, denoted by a black circle) improves this estimate by more than a percentage point, yielding a predicted invalid vote rate of 6.18%. Incorporating relevant control variables and country fixed effects (Model 3, denoted by an X), improves even more upon this estimation: the estimated invalid vote rate in this election is 2.51% – statistically indistinguishable from the observed value.

In short, incorporating measures of the level of candidates competing *as well as the change* in the candidate choice set substantially improves aggregate estimates of voter behavior compared to estimates derived using only levels of candidates competing. One notable implication of the Ecuadorian and Costa Rican cases presented above is that the effect of change in the number of candidates can, in the extreme, cancel out the effect of the level of candidates competing on invalid vote rates. I discuss this implication in more depth in the Discussion below; the next section turns to an assessment of change in invalid vote rates as the dependent variable.

Table 3
Descriptive statistics: Mayoral elections in Peru.

	Observations	Mean	Standard Deviation	Minimum	Maximum
Change Invalid Vote	583	−0.55	8.52	−34.95	92.45
ΔEffective Number of Candidates (%)	583	−0.10	0.38	−3.51	0.67
Margin of Victory	779	0.05	0.03	−0.02	0.20
ΔMargin of Victory	583	0.002	0.03	−0.13	0.16
Incumbent	779	0.06	0.16	0	1
Turnout	779	0.84	0.05	0.64	1
Urbanization	771	0.52	0.25	0.11	1
Illiteracy	574	16.62	7.79	2.8	35.5
Ln (District Size)	771	11.02	1.04	8.23	15.84

3.3. Change as a dependent variable

The models above link levels and change in the number of relevant candidates to levels of invalid voting. However, a dynamic model should also assess the ability of dynamic predictors to explain over-time change in invalid vote rates. Appendix Tables A4 and A5 present the results of regression analyses predicting change in invalid vote rates in presidential elections using the independent variables described above. Consistent with expectations, the sign for change in the effective number of candidates is negative across models; however, the variable only reaches marginal levels of statistical significance ($p < 0.1$), and only in some specifications.

Existing studies of invalid voting focus in large part on predicting levels of invalid vote rates across elections (see Mcallister and Makkai, 1993; Power and Roberts, 1995; Power and Garand, 2007). One potential explanation of these marginally significant results is that change in invalid voting may be undertheorized, explained by features of political systems not assessed in prior work and not included here. In other words, those variables that explain levels might simply not predict change in invalid voting well. At the same time, the fully specified models presented here include a limited number of country-year observations and a large number of covariates. The marginal estimated relationship between change in candidates and change in invalid voting may be due to the limited number of country-year observations in the dataset (see Table 2).

While I cannot directly assess the latter possibility, I gain leverage over this question by using subnational data, in this case from mayoral elections held in Peru between 2002 and 2014. Provincial mayors are selected through single round, first-past-the-post mayoral elections, which are held concurrently to elections for other subnational offices (e.g., governors, city council members).[32] Voting is mandated and enforced in Peru, and incumbents can run for immediate reelection.

[32] Provinces are roughly equivalent to counties. They represent the second level of subnational government in Peru, below Departments (also called Regions).

Table 4
OLS, robust regression analyses: Change invalid vote in mayoral elections.

	Dynamic	Dynamic + Controls	Dynamic + Dynamic Controls
Effective Number of Candidates	−0.14	−0.25	−0.17
	(0.39)	(0.45)	(0.47)
ΔEffective Number of Candidates (%)	−8.15*	−8.73**	−9.08**
	(1.44)	(1.39)	(1.44)
Margin of Victory		−32.95**	−20.14
		(13.53)	(15.24)
ΔMargin of Victory			−14.42
			(8.66)
Incumbent		1.28	1.32
		(2.13)	(2.17)
Turnout		46.10	46.33
		(26.61)	(26.80)
Urbanization		0.26	0.14
		(0.98)	(0.97)
Illiteracy		−0.09	−0.09
		(0.05)	(0.05)
Ln (District Size)		−0.88	−0.89
		(0.62)	(0.61)
Year	0.04	0.21	0.22
	(0.11)	(0.22)	(0.22)
Constant	−89.78	−448.78	−472.97
	(215.38)	(463.36)	(463.84)
Observations	583	566	566
R-squared	0.14	0.20	0.20

Region controls included but not shown. Standard errors are clustered by district. *p < 0.05, **p < 0.01.

Invalid vote rates in national and subnational contests also vary significantly across regions and time (see Fig. 1 and Table 3 for descriptive statistics).

First-past-the-post mayoral races present a good case for testing the proposed relationship between levels and change in candidate options and invalid voting. The winner-take-all nature of these elections is similar to the logic of presidential contests. While Peru is a unitary country, it has undergone significant decentralization in recent years, increasing the power of local office holders (McNulty, 2011). Mayoral elections are not as high-salience as presidential or gubernatorial elections; however, they receive substantial coverage in local print, radio, and television news.[33] It is therefore not unreasonable to expect voters to have some knowledge of local candidates.

I am not able to control for all of the covariates included in the presidential analyses above; not all measures are available,[34] and some institutional features (concurrent and second round elections, mandatory vote laws) are constant over time. I control for the margin of victory between first and second place candidates, illiteracy (among adult women in each region), urbanization (in each province), and province size. I also control for turnout in each province and the presence of an incumbent candidate.

Table 4 presents the results of models estimating the relationship between change in the effective number of mayoral candidates competing and change in invalid vote rates in Peru. Fixed effects for each subnational region are included but not shown to conserve space; results are robust to their exclusion (see Appendix Table A10). Across model specifications, the results are consistent and strong: contractions in the number of relevant candidates, a signal of decreased variety in the choice set, are associated with a significant increase in invalid votes cast in mayoral elections. Expansion in the number of relevant options, in contrast, is associated with significant declines in invalid voting, consistent with perceptions of increased candidate variety among voters.[35]

The estimated effects are both significant and substantial. In a model estimated without control variables, a shift from the 25th percentile (−1.12 effective candidates), to the 75th percentile (+0.65 effective candidates) of relative candidate change is associated with a 14.4 percentage-point change in invalid vote rates, (from +9.13 percentage points when the choice set contracts to −5.3 percentage points as the choice set expands). For a model including static control variables, the same shift in the effective number of candidates is associated with a 15.5 percentage-point change in invalid vote rates (from +9.78 to −5.67 percentage points). Finally, a fully dynamic model predicts a 16 percentage-point change in invalid voting over this range of changes to the choice set (from −10.17 to +5.9 percentage points). These changes are substantial compared to the range of most observed changes in invalid vote rates in mayoral elections (90% of observations lie within a range of −10 and + 10 percentage points).

4. Discussion

This paper argues that features of political competition affect rates of invalid voting by changing voters' propensity to protest political competition that they view as unrepresentative or unclear. Specifically, I show that a greater number of presidential candidates is associated positively with higher rates of blank and spoiled voting. Invalid voting occurs most frequently when the number of relevant candidates contesting an election is high. I further demonstrate that when features of competition change in ways that diminish voters' perceptions of the representativeness of the political space (fewer candidates), this leads to increased invalid voting in the aggregate. Conversely, when competition changes in ways that make politics more competitive or more representative (increased number of candidates), this fosters feelings of inclusion among the voting public, resulting in lower rates of invalid voting. The model proposed here thus suggests that change in the candidate options conditions the effect of the level of candidate options.[36] In cases of extreme shifts in the candidate menu, it is thus possible that the effect of the level of candidate options will be negated – and potentially reversed – by the effect of change.

The number of relevant candidates certainly does not comprise the universe of shifting political factors that might affect electoral participation around the world. Polarization in the choice set, candidate quality, the presence of a protest candidate, and the amount, tone, and quality of media coverage of candidates are among many other factors that might influence rates of invalid voting around the world.

Clarifying the relationship between shifting features of the political landscape such as these and invalid voting behavior, in particular by assessing the proposed mechanisms linking individual behavior to shifting choice sets, could be one fruitful avenue for future research. This paper has additional implications for individual-level models of vote choice, especially where invalid voting is widespread. In the first place, this work serves as a reminder that in excluding blank and spoiled votes from models of electoral behavior, we risk overlooking a meaningful option used by disgruntled voters around the world and fail to explain the full range of voter behaviors. Second, this paper's core finding that choice sets condition voters' decisions to cast invalid ballots suggests that excluding this option from vote choice models represents a violation of statistical assumptions, most notably the Independence of

[33] Google news searches of "province name mayor" (e.g., "Arequipa alcalde") show substantial campaign coverage in large provinces, and Google Trends reveals significant peaks in news stories and searches of mayoral candidates in large districts preceding elections. Comparable data are not available for smaller districts.

[34] Annual GDP at the province level and subnational democracy scores are unavailable.

[35] Results are robust to alternative model specifications, and are consistent in similar models estimated in Colombia, where voting is voluntary and incumbents cannot seek immediate reelection. See Appendix Tables A8-A12.

[36] This language implies the use of an interaction term. I present the results from such models graphically in Appendix Figures A2 and A2B. Although the results are imprecisely estimated, they are consistent with the theoretical perspective described here: where the level of competitive candidates increases, observed invalid voting is lower than where the level of candidates decreases.

Irrelevant Alternatives (IIA) assumption.

Increasingly, scholars are coming to view invalid voting in high salience elections as an intentional and meaningful behavior worth explaining. This paper contributes to growing academic discussion of invalid voting by emphasizing the importance of politics in determining protest voting. Invalid vote rates vary substantially over time, across and within countries, while demographics and political institutions change less frequently. In seeking to explain this variation, then, we must account for features of political systems that change. This paper further underscores the need for incorporating changes in the political context, and not merely levels of contextual variables, into models of political behavior generally. In discussing invalid voting in Latin American elections, I demonstrate the theoretical and analytical importance of accounting for change in models of the phenomenon. Doing so contextualizes observed levels of explanatory variables (in this case, the number of relevant candidates), allowing for a more nuanced understanding of whether levels of these factors, patterns in those factors, or a combination of the two affect election outcomes. While this paper focuses on invalid vote rates as an outcome, this approach has the potential to be useful for studies of a much broader set of political phenomena.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.electstud.2018.04.015.

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