TRADING OFF THE BENEFITS AND COSTS OF CHOICE: EVIDENCE FROM AUSTRALIAN ELECTIONS

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I investigate the robust predictions of a theory on the costs and benefits of dealing with increased numbers of choices in an election context. My data consist of a rich array of measures of voting behaviors and corresponding ballot and voter population characteristics for a panel of electoral districts from three Australian federal election cycles. I examine how the number of candidates and voting tickets on the ballot, as well as key moderating variables, affect the share of voters (1) opting for a simplified alternative to the baseline voting process; and (2) intentionally casting an invalid ballot. The findings indicate that incremental options can increase or decrease motivation to engage in a choice process; the overall pattern of results appears consistent with a diminishing returns model of expanded choice. Voters appear to trade off costs and benefits rationally in their decisions concerning how and whether to make choices. Public policies and private strategies should leverage moderating variables to encourage participation in choice processes and should account for opt-out tendencies at both ends of the choice spectrum.

Keywords: individual decision-making, choice overload, voter participation, motivation, panel data.

JEL Classification: D12, C23, D81

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1. Introduction

A substantial body of psychological theory and evidence indicates that greater freedom of choice is associated with greater intrinsic motivation and overall satisfaction (e.g., Langer and Rodin 1976, Taylor and Brown 1988).[1] Consistent with this, it is axiomatic in economics that having a greater variety of choices increases a consumer's utility: given "well-defined" preferences, a consumer can generally get closer to his ideal option if he has more options. People in real life seem to get this: it has been found that individuals are more likely to select a choice set the more complete or richer the array of choices it offers (Iyengar and Lepper 2000).

Meanwhile, a growing body of literature in psychology and economics suggests that having more options can *demotivate* individuals. As options and decision complexity increase, individuals tend to seek alternative decision processes and ways of framing their options that make arriving at a decision easier (Wright 1975, Payne 1982, Hauser and Wernerfelt 1990, Timmermans 1993, Chernev 2003, Nagler 2007). To avoid having to choose from an excessive option set, the individual may opt out of making a choice altogether: studies have found people less likely to purchase a good, invest in a 401(k) plan, or take on a loan as the number of options increases (Tversky and Shafir 1992, Iyengar and Lepper 2000, Boatwright and Nunes 2001, Iyengar et al. 2004, Bertrand et al. 2010). Traditionally, explanations of these behaviors have centered on "choice overload," the notion that individual limits on cognitive processing ability are what lead to demotivation as option arrays expand (Shugan 1980, Malhotra 1982, Gourville and Soman 2005). Recent research has identified additional explanations. Concise option menus may provide superior contextual information

[1] See Iyengar and Lepper (2000) for a number of additional cites.

to extensive menus, better enabling assessment of the quality of different options (Kamenica 2008). A larger choice array may suggest to a rational individual that less surplus is to be obtained on average from making a choice, either because the average quality of the options is lower or because the firm will extract more surplus from consumers (Kamenica 2008, Villas-Boas 2009). Expanded choice arrays may also imply increased search and evaluation costs (Kuksov and Villas-Boas 2010).

This paper investigates voter reactions to the number of options on the ballot in Australian federal elections. The key innovation of my approach is its ability to distinguish how people balance motivation against demotivation in their choice-related decisions. I am able to observe variation in the various perceived benefits of choosing (e.g., option variety, meaningfulness of the decision faced, one's ability to influence an outcome), while the costs, accruing the number of options and complexity of the choice process, are held constant. I am therefore able to witness empirically individuals' efforts to trade off a preference for making a choice against the desire to avoid choosing, where the latter accrues to the various drawbacks faced in situations in which the number of options is greater or the process less simple (e.g., when one must preference-order a large number of options). This balancing of the motivational and demotivational characteristics of choice is the paper's focal contribution; by contrast, previous papers in the empirical and experimental literature have tended to provide evidence on either the motivational *or* demotivational effects of expanded choice, but not on the interaction between the two.

My approach makes it possible to examine whether outcomes are consistent with the robust predictions of a theory that individuals experience – and seek to manage – both costs and benefits from expanded choice. Hauser and Wernerfelt (1990) and Kuksov and Villas-Boas (2010) have theorized about how agents might engage in cost-benefit tradeoffs when dealing with a large number of

alternatives. Other work in the literature has explored the cost side extensively, pointing to the possibility of a certain number of options (e.g., six) as constituting a "red line" of sorts, with consumers being able to optimally process choice up to that number of options, but experiencing substantial degeneration in their capabilities beyond it (e.g., Miller 1956, Wright 1975, Malhotra 1982).

My data consist of a rich array of measures of key voting behaviors and corresponding ballot and voter population characteristics for a panel of electoral districts from three Australian election cycles. In studying the Australian election context, I obtain insights from a "real life" choice situation that offers four specific advantages: (1) the baseline electoral process, according to which the individual must preference-order all the available options, is quite complex and so provides a natural setup for analyzing the decision-maker's complexity management "problem"; (2) the number of viable candidates on the ballot varies substantially across electoral contexts; (3) voting is compulsory, so selection effects accruing to which voters turn out versus which do not are avoided; and (4) alternatives to the baseline choice process offer a window on voter motivations concerning the costs and benefits of expanded choice.[2]

I find that voters' tendencies to choose alternatives to the baseline choice process vary in ways generally consistent with variations in the costs and benefits of choice. In particular, my results suggest that expanded choice sets yield diminishing returns; that is, they yield considerable net benefits at first, but these are inevitably overtaken by various sources of increasing cost or risk as option sets continue to expand in size and complexity. I also find broad evidence that individuals balance the perceived benefits and costs of choice at the margin. The

[2] A number of previous papers (most recently, Augenblick and Nicholson 2012) have analyzed "voter fatigue," considering the effect of sequencing of options on a ballot on the tendency to make or avoid making a choice in a particular contest on the ballot. In contrast with these papers, my study analyzes the effect of varying the size of the choice array on a single binary balloting decision, i.e., that of whether or not tender a valid ballot, or whether to vote an entire ballot by a simplifying process.

findings therefore cast doubt on the red-line concept that limitations in individuals' abilities to process choices cause demotivation to cut in consistently at a particular threshold. My findings are largely robust to variations in the regression model and estimation techniques employed.

The rest of the paper is structured as follows. Section 2 motivates my use of the Australian federal elections as an object of study. Section 3 describes my dataset and empirical methodology. Section 4 presents the results of my analysis. Section 5 concludes.

2. The Australian Federal Elections

As mentioned in the introduction, four characteristics of the federal elections in Australia make them a revealing object for study with respect to individual choice behavior. In this section, I discuss these characteristics in greater detail. (In the Appendix, I provide a brief general primer on the Australian system of government and the structure of federal elections for House and Senate in Australia.)

2.1 Characteristic #1: A complex baseline choice process

Australia's federal elections employ a process called "preferential voting" that is markedly more complex than voting in general elections in the United States. An Australian voter must not just figure out which candidate he most prefers, but which he likes second-best, third-best, fourth-best, and so on. The ballot for House or Senate lists all candidates with a box next to the name of the candidate. In the box, the voter places a number indicating the order of preference, with "1" representing the preferred candidate, "2" the second-preference, and so on, until all boxes are filled. Any ballot that is submitted

without every box filled is deemed *informal*, or invalid, and is not counted. Any ballot that does not offer a complete, unambiguous ordering is also considered informal – for example, a ballot on which two candidates are given a "14" ranking. The full preference orderings voters provide play a role in determining who wins election. The vote counting processes, which differ slightly between the House and Senate, are described in the Appendix.

Preferential voting is differentiated from simply voting a first preference by the rate at which complexity in the decision grows with the number of candidates. Previous authors have observed that choice becomes more difficult when decision-makers face the prospect of selecting a favorite from a larger set of options (e.g., Iyengar and Lepper 2000). But when a decision-maker's choice involves placing a set in preference order, the number of possible options grows with the factorial of the number of members in the set, rather than linearly with that number. This suggests that increases in the number of candidates will lead more rapidly to choice overload under preferential voting than under first-preference voting, such that the decision-maker's need to manage complexity is likely to be an important feature of the voting process.

2.2 Characteristic #2: Substantial variation in the number of options

Another key difference from general elections in the United States is that in Australia there are typically more candidates on the ballot and the number of candidates varies substantially. During the period covered by my study, the average Australian voter faced a House ballot with 7 candidates, each representing a distinct political party; this number ranged across my sample from as low as 3 to as high as 14. On the Senate ballot, the average voter faced 63 candidates representing 32 parties; the number of candidates ranged from 9 to 84,

while the number of parties ranged between 5 and 49.[3] These numbers represent, in most cases, viable options for the voter. Unlike the United States, Australia does not have a simple two-party system. Two major parties, the Labor Party and the Liberal Party, obtain the majority of votes and seats in House and Senate. However, the majorities for these parties are not nearly as large as those for the two major parties in the U.S. First-preferences for Labor and the Liberals usually average in the low 80-percent range. The remaining 15-20% of first-preference votes go to candidates from a range of other parties. And while most Senate and House seats go to Labor or the Liberals, a significant portion go to other parties. At present, approximately 23% of seats in the House and 28% in the Senate are held by other parties, which include the LNP, the Nationals, and the Greens. It would be wrong, in short, to dismiss the many candidates who appear on the ballot as not representing "real choices" in terms of their being able to elicit serious consideration by voters.

In Australian federal elections, the wide range in the number of options on the ballot across electorates and over time – both nominally, and in terms of real, viable choices for the voter – provides an excellent opportunity for studying the effects of varying numbers of options on decision-maker behavior.

2.3 Characteristic #3: Compulsory participation

Since 1912, Australia has mandated voter enrollment (or registration) by all eligible adults. Since 1924, it has mandated voting in federal elections by enrolled voters. Today it is one of the few countries in the world to have compulsory voting. Those who do not show up to vote are required to provide the local election authorities with a "valid and sufficient reason" for not voting, or

[3] Here, I count each "independent" or "unaffiliated" candidate as representing a distinct party affiliation.

else pay a modest fine of AUS$20 (Australian Electoral Commission 2010). Coupled with pro-voting campaigns by the election authorities, this penalty has been sufficient to generate near-universal compliance. Prior to the compulsory voting rule, voter turnout never exceeded 79%. By contrast, turnout in the first compulsory federal election, in 1925, was 91.4%. More recently, a turnout rate of 95% is typical (Australian Electoral Commission 2012).

The key consequence of compulsory voting of relevance to the study of choice is that people for whom the perceived costs of preferential voting exceed the perceived benefits are still constrained to vote, assuming the differential is not great enough that they would prefer to pay the $20 fine. Therefore, rather than not vote at all, they must generally choose alternative strategies, which, as I shall discuss below, reveal a good deal about their motivations.

2.4 Characteristic #4: Revealing alternatives to the baseline process

Voters in Australia who do not wish to vote by the baseline process have two options that do not violate election law: in Senate elections they may vote "above the line," and in both Senate and House elections they may intentionally tender an informal ballot.

Senate ballots are made up of two sections separated by a horizontal line, as shown in Fig. 1. In the bottom section are boxes for each candidate running. In the top section are boxes representing "voting tickets" posited by political parties or other groups. Voters can either vote below the line or above the line. Those who vote below the line follow the baseline preferential voting process, numbering all boxes according to their preference ordering. Those who vote above the line need only put a "1" in the box of a single voting ticket. Each voting ticket represents a complete ordering of the candidates; voting ticket orderings are published by the Australian Electoral Commission and available for review by the

voters. In selecting a particular voting ticket, the voter indicates his desire to have his vote for Senate counted as if he had voted below the line with the corresponding preference ordering. House ballots do not offer an above-the-line option, so all voting must follow the baseline preferential voting procedure.

< PLACE FIG. 1 APPROXIMATELY HERE >

Above-the-line (henceforth, ATL) voting affects the voter's choice experience in two ways. First, it means the voter is expressing a first-preference among available alternatives rather than specifying a full rank ordering. Second, it generally presents the voter with a smaller number of options, as there are typically fewer voting tickets above the line than there are candidates below the line.[4] On the positive side, therefore, ATL voting reduces the complexity of the choice process and offers a more manageable number of options. On the negative side, ATL voting constrains choice by limiting the voter to the candidate orderings represented by the voting tickets set forth on the ballot. A particular voter's decision to vote ATL would indicate that she perceived the costs of navigating the complexity of full preferential voting and of dealing with the large number of candidates below the line to be greater than the benefit of having unconstrained freedom of choice in influencing the election outcome. Discussions in the Australian press are generally consistent with this analysis of the tradeoff involved in voting ATL versus below the line.[5]

Intentional informal balloting represents another alternative to full preferential voting. An individual who does not wish to vote may turn in a blank ballot or, more generally, a ballot that in some way fails to meet the requirements of preferential voting (for example, a ballot with the words "Screw this!"

[4]In the three election years covered by my study (2004, 2007, and 2010), the number of voting tickets never once exceeded the number of candidates on a Senate ballot.

[5] See, e.g., "Why You Should Take Time and Vote Below the Line," *news.com.au*, 6 September 2013, retrieved 18 June 2014 from http://www.news.com.au/national/why-you-should-take-time-and-vote-below-the-line/story-fnho52ip-1226713339107.

scrawled on it). Because tendering an informal ballot represents a complete abdication of the opportunity to influence the outcome of the election, one would expect a voter to do this on purpose if and only if the cost of undertaking the decision and completing the ballot exceeded the benefit of influencing the election outcome in any way. Discussions in the Australian press suggest that voters cast intentional informal ballots "in real life," *inter alia*, out of apathy, dissatisfaction with all of the choices on offer, and frustration at the difficulty of having to mark a ballot in the required manner.[6]

3. Data and Methods

3.1 Data

Data for my analysis came from two sources. Election data by electorate were obtained from the Australian Electoral Commission (AEC) for three federal election cycles: 2004, 2007, and 2010.[7] 150 electorates existed in each of the three election years. Electorate boundaries, while often roughly the same from one election to another, are altered between elections through a process known as redistribution. Redistributions are declared at a state level, whence most, though not usually all, electorates within the state have their boundaries redrawn. Four out of the six Australian states and both territories experienced redistribution at

[6] See, e.g., "One in Five Australians Don't Cast a Vote That Counts," *news.com.au*, 12 August 2013, retrieved 18 June 2014 from http://www.news.com.au/national/one-in-five-australians-don8217t-cast-a-vote-that-counts/story-fnho52ip-1226695607576; and "Informal Voting Is On the Rise," *Election Watch*, an analytic site managed by the University of Melbourne, 19 September 2013; retrieved 30 June 2014 from http://electionwatch.edu.au/australia-2013/analysis/informal-voting-rise.

[7] Data may be obtained online through the AEC website at http://www.aec.gov.au/. Data on voting tickets in the elections, while available form the AEC website, were more easily accessed from the website of the Australian Broadcasting Company (ABC), http://www.abc.net.au, which formed the source for this data item in my study.

least once during the relevant period; for each of these entities, I have been able to observe which electorates had their boundaries redrawn and which did not. Following Levitt and Wolfram's (1997) study of U. S. Congressional elections, I treat any electorate with redrawn boundaries as a new entity following redistribution. Accordingly, I have treated the data set as an unbalanced panel consisting of a total of 450 observations on 319 distinct electorates.

The election data include observations on the following key voting behaviors by electorate by year: for the Senate, informal ballots as a percent of the total vote count, and ATL votes as a percent of the total formal (i.e., not informal) vote count; and for the House, ballots tendered completely blank and so-called "deliberate" informal ballots, each as a percent of the total vote count.[8] I have also obtained from the AEC data on the number of candidates appearing on Senate and House ballots, the number of political parties accounted for among Senate candidates, and the percent of candidates who are male or female.

Blank ballots and "deliberate" informal ballots represent two ways of measuring intentional informal balloting behavior, that is, attempts to opt out of casting an effective vote in the election through intentional tendering of what one knows to be an invalid ballot. The set of all informal ballots is probably an over-inclusive measure of intentional opt-out, as a voter might end up tendering an invalid ballot by making an honest error in filling it out; I therefore avoid using this measure. The so-called "deliberate" informal ballot count consists of the subset of informal ballots deemed by the Australian Electoral Commission to have been invalidated deliberately, either by having been tendered blank or else because they contained "marks" or "scribbles" (Australian Electoral Commission 2011). Blank ballots are the subset of these that are simply left blank. While likely under-inclusive, blank ballots offer the advantage over the "deliberate" informal

[8] The AEC does not release blank ballot counts or "deliberate" informal ballot counts for Senate elections.

ballot count of not introducing any biases due to being based on someone's judgment as to what constitutes a deliberately invalidated ballot.

Demographic and lifestyle data, representing key characteristics of the population of each electorate, were obtained from Census results managed by the Australian Bureau of Statistics (ABS).[9] The ABS matches its Census data to the electorate boundaries for each federal election; it was therefore possible, by choosing the correct matched set of Census data, to maintain consistency with the unbalanced panel format of the election data observations. I used 2006 Census data for the 2004 and 2007 electorates, and 2011 Census for the 2010 electorates. This mapping ensured the most contemporaneous match possible of electoral data to demographic and lifestyle data.

Table 1 provides a list all the election, demographic, and lifestyle variables, along with summary statistics. Not surprisingly, the rate of ATL voting is quite high, whereas my measures of the rate of intentional opt-out are all relatively low.

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3.2 Empirical models

I posit the following two alternative models of intentional informal balloting applicable to House elections:

$$(1) \qquad INFORMAL_{it} = \alpha_I + \beta_{I1} \cdot Candidates_{it} + \gamma_I \cdot \boldsymbol{X_{it}} + \phi_I \cdot \boldsymbol{Z_{it}} + \eta_{it}$$

$$(2) \qquad \begin{aligned} INFORMAL_{it} &= \alpha_I + \beta_{I1} \cdot Candidates_{it} \\ &+ \beta_{I2} \cdot Candidates_{it}^{\,2} + \gamma_I \cdot \boldsymbol{X_{it}} + \phi_I \cdot \boldsymbol{Z_{it}} + \eta_{it} \end{aligned}$$

[9] Data may be obtained online through the ABS website at http://abs.gov.au/.

Here, the dependent variable is some measure of the percentage of voters in electorate *i* in year *t* who tendered an informal ballot intentionally. The key explanatory variable is the corresponding number of candidates on the ballot. The vector $\boldsymbol{X}_{it}$ represents characteristics of the roster of candidates for electorate *i* in year *t*, and the vector $\boldsymbol{Z}_{it}$ represents demographic and lifestyle characteristics of electorate *i* in year *t* that might conceivably influence informal balloting. These variables enter as controls. The η_{it} are disturbances.

In the linear model (1), a significant positive coefficient β_{I1} would indicate that voters experience an increase in the net costs of voting, or equivalently a decline in the net benefits, as larger numbers of candidates appear on the ballot and so increasingly opt into informal balloting in such situations. Choice overload provides one explanation of this pattern, but there are others. One alternate possibility is that the voter's perceived probability of being the pivotal, or "median," voter declines with the number of candidates on the ballot. Alternatively it is possible that voters perceive fewer differences in policy positions between candidates as the number of candidates grows, such that the perception that it matters which candidate one votes for diminishes. Or it is possible that having a plethora of candidates on the ballot suggests something negative about average candidate quality, consistent with previous studies of the informational content of choice menus (e.g., Kamenica 2008). The result of a positive β_{I1} is robust to which of these various theories, or which combination of them, proves true.

In the linear model I consider the possibility that two specific key characteristics of the ballot option set moderate the positive effect of number of candidates on the rate of intentional informal balloting. The first of these is how *dispersed* preferences for various candidates are over the mass of voters,

independent of the number of candidates. A relatively small amount of dispersion would indicate that voters perceive the choice to be a clearer one; therefore the cost to the individual voter of making a choice, and the tendency to cast an informal ballot, would likely be lower. Meanwhile a large amount of dispersion suggests the possibility of a muddle in minds of voters, hence greater "overload" and higher costs to the individual in making a decision. I measure preference dispersion using a Hirschman-Herfindahl index (HHI) of the vote shares of the candidates in the election results – that is, the sum of the squared vote shares (i.e., first preferences) across all candidates on the ballot. Irrespective of dispersion, a straight HHI will tend to fall proportionally with the number of candidates; I therefore include in the regression model instead the product of HHI multiplied by the number of candidates. This measure appropriately adjusts for the candidate count. I anticipate that this variable will take a significant negative coefficient in the model. That is, less dispersion in voter preferences as reflected in a higher candidate-count-adjusted HHI should result in a lower rate of intentional informal balloting.

The second potential moderating characteristic is how obvious it is that the top candidate will win the election. The less the outcome of the election is in doubt, the less a voter perceives his vote will make a difference, all else equal; and the less the perceived benefit of casting a valid ballot. I measure the obviousness of the election outcome using the share of first-preference votes accruing to the top candidate in the election results. Since this "top share" will tend to fall proportionally with the number of candidates, my regression variable interacts top share with the number of candidates to create a candidate-count-independent measure of outcome obviousness. I anticipate that this variable will take a significant positive coefficient in the model. That is, greater obviousness of the election outcome as reflected in a higher candidate-count-adjusted top share should result in a higher rate of intentional informal balloting.

I posit model (2) as an alternative specification, reflecting a possible quadratic relationship between the number of candidates and the rate of intentional informal balloting. While, as discussed above, there are a number of potential explanations for why the rate of intentionally invalidated ballots might increase as the number of candidates grows large, one might also expect a large rate of ballot invalidation when there are very few candidates if the perceived benefit of voting is lower when one has little choice. In (2), a significant negative β_{I1} and significant positive β_{I2} would provide consistent but not conclusive evidence that the rate of intentional informal balloting declines with the number of candidates over the low range but increases with the number of candidates over a higher range. More generally, such a result would be consistent with a "diminishing returns" model of expanded choice, whereby the number of candidates on the ballot contributes to the net costs of casting a valid ballot, and therefore to the tendency to opt out of (or not opt into) valid balloting, at a *progressively increasing rate*. Such a model is appealingly consistent with how incremental value is typically conceptualized in economics.[10]

To distinguish which of (1) or (2) is the correct model, I estimate both using maximum likelihood (ML) methods and then employ a likelihood ratio (LR) test. A significant increase in the likelihood when one moves from the linear to the quadratic model constitutes a rejection of a restriction implying that the true model is linear and favors the quadratic specification. If the likelihood does not increase significantly, then the linear model is favored.

[10] Plots of the House blank balloting rate and "deliberate" informal balloting rate versus the number of candidates on the ballot, not presented here in the interest of space, show an apparent "U"-shaped pattern. These support the proposed possible quadratic relationship between intentional informal balloting and number of candidates.

For Senate elections, I posit the following model of above-the-line voting[11]:

$$(3) \qquad \begin{aligned} ATL_{it} &= \alpha_A + \beta_{A1} \cdot VotingTickets_{it} + \beta_{A2} \cdot VotingTickets_{it}^2 \\ &+ \beta_{A3} \cdot Candidates_{it} + \beta_{A4} \cdot Parties_{it} + \gamma_A \cdot X_{it} + \phi_A \cdot Z_{it} + \varepsilon_{it} \end{aligned}$$

The dependent variable is the percentage of formal vote ballots in electorate *i* in year *t* that comprise ATL votes. The key explanatory variables are the corresponding number of voting tickets on the ballot, the number of voting tickets squared, the corresponding number of Senate candidates on the ballot, the corresponding number of political parties represented by the candidates on the ballot. The vectors $\boldsymbol{X}_{it}$ and $\boldsymbol{Z}_{it}$ are the same control variables as in (1), and the ε_{it} are disturbances.

The number of voting tickets measures the extent of variety and complexity of choice above the line. The quadratic function I propose reflects the potential for a diminishing marginal effect of voting tickets on ATL voting, and is consistent with a diminishing returns model of expanded choice. A significant positive β_{A1} and significant negative β_{A2} would indicate that the net benefit of voting increases with the number of voting tickets on the ballot, but at a decreasing rate as increased options contribute progressively less to benefits and more to the costs of option management.[12] Meanwhile, the number of candidates nominally measures the extent of variety and complexity of choice *below* the line. A significant positive coefficient β_{A3} would indicate that voters experience lower

[11] A plot of the mean Senate informal balloting rate across electorates within each state-year versus the number of candidates on the Senate ballot by state-year, not presented here in the interest of space, shows no discernable pattern. Accordingly, I do not posit a model of Senate informal balloting for estimation. One may speculate that the lack of apparent relationship between intentional informal balloting and number of candidates accrues to Senate voters availing themselves instead of the ability to vote ATL as the number of candidates grows.

[12] A plot of the mean Senate ATL voting rate across electorates within each state-year against the number of voting tickets by state-year, not presented here in the interest of space, shows an apparent "concave" relationship. The plot supports the notion that the number of voting tickets has a positive but diminishing marginal effect on interest in ATL voting.

net benefits, or higher net costs, of voting below the line when larger numbers of candidates appear there, and so increasingly opt into ATL voting as a response.

Variation in the number of distinct parties accounted for by the candidates is a moderating characteristic that allows investigation of the effects of variation in the amount of choice variety *with the number of candidates held constant*. If the candidates represent a greater number of parties, all else equal, this should indicate greater differentiation (e.g., in ideology and stands of issues), hence greater variety. The benefits of voting below the line would be higher while the costs, in terms of managing options, would be unchanged. My theory therefore anticipates a significant negative coefficient β_{A4}.

3.3. Estimation strategy

Australia is a large and diverse country, so heterogeneity in the electorate voting populations is likely to be substantial. I account for this heterogeneity in two ways when estimating models (1) through (3). First, I include as control variables the demographic and lifestyle variables listed in Table 2; these account for many of the important sources of heterogeneity likely to affect voting behavior.[13] Second, to control for unobserved cross-electorate heterogeneity, I employ electorate-level fixed effects (FE) estimation. This approach posits the intercept in each model (α_I or α_A, as appropriate) as varying with the electorate *i.* The procedure purges the parameter estimates of contamination due to unobserved electorate-specific influences on the dependent variables. I toggle this simple FE approach with a two-way FE method, which accounts also for unobserved year-specific effects on the dependent variables. As an alternate method, I consider random-effects (RE) estimation, employing a Hausman

[13] As an additional control variable, I include the share of candidates on the ballot who are male.

specification test to check whether that the RE estimator is unbiased (i.e., a null hypothesis that the RE estimator does not differ systematically from the FE estimator is not rejected). In such a case, RE would provide an efficiency gain over the FE estimator and would therefore be preferred.

While panel data methods have the advantage of accounting for unobserved sources of between-district variation in voting behavior, at the same time they soak up all such variation in the variables of interest, leaving only within-district effects to be explained. This introduces noise into the parameter estimates. In view of this downside, I also conduct estimation on pooled annual data assuming independently distributed errors and a common intercept for all observations.

Another essential characteristic of the data is that each observation represents a group of individuals characterized by the same values of explanatory variables (i.e., representing a given electorate in a given year), whereby the dependent variable represents a characteristic accruing to a *proportion* of the individuals in each group (i.e., the percentage who voted ATL). Accordingly, I employ grouped data logit in place of the usual OLS-based FE and pooled regression approaches, as it provides an efficiency gain over these approaches. Because of the need to perform LR tests to rule between models (1) and (2) when estimating the determinants of House intentional informal balloting, I perform grouped data logit ML estimation of the House election models. When estimating the Senate model (3), for computational simplicity I instead employ grouped data logit weighted least squares estimation. The actual dependent variable employed in each estimated model represents a transformation $y_{it} = \ln\left[Y_{it} \left(1 - Y_{it}\right)^{-1} \right]$ where Y_{it} represents ATL as a share of total votes. The error term has expectation zero and variance $\left[Y_{it} \left(1 - Y_{it}\right) n_{it} \right]^{-1}$, where n_{it} is the total number of votes in electorate

i in year *t* for the election in question. Therefore, weighted least squares with cell weights, $\left[Y_{it}\left(1-Y_{it}\right)n_{it}\right]^{1/2}$ is efficient.[14] To set up the Hausman tests, I perform all RE regression runs using ML estimation, as it provides for an efficient model of the covariance matrix based on the error structure represented by the random effects.

The estimation models (1) through (3) may be inappropriate if unobservable factors that influence selection into informal or ATL voting also influence the number of candidates, parties, or voting tickets appearing on the ballot. For example, voter apathy may be greater in certain electorates or in certain years, resulting in a greater rate of informal and ATL voting while also reducing the motivation of political parties to put up incremental candidates or voting tickets.

I deal with this possibility in several ways. First, as discussed above, I include in my regressions a number of control variables, including several measures that are intended to track human capital. These variables are likely to pick up a substantial portion of the unobserved variation in voter interest and engagement in the elections. Second, my use of panel data estimation techniques captures unobservable factors at the electorate level that may tend both to affect ballot entries and informal and ATL voting selection. Finally, to test for the effects of unobservables on both the number of candidates and ATL voting, I make use of a systematic difference between Australia's six states on the one hand and two territories on the other as to the range in the number of Senate candidates that parties put on the ballot. As mentioned in Appendix, the number of open Senate seats per state in each federal election is six, whereas for territories it is two. Parties put up no more candidates than the number of open seats, hence the range in the number of candidates per party is 1 to 6 for states, but only 1 to 2

[14] See Ruhm (1996) and Greene (2003), pp. 686-688.

for territories. This *de facto* constraint on candidate entries creates a natural experiment with respect to the effects of variations in unobservable voter characteristics. These characteristics are presumably independent of the rule on the number of open Senate seats, meaning that in territories they would tend to create the same variation in ATL voting rates as they would in states. Therefore, unaccounted for variation affecting both number of candidates and ATL voting rates would manifest itself in a significant positive coefficient on a territory dummy variable (i.e., a variable indicating observations corresponding to either the Northern Territory or Australian Capital Territory) interacted with the number of candidates on the ballot. Conversely, if such an interactive variable is found to be insignificant as a determinant of ATL voting rates, this would indicate that such unobserved variation is unlikely to be a problem.

4. Results

Table 2 presents estimation results for my models of House intentional informal balloting. The top and bottom sections of the table display results respectively using the blank ballot rate and "deliberate" informal ballot rate as the dependent variable. The first two columns present the results of pooled regression estimation (i.e., without panel techniques), while the last six columns are devoted to panel data estimation. The results shown are for the "preferred" models, as indicated by outcomes from the Hausman specification and LR tests. In all cases involving panel data estimation, the Hausman tests rejected a hypothesis of no significant difference between the RE and FE estimators and so favored FE estimation. The LR tests, evaluated at the 1% critical level, favored the quadratic specification for all four cases involving pooled regression, while the linear specification was favored for the four tested cases involving district-level FE (models 3, 4, 11, and 12). Models 5-8 and 13-16 represent variants on the FE-

estimated linear models that include my preference dispersion (HHI) variable with or without the inclusion of the top-share variable. All runs employ as control variables all the demographic and lifestyle variables in Table 1, as well as the share of candidates on the ballot in the corresponding election who were male. The coefficients for control variables are not shown, so that attention may be focused on the effect of number of candidates and key moderating variables on the relevant voting behaviors.

< PLACE TABLE 2 APPROXIMATELY HERE >

Consistent with expectation, the results for the quadratic models show a negative and significant coefficient on number of candidates and a positive and significant coefficient on candidates squared. Meanwhile, the results for the linear models show a highly significant positive effect of the number of candidates on the ballot on the incidence of both measures of intentional informal balloting behavior. In variants of the linear models, the preference dispersion variable consistently takes a negative and significant estimated coefficient, while the top share variable's coefficient is consistently positive and significant across all specifications that include it.[15]

Table 3 reports the results of estimating the ATL voting model (3) on the Senate data. I alternate inclusion/exclusion of a number of parties variable, in addition to toggling year effects and panel-data versus non-panel regression. In all the panel runs, the null in the Hausman test was rejected, hence FE estimation results are displayed.

< PLACE TABLE 3 APPROXIMATELY HERE >

In all eight runs, consistent with expectation, the coefficient on voting tickets is positive and highly significant, while the coefficient on voting tickets squared is negative and highly significant. I also find in all eight runs a highly

[15] For the economic interpretation of these results, as well as those reported below vis-à-vis estimation of the ATL voting model, see Section 3.2 (which treats these results prospectively).

significant positive effect of the number of candidates on the incidence of ATL voting. Meanwhile, the effect of number of parties on the ballot is significant and negative where this variable is included in the pooled regression models, though not the FE models.

The term interacting number of candidates with a territory indicator is positive and highly significant in all four non-panel regression runs, and negative and significant in all four FE runs. Since, as discussed in the previous section, a *positive* coefficient on this interactive variable is the anticipated indicator of omitted variables bias, the one-tailed significance test presents the result of interest. The outcomes of the test suggest that unobservable factors that affect both the number of candidates on the ballot and the rate of ATL voting are indeed present. However, the effects of those factors are absorbed by the electorate-specific intercepts used in FE estimation, which indicates that they vary across electorates but not over time within electorates. One may conclude confidently that the results of the panel regressions in my study are unaffected by excluded variables bias due to the endogeneity of the number of candidates, parties, or voting tickets.[16]

5. Conclusions

In its analysis of Australian federal election results, this paper has studied both the possibilities of opting out of making a choice altogether (intentional informal balloting) and opting into a simplified alternative to the baseline voting

[16] The significant positive coefficients on the interactive term in the non-panel runs indicate that electorate-level unobservables cause political parties to engage in mitigating behavior. That is, parties respond to characteristics that lead to increases in the rate of ATL voting, such as apathy, by putting up fewer candidates. Thus endogeneity of the number of candidates causes the measured effect of the candidates variable on ATL voting in the non-panel runs to be biased downward, that is, the effects are stronger than what is measured. The same mitigating behavior may also result in downward bias in non-panel runs with respect to the measured effect of number of voting tickets on ATL voting rates.

choice process (above-the-line voting) as responses to variation in the number and variety of options facing the voter. I find evidence that is consistent both with incremental options increasing and decreasing the average individual's motivation to engage in a choice process. Specifically, based on a linear model of intentional informal balloting in the House elections, an increment to the number of candidates on the ballot appears to demotivate voters, corresponding to a greater rate of intentional informal balloting. Demotivation in the House elections is similarly indicated based on estimation of a quadratic model, where when the number of candidates is large an increment to the number of candidates on the ballot corresponds to a greater rate of intentional informal balloting. Meanwhile, also based on the quadratic model, an increment to the number of candidates on the ballot when the number of candidates is small corresponds to the *pro*-motivational finding of a *lower* rate of intentional informal balloting. In Senate elections, an increment to the number of voting tickets on the ballot appears, pro-motivationally, to induce a greater rate of voting above the line. Meanwhile, an increment to the number of *candidates* induces voters similarly to adopt ATL voting, whereby they avoid having to choose among individual candidates – an indication of demotivation. While this evidence appears paradoxical on the surface, the overall pattern of results, viewed particularly in light of the findings from my quadratic models, seems strongly consistent with a diminishing returns model of expanded choice whereby marginal benefits decline and costs grow progressively with incremental expansions of the choice set.

My results indicate further that factors distinct from the number of choices, but reflecting various costs and benefits associated with the choice process or its expected outcome, moderate individuals' responses to the number of choices presented. In the House elections, holding number of candidates on the ballot constant, increments to the level of dispersion in voter preferences across candidates and the level of certainty over who will win the election correspond to

a greater rate of intentional informal balloting. In the Senate elections, when the candidates listed on the ballot correspond to a greater number of political parties, all else equal, the rate of ATL voting is reduced. These findings are consistent with the notion that individuals take account of all the costs and benefits relevant to the decision of whether and how to engage a choice, and that in that decision they trade off sources of benefit against each other at the margin.

My diminishing returns results are consistent with a tentative conclusion that motivation problems may arise for decision-makers presented with either too many or too few options. The implication is that problems "at both ends" may need to be addressed effectively by policy makers and business managers charged with creating choice menus or otherwise setting up the conditions for public or private choice.

The finding concerning moderating variables appears to support the notion that cost- or benefit-related factors other than the number of options may be manipulated in choice processes in order to induce optimal engagement. This, too, has potentially important policy implications. Developing an optimal choice menu, such as for Medicare, Social Security, or an election ballot, is not, it would seem, just a matter of offering the right number of options. It may be a matter of modifying the decision process – as in the case of ATL voting – or environment so as to alter the perceived costs and benefits associated with dealing with a given number of options, such that the decision-maker may be induced to deal with them. Or it may be a matter of framing the choice so that it may appropriately motivate the decision-maker. If the net benefits of the choice are viewed as great enough, or the net costs small enough, a decision-maker may be brought to act rather than opt out.

One potential limitation of the study is that both of my measures of intentional informal balloting are under-inclusive. The larger set of "deliberate" informal ballots as measured would exclude, for example, cases where a voter

began the process of filling out a ballot, got exasperated, and tendered the ballot without completing it; such a ballot would constitute an intentional opt-out, but would not qualify as under the AEC's counting rules. The subset of blank ballots excludes these and more. Bias would be introduced into my analysis only if variations in the key explanatory variables, such as number of candidates, resulted in greater or less than proportional variation in the portion of intentional informal ballots that these variables fail to account for. There is no way to know whether this is the case, but no reason to expect that it would be.

Appendix: The Australian Federal Government and Elections

The main decision-making body in Australia's federal government is the federal parliament, which consists of two houses, the Senate and the House of Representatives. The Senate provides non-proportional geographic representation similar to the United States Senate, while the House of Representatives provides representation on a population basis. Australia is composed of six states and two territories – the Australian Capital Territory and the Northern Territory – and is moreover divided into 150 electoral districts, or "electorates," of approximately equal population. Each state is represented in the Senate by 12 senators and each territory by two senators, while each electorate sends a single representative to the House.

Federal elections occur in Australia every three years. Members of the House of Representatives serve three-year terms and come up for election every cycle. Senators who represent states serve six-year terms, with voters in each state selecting candidates to fill one-half of their state's seats in any given election cycle. Senators who represent territories serve three-year terms and come up for election every cycle. In summary, then, an Australian voter in each federal election selects one candidate to fill a House seat and six to fill Senate seats if he

lives in a state, or one candidate to fill a House seat and two to fill Senate seats if he lives in a territory.

In the House elections, in which candidates vie to fill a single open seat, the tendency is for competing political parties to put up only one candidate each. Often, independent candidates also participate in these contests. Meanwhile, in the Senate elections, in which multiple seats (2 or 6) are being filled, parties tend to put up multiple candidates, though the numbers of candidates per party vary (i.e., in the range of 1 or 2 for territories, and 1 to 6 for states).

For the House of Representatives, each electorate must choose one person to be elected. Corresponding to this objective, election occurs based on a simple majority. For the Senate, in contrast, several seats may need to be filled. Corresponding to this different objective, election occurs when a candidate obtains a quota of formal votes.

The process of obtaining an outcome in the House begins with the counting of all the "1" votes for each candidate. If a candidate gets 50% of the votes on this first count, he is elected. If no candidate receives a majority of the "1" votes, then the candidate with the fewest votes is eliminated and his votes are transferred to the remaining candidates according to the second preferences ("2" votes) shown on the corresponding ballots. If still no candidate has a majority, then the next candidate with the fewest votes is eliminated and the ballots are again reassigned according to the next preference shown to a candidate who has not been eliminated.[17] This process continues with cascading to lower level preferences until a candidate has more than half of the votes cast.

[17] For the second round elimination, this would mean: the ballots that voted the newly eliminated candidate by first preference are now assigned to their second-preference candidate, if that candidate had not been eliminated at the previous round; and to their third-preference if the second-preference candidate had been eliminated. Ballots that had been assigned to the newly eliminated candidate based on second preference in the previous elimination are assigned to their third-preference candidate.

The process for of obtaining an outcome in the Senate begins with a calculation of the quota: the total number of formal ballot papers is divided by one more than the number of seats to be filled, and one is added to the result. That is,

$$Q = (F / (S + 1)) + 1$$

where F is the number of formal ballot papers and S the number of seats to be filled. Next, as in a House election, the number of "1" votes for each candidate is counted. Candidates who receive a quota based on this count are immediately elected.

Any surplus votes obtained by each of the elected candidates beyond those needed to reach a quota are then transferred to the other candidates based on the "2" votes of those candidates' voters. However, this transfer occurs at a reduced rate, with the discount factor being equal to the surplus divided by the total number of votes the candidate in question received. So, for example, if the quota is 7,000, and Candidate A receives 8,000 formal votes, then her surplus of 1,000 votes is transferred based on the "2" votes of her 8,000 voters, but with each transferred vote discounted by a factor of $1{,}000/8{,}000 = 0.125$. Additional candidates may receive a quota and be elected following this transfer process.

If unfilled seats remain after the transfer, a new stage in the count begins, in which unsuccessful candidates are eliminated. The candidate who has the least number of votes is excluded, and his ballots are transferred based on the highest preference accorded to a remaining candidate. Following this, more candidates may receive a quota and be elected. The process is then repeated until all the open Senate seats are filled.

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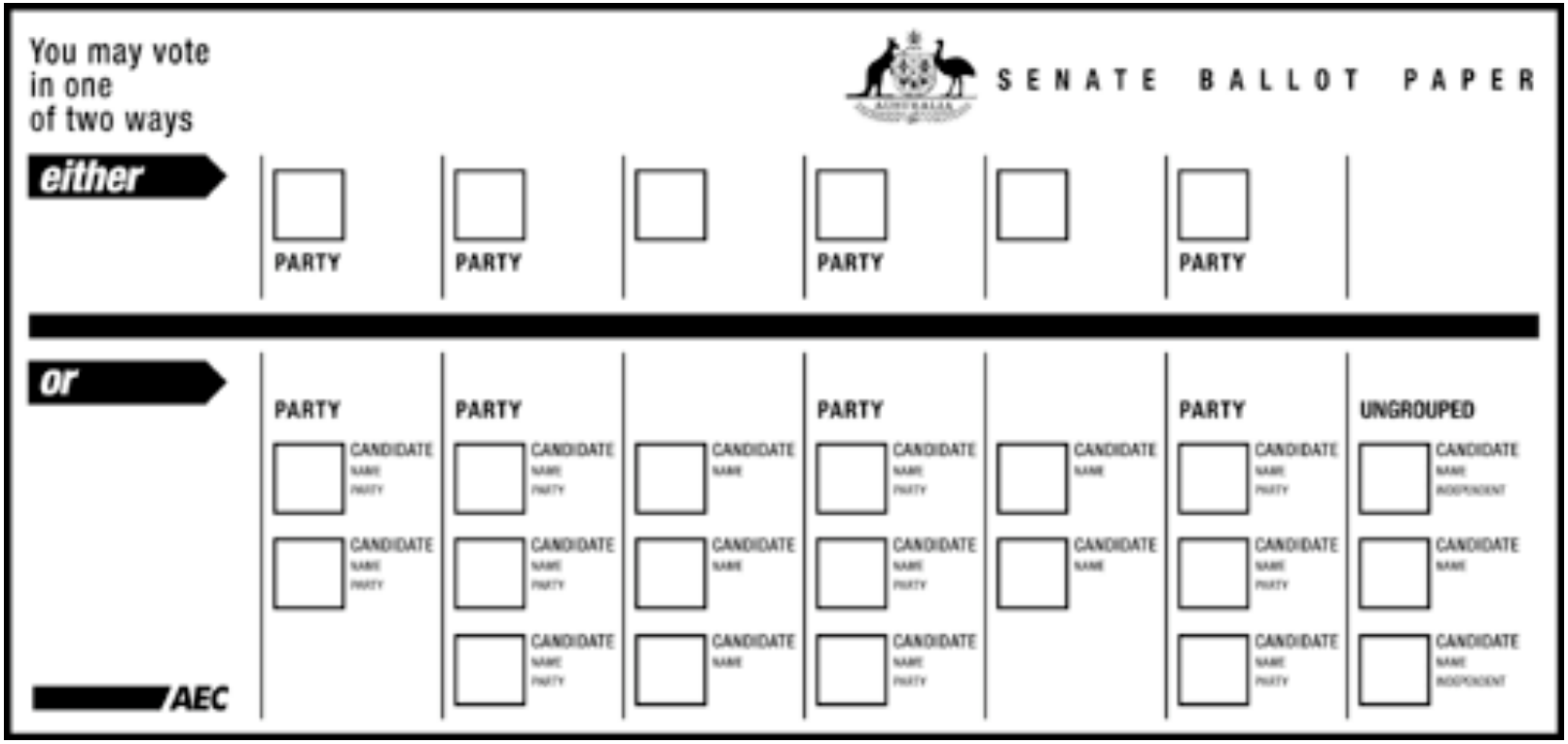

Fig. 1. Senate ballot paper.

Table 1
Summary statistics - election variables and demographic/lifestyle variables (*N*=450).

Variable	Mean	St. Dev.	Min.	Max
Election variables				
Senate Elections				
Above-the-Line Votes, % of formal	96.2	3.9	74.0	99.4
Informal Ballots, % of total	3.4	1.3	1.3	8.7
Number of Candidates on Ballot	62.9	16.6	9.0	84.0
Number of Political Parties on Ballot	31.7	9.1	5.0	49.0
Number of Voting Tickets on Ballot	27.3	7.9	4.0	41.0
Male Candidates, % of total	65.6	6.2	45.5	73.3
House Elections				
Informal Ballots, % of total	4.9	1.8	1.9	14.1
Blank Ballots, % of total	1.2	0.5	0.3	3.9
"Deliberate" Informal Ballots, % of total	1.7	0.8	0.5	5.3
Number of Candidates on Ballot	6.7	1.8	3	14
Male Candidates, % of total	73.1	17.5	0	100
Demographic/lifestyle variables				
% of Individuals				
Engaged in Volunteer Activity (last year)	14.5	3.6	5.5	23.0
Managers and Professionals	15.4	5.4	5.9	32.9
Work in a Human Capital-Intensive Industry[1]	12.4	4.6	5.5	31.1
Completed 12 Years of Education	35.1	10.7	17.2	64.1
European Ancestry	53.9	7.4	21.9	66.5
Earning AUS$1,000/week or more	16.5	6.6	5.7	39.1
Australian Citizens	86.0	5.2	59.8	92.9
Arrived in Australia during past 11 years	6.5	4.6	0.8	23.0
Aged 20-24	6.7	1.7	3.9	15.4
Aged 65+	13.7	3.5	4.4	23.7
% of Households				
Single Parent Families	10.3	2.0	4.3	18.0
Have Broadband Connection	42.7	15.6	14.6	79.2

Note: Observations in the unbalanced panel data set consist of a given electorate (out of 319 distinct entities) in a given year (2004, 2007, or 2010).
[1]Includes the following industries designated by ABS: information, media and telecommunications; financial and insurance services; professional, scientific and technical; public admininstration and safety; and education and training.

Table 2
House intentional informal balloting - preferred models.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
% Blank Ballot								
Candidates	-0.0588***	-0.0146***	0.0245***	0.0286***	0.0437***	0.0624***	0.0382***	0.0560***
	(0.0044)	(0.0045)	(0.0027)	(0.0027)	(0.0070)	(0.0071)	(0.0073)	(0.0073)
Candidates Squared	0.0060***	0.0039***						
	(0.0003)	(0.0003)						
HHI of Vote Shares*Candidates					-0.0566***	-0.0995***	-0.1223***	-0.1777***
					(0.0192)	(0.0193)	(0.0297)	(0.0297)
Top Share*Candidates							0.0576***	0.0680***
							(0.0199)	(0.0197)
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
% "Deliberate" Informal Ballot								
Candidates	-0.1104***	-0.0747***	0.0287***	0.0286***	0.1129***	0.1022***	0.0991***	0.0900***
	(0.0037)	(0.0038)	(0.0022)	(0.0022)	(0.0059)	(0.0059)	(0.0061)	(0.0062)
Candidates Squared	0.0079***	0.0070***						
	(0.0003)	(0.0003)						
HHI of Vote Shares*Candidates					-0.2497***	-0.2183***	-0.4153***	-0.3626***
					(0.0162)	(0.0163)	(0.0252)	(0.0254)
Top Share*Candidates							0.1456***	0.1273***
							(0.0169)	(0.0171)
District-level Fixed Effects?	N	N	Y	Y	Y	Y	Y	Y
Year Effects?	N	Y	N	Y	N	Y	N	Y

Notes: All runs were estimated by grouped data logit maximum likeihood estimation and include state-level dummies. Each model controls for all of the demographic and lifestyle variables listed in Table 1 and for the percent of candidates on the ballot who are male. N=450 for all models.
***Significant at 1% level

Table 3
Senate ATL voting models.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Voting Tickets	0.0846***	0.0839***	0.0860***	0.0858***	0.0482***	0.0546**	0.0462***	0.0712*
	(0.0116)	(0.0117)	(0.0115)	(0.0116)	(0.0130)	(0.0215)	(0.0143)	(0.0371)
Voting Tickets Squared	-0.00209***	-0.00211***	-0.00197***	-0.00199***	-0.00101***	-0.00106***	-0.00101***	-0.00123***
	(0.00018)	(0.00019)	(0.00019)	(0.00019)	(0.00024)	(0.00033)	(0.00027)	(0.00045)
Candidates	0.0456***	0.0463***	0.0499***	0.0505***	0.0378***	0.0361***	0.0393***	0.0441***
	(0.0023)	(0.0024)	(0.0029)	(0.0030)	(0.0028)	(0.0028)	(0.0055)	(0.0150)
Parties			-0.0147**	-0.0143**			-0.0024	-0.0109
			(0.0060)	(0.0060)			(0.0071)	(0.0202)
Cand*Territories Interaction	0.1114***	0.1112***	0.1097***	0.1098***	-0.02658**	-0.03445**	-0.02583*	-0.03983**
	(0.0079)	(0.0080)	(0.0079)	(0.0079)	(0.01311)	(0.01406)	(0.01327)	(0.01665)
Test H_0: $\beta=0$ vs. $\beta>0$	R: 1%	R: 1%	R: 1%	R: 1%	FTR	FTR	FTR	FTR
District-level Fixed Effects?	N	N	N	N	Y	Y	Y	Y
Year Effects?	N	Y	N	Y	N	Y	N	Y
R^2	0.9279	0.9283	0.9290	0.9293	0.9973	0.9975	0.9973	0.9975

Notes: Dependent variable for all runs is above-the-line votes as a percent of formal Senate ballots. All runs estimated by grouped data logit (weighted least squares technique). Each model controls for all of the demographic and lifestyle variables listed in Table 1 and for the percent of candidates on the ballot who are male. N=450 for all models.
***Significant at 1% level **Significant at 5% level *Significant at 10% level