Following Through on an Intention to Vote: Present Bias, Norms, and Turnout

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Abstract: I present a model that maps the intention to vote into action to help understand broad patterns of turnout. It extends the standard cost-benefit framework of turnout to multiple periods with uncertainty about how the choice to vote will be experienced and includes the possibility of present bias in time preferences. Civic duty and social pressure are voting norms that serve as commitment devices for citizens to follow through and vote. This *Follow-Through Model* parsimoniously accounts for two important features of turnout: the connection between voting and norms and increasing socio-economic standard of living in the United States without corresponding increase in aggregate turnout. Evidence from a nationally-representative survey merged to administrative records confirms that present bias is negatively related to both turnout and follow through of intended voting, and that voting norms mitigate each. The model and results highlight why lower-income Americans are less likely to vote, have implications for policy approaches to mitigate inequality in political participation, and serve as a framework to reason about individual influences on turnout.

Keywords: Voter turnout; Norms; Civic duty; Present bias; Time preferences.

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Turnout in American elections is neither universal nor zero. In the 2016 presidential election, about 138 million Americans voted out of a voting age population of 251 million. Only 81 million voted in the 2014 midterm election and 24 million votes were cast in 2014 House primary elections. Why do some eligible citizens vote in most elections, some occasionally, and some never at all? Why do some who think that they should vote follow through and turn out while others fail to follow through? These questions are particularly relevant in the United States, where many hypothesize that lower participation by the middle and lower classes leads to less representation of their interests relative to the more participatory upper class and wealthy.

While field experiments show that *external* messages can bring people to the polls, the magnitude of these influences is small compared to variation across individuals. This suggests that characteristics *internal* to the individual are the most relevant factor for who does and who does not vote. Understanding remains limited regarding these internal characteristics, particularly those characteristics that help individuals who want to vote but have competing demands on their time translate an intention to vote into the action of voting. These internal characteristics should help explain, or at least be consistent with, correlates of turnout such as habit, election salience, socioeconomic status, and belief that voting is a duty.

I argue here for a new theoretical focus that places citizen political choices in an over-time setting. I present a model of intertemporal political choice that includes *present bias* to help understand why some citizens vote more often than others and to help rationalize the importance of both SES and norms such as civic duty. Present bias is an individual trait that leads many to a focus on the here and now such that they over-weight immediate costs and benefits relative to longer-term costs and benefits. The consequences of present bias in the realm of intertemporal economic decision-making can be large, for example leading to the widespread failure to accumulate sufficient savings for retirement, the common problem of procrastination, unhealthy choices in diet and exercise, and widespread high interest consumer debt. Present bias appears to be especially common among, though not exclusive to, citizens of lower income. The theory connecting present bias to problems in savings and procrastination applies equally to the problem of following through

on an intention to vote and participating in politics. This essay shows that present bias is not only related to abstaining in elections, but that a model of turnout with present bias is consistent with important empirical regularities of participation in America.

The *Follow-Through Model* of turnout presented here is an extension to the cost-benefit model commonly applied in political science due to Downs (1957), Riker and Ordeshook (1968), and others. The key innovation is in extending the standard single-period problem to a multiple period discounted utility function with a present bias parameter (specifically, the (β, δ) model, Laibson, 1997; O'Donoghue and Rabin, 1999). The utility function allows the citizen's future experiences to be uncertain such that each individual has probabilistic beliefs about the likelihood that he or she will have certain experiences in these future time periods. These potential experiences would be differentially enjoyed conditional on the choice to vote or abstain. The possibility of present bias means that on the day of the election the costs to voting are of larger magnitude than anticipated. The unanticipated magnitude hinders the follow through of an individual who had intended to vote. The combination of these two extensions provides a new framework to reason about the individual choice to vote and helps account for two long-standing empirical observations from studies of turnout.

Combining the Follow-Through Model with the association between present bias and lower educational attainment and income explains a paradox in studies of voting. Turnout has long been positively correlated with SES, and many argue that those with high SES gain greater representation because of their greater participation. While education and income have increased consistently over the past 50 years, turnout has remained stagnant or declined.[1] A micro-foundation of turnout with present bias resolves strong cross-sectional correlation without corresponding over time increases in turnout with increases in SES. Present bias influences where in the distribution of SES individuals fall, and also influences which individuals follow through on an intention to vote. If

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[1] For example, not until 1967 did half of Americans 25 and older have a high school diploma. By 2009, 87 percent had achieved that level of education or more. In the 1960s turnout in presidential elections averaged 63 percent of the voting eligible population. In the 2000s, presidential turnout averaged 58.6 percent. See http://www.census.gov/prod/2012pubs/p20-566.pdf and http://www.electproject.org/national-1789-present, retrieved November 30, 2016.

present bias is a relevant causal factor on turnout, then we should observe a consistent correlation between *relative* SES and turnout, regardless of real changes in overall SES. Present bias is an omitted variable in the SES-turnout relationship that accounts for the paradox.

The Follow-Through Model also suggests why individuals might develop norms of voting behavior. The model classifies beliefs about civic duty, ethical voting, and conformity with social networks as *commitment devices* to increase the post-election utility to voting and help overcome the hurdle of present bias. Modeling norms as commitment devices suggests why individuals might invest in creating such prosocial norms of political behavior in the first place. While these norms are subject to the same discounting as other inputs to the calculus of turnout, norms increase the utility of voting after the election to help overcome election day costs.

The model has implications for how political scientists think and model turnout and other political behavior, and for reformers and campaigns for how they think about mobilization. For political scientists, the model offers a new interpretation of the over-report of turnout in surveys, an explanation for the less well-off participating less in politics, a framework for thinking about the mechanism connecting voting norms and other influences of turnout to behavior, and a simple explanation for the paradox of SES and turnout. The model of individual behavior also has implications for candidate behavior, which I discuss below. For those interested in increasing participation, reasoning about intertemporal choice with present bias suggests that differential targeting of messages by the present bias of the citizen may be more effective than current practice, and that development of messages may benefit from consideration of the over-time consequences of voting or abstaining. I discuss these ideas in a section near the end of the essay.

I take the model to data with empirical validation of the negative correspondence between turnout in American elections and measures of present-biased preferences. Team modules from the 2014 Cooperative Congressional Election Study show that Americans with present bias are 10 to 17 percentage points less likely to vote. I also show that those who express a definite intention to vote prior to the election are less likely to follow through and do so if they have present bias. Importantly, my measure of present bias is a standard measure from economics used to measure

time preferences about income. That such a simple economic measure is so strongly related to validated political behavior suggests the importance of this internal trait. Additionally, the belief that voting is a duty, measured prior to the election, mitigates much of the negative influence of present bias at the time of the election.

I note at the outset that the argument here does not resolve the collective action paradox of voting. I take the non-zero turnout observed in national elections around the world as evidence that many in the population perceive an incentive to vote in large elections. The model presented here of who follows through on intention to vote might spur developments that lead to more knowledge of what goes into the utility function leading so many to perceive such an incentive.

The essay proceeds as follows. First, I highlight current empirical regularities and standard theories of turnout followed by an introduction to a time-dynamic model of the choice to turn out with present bias. I then relate present bias measured in a nationally-representative sample of Americans to their turnout in recent elections, and show that belief that voting is a duty ameliorates all or most of the negative influence of present bias on participation. I then show that present bias negatively influences the follow through of those who intend to vote prior to the election. Finally, I offer concluding remarks including ideas for future research and field tests of messages to try to mitigate present bias in political behavior.

Empirical regularities of turnout in American elections

The two most consistent correlates of American turnout are demographics of the individual and election context. First, individuals of higher education, income, age, residential stability, and socio-economic status are more likely to vote than those of less stable life circumstances.[2] Second, turnout is higher in presidential contests than in midterm or off-cycle contests, and increases with campaign spending and competitiveness.[3] This observational correlation between campaign effort or election salience and turnout has been corroborated by randomized experiments showing that

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[2] See, e.g., Key (1958), Campbell et al. (1960, ch. 5), Wolfinger and Rosenstone (1980), Rosenstone and Hansen (2003), Leighley and Nagler (2014).

[3] See, e.g., Key (1958), Caldeira and Patterson (1982), Cox and Munger (1989), Rosenstone and Hansen (2003).

campaign messages have a positive causal influence on turnout.[4] Hundreds of other studies have found clear relationships to other features of individuals and contexts, from the institutional barriers to participation to habituation to genetics to interactions between context and individuals.[5] One work relevant to this essay is Fowler and Kam (2006), who show that individuals with higher discount factors (more patience) are more likely to vote. That work does not measure present bias.

Two further empirical regularities important to the argument in this article are the influences of individuals' social networks and the importance of norms such as civic duty. Recently, inquiry has returned to the idea that the turnout choice is a social behavior embedded in the individual beliefs about what social connections consider appropriate (e.g., Gerber, Green, and Larimer, 2008; Bond et al., 2012; Sinclair, 2012). Also important are individuals' internal beliefs about norms of appropriate behavior, from a belief that voting is a "civic duty" for citizens of democratic systems (Campbell et al., 1960; Riker and Ordeshook, 1968), to beliefs about turnout of in-groups influencing an individual's own choice.[6]

Existing models of individual turnout

A set of theories have been developed to understand the turnout choice at the individual level, but the two most common in political science are the cost-benefit model and the resource model. Early work applied a simple cost-benefit calculation to turnout, with the small probability that any individual would actually change the election outcome leading to the equilibrium of near-zero turnout in large election (Downs, 1957). An enriched version of the Downs (1957) model aimed to rationalize turnout despite small probabilities of being pivotal by adding a consumption value to participation separate from influence over the outcome (Riker and Ordeshook, 1968, henceforth RO). The RO framework is now probably the most common simple model of turnout in political science.[7] A second well-used model of turnout is the "resource model" of Brady, Verba, and

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[4] See, e.g., Gerber and Green (2000), Green and Gerber (2008).

[5] See, e.g., Fowler, Baker, and Dawes (2008), Fraga and Hersh (2010), Gerber et al. (2013), Meredith (2009), Wolfinger and Rosenstone (1980).

[6] See, e.g., Uhlaner (1989), Gerber and Rogers (2009).

[7] Political economists have developed models of political participation that also aim to rationalize non-zero turnout by creating some form of socialized utility (e.g., Ali and Lin, 2013; Feddersen, Gailmard, and Sandroni, 2009; Feddersen and Sandroni, 2006).

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Schlozman (1995), which builds upon the cost-benefit model. The resource model suggests that many of the reasons one might not vote, from costs to interest to social networks, vary by the social, economic, and educational resources available to the individual. The model explains how turnout should vary across the population, as those with higher SES are better able to navigate the costs to voting, more likely to understand politics and have an interest in participating, and more likely to be part of social networks where voting is expected and solicited.

These two models of participation are each consistent with many of the empirical regularities of turnout. However, each is challenged by other regularities. The RO cost-benefit model accounts for observed variation in election context and the influence of civic duty and prosocial voting norms, but is less clearly connected to the SES correlation. The resource model builds upon the RO model in light of the SES correlation, but is challenged by the paradox of large increases in real American SES over previous decades yet no corresponding increase in aggregate turnout. Most of the factors that the resource model deems important for turnout are more widely available to Americans today, and yet turnout has not increased. I build on the two models to create more consistency with these empirical regularities.

Economic models of intertemporal choice with present bias

In this section, I present a brief background on the theory and evidence of present bias in economic decision-making. The economic evidence shows that present bias is widespread and consequential for many economic actors. In the following section, I apply these insights to the choice to vote before exploring how much present bias influences turnout.

Present bias is thought to be a primitive trait of individuals that influences how they make decisions that influence their experiences into the future (Meier and Sprenger, 2015). In particular, exerting costly effort in the moment for some longer term benefit is influenced by the individual's ability to anticipate future experience and control present temptations. Ability to control temptations varies across the population, and this ability has consequences for many economic and health outcomes.

As a simple model of decision making, consider first a standard discrete-time discounted utility function for a single action x_i for individual i, where i's utility U_i in each time period t depends on action x_i and a random state variable $s_t \in S_t$. Individual beliefs about future states of the world are summarized by a probability distribution p_i where $\sum_{s_t \in S_t} p_i(s_t) = 1$. Utility in future time periods is discounted exponentially by factor δ_i. Then, i maximizes utility by

$$\max_{x_i \in X_i} \sum_{t=0}^{\infty} \left[\delta_i^t \sum_{s_t \in S_t} p_i(s_t) U_i(x_i | s_t) \right]. \tag{1}$$

The specification highlights that a single choice x_i has consequences for the individual's utility in current ($t = 0$) *and* future ($t > 0$) time periods, and that this utility is a function not only of the action chosen x_i but also of uncertain future states of the world. (In the next section, the action x_i will be voting versus abstaining.)

Equation 1 presents a standard discounted utility model of intertemporal choice. A revisionist school of economists and psychologists have argued for modification to the standard model in light of evidence from observational and experimental research showing that most individuals do not appear to make financial choices consistent with the standard model.[8] One common revision is to the assumption of fixed intertemporal discounting. The standard model assumes that the discount factor δ between two periods is independent of when the utility is evaluated. That is, no matter in what time period t the agent considers the difference in utility between, for example, $t = 10$ and $t = 11$, the standard model assumes a fixed discount to utility between $t = 10$ and $t = 11$. A large body of evidence, however, "suggests that discounting is steeper in the immediate future than in the further future (DellaVigna, 2009, p. 318)." That is, economic agents are *present biased*, discounting future utility more between time $t = 0$ and time $t = x$ than between time $t = b$ and $t = b + x$, $b > 0$.[9] This observation has been used to understand evidence for a variety of important economic and health outcomes that seem inconsistent with the standard model, from

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[8] For a review, see e.g., DellaVigna (2009).

[9] See Thaler (1981) for a seminal experimental example. Note that neither model requires that the discount factor δ be *constant* between every time period, however the standard model assumes that each between-period discount be unrelated to time of evaluation.

excessive consumption of tobacco and unhealthy food to procrastination, credit card debt, and insufficient saving for retirement.

A variety of models have been proposed to represent present-biased preferences from a dual-self model (e.g., Thaler and Shefrin, 1981) to preferences over menus (e.g., Kreps, 1979). I employ a popular variant, the (β, δ) model formalized by Laibson (1997) and O'Donoghue and Rabin (1999). The (β, δ) model modifies the standard discounting model with discount factor δ by adding a $\beta \leq 1$ parameter that represents present bias with respect to future utility. Letting $u_{it}(x_i) = \sum_{s_t \in S_t} p_i(s_t) U_i(x_i | s_t)$ be the per-period utility, the overall utility at time t is $U_t(x_i) = u_{it}(x_i) + \beta \delta u_{i,t+1}(x_i) + \beta \delta^2 u_{i,t+2}(x_i) + \beta \delta^3 u_{i,t+3}(x_i) \ldots$ When $\beta = 1$, this reduces to the standard discounting model. When $\beta < 1$, discounting between the current period and future periods is greater than discounting between future periods further in the future.[10] Evidence suggests that time preferences are primitive characteristics of the individual with consequences for life outcomes (Meier and Sprenger, 2015).

Because present bias implies negative long-run economic and health consequences due to over-weighting of the present, individuals who are aware (or partially aware) of their present bias might choose to take mitigating action. A sophisticated individual who (partially) knows of their present bias may look for *commitment devices* to tie their future self to the correct behavior (e.g., O'Donoghue and Rabin, 2001).[11] While these commitment devices are subject to time discounting, they change the relative utility of actions in each time period in a way to help overcome the problems of present bias.

Two observations suggest that some individuals are at least partially aware of their present bias. First, a variety of empirical research suggests real-world demand for costly commitment devices

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[10] Angeletos et al. (2001) show that a quasi-hyperbolic discounting model better fits the intertemporal income and consumption dynamics observed in American consumer choices than the standard exponential discounting model.

[11] For example, DellaVigna and Malmendier (2006) show that Americans who attend health clubs with two fee options, per-use or monthly membership, often buy the monthly membership even though they end up using the gym less than would be justified and would have been better off (ex post) with the per-use fee. The authors interpret this as evidence of present-biased actors. Aware that they should exercise yet also aware that futures selves will prefer not to go to the gym, these individuals buy the monthly membership as a commitment device to decrease the marginal cost of future attendance and increase their likelihood of exercise. See Bryan, Karlan, and Nelson (2010) for a review of commitment devices.

(see, e.g., fn. 11), an observation challenging to justify if decision makers were entirely unaware of their time inconsistency. Second, everyday life provides many opportunities to experience intertemporal trade offs, suggesting that most are likely to learn from these experiences about their own level of present bias (though unlikely to become fully informed of the extent of inconsistency, see Ali, 2011). Partial awareness of one's present bias suggests both the potential for inaccurate forecasts of future behavior and a demand for commitment devices to help follow through on intentions to take costly action. In the next section, I apply these insights to the political problem of turnout.

Micro-foundation for choice to turn out

In this section, I apply a discounted utility model to the choice to turn out in democratic elections. The intertemporal approach provides a framework to understand why some citizens follow through on an intention to vote. The key innovation is to model the choice to vote as a function of the individual's perception of the uncertain consequences of that choice over multiple future time periods and to include present bias in discounting.[12]

Consider a choice to vote in a single election, $X_i = \{V, A\}$ for Vote or Abstain. To highlight the over-time dynamics of the election day choice to turn out, and to move towards a model with present bias, I first separate the sum in (1) into two separate additive components and include a parameter measuring the cost to vote, c_i. Letting $u_{it}(x_i)$ represent the single-period expected utility for i at time t, $u_{it}(x_i) = \sum_{s_t \in S_t} p_i(s_t) U_i(x_i|s_t)$, $\mathcal{I}(\cdot)$ be an indicator function taking the value of one when its argument is true, zero otherwise, and assuming no anticipatory utility in periods prior to the election, the maximization problem is

$$\max_{x_i \in X_i} \left[[\delta_i^e (u_{it=e}(x_i) - \mathcal{I}(x_i = V)c_i)] + \sum_{t=e+1}^{\infty} [\delta_i^t u_{it}(x_i)] \right]. \tag{2}$$

The broken apart sum (2) highlights that utility surrounding the turnout choice x_i is the sum of

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[12] Uncertainty is an important component of individual political action. Palfrey and Rosenthal (1985) present a game-theoretic model where uncertainty about the behavior and preferences of *other* citizens can lead to non-zero turnout. Others have also applied behavioral modifications to formal models of turnout, e.g. Patty (2006).

discounted utility about x_i given state s_t on the day of the election $t = e$ less the individual's costs of voting c_i when $x_i = V$, plus the utility given realized states in time periods after the election having chosen action x_i. Note that the costs to vote are paid on the day of the election but not in subsequent time periods.

In each time period, utility is determined by a combination of the action taken, x_i, and the realized state of the world s_t. Because the future state of the world is uncertain, the consequences of the turnout choice for future time periods are stochastic and the action chosen depends upon the citizen's beliefs about the likelihood that a variety of future situations will confront them. These situations would be differentially experienced were they to have voted or abstained. For example, there is some probability that in a future time period they will be asked by friends or family if they voted.[13] The individual assigns some probability that they will observe negative news coverage about the officials elected in the election, or that they will be confronted with or hope to display a bumper sticker that says "Don't blame me, I voted Republican." They give some probability to needing constituent service from representatives who have access to turnout records (Hersh, 2015, p. 201-4), or that their neighborhood will obtain government services in proportion to the political participation of the voters in that neighborhood. Beliefs about the probability of these future experiences affect the choice to vote.[14]

The choice to vote for most, then, is a trade off between costs on election day and potential states of the world and (uncertain) benefits in future time periods. It seems likely that for most voters the discounted expected utility in post-election time periods is non-negative. Of course, there are some future situations that may benefit from abstention, for example being drawn for jury duty from the registration records or the inconvenience of campaign mailers or canvassers at the front door in the next election. However, if turnout on the day of the election is net costly, net future utility negative for the majority of voters is inconsistent with the level of turnout observed

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[13] Gerber, Green, and Larimer (2008) find that Get-out-the-vote (GOTV) messages about disclosure of turnout to neighbors has the largest effect on turnout of any other GOTV message. See also Bond et al. (2012).

[14] Get-out-the-vote (GOTV) messages in this model might be interpreted as modifying the individual probability distributions p_i, the summary of their beliefs about the relative likelihood of different election day or post-election experiences.

in most elections.

A key assumption of the model is that the choice to turn out in large elections is directly related to the individual's welfare, i.e., that $U_i(x_i = V)$ is not always equal to $U_i(x_i = A)$. If there were no consequence to voting or abstaining, the formulation in (2) would provide no traction. I take as a starting point that individual utility does vary by the turnout choice given the observation that individuals *do* turn out in large elections and that levels of turnout *do* vary across different individuals and contexts, similar to the RO model.[15] Many individuals undertake the cost to vote in some elections. I note that the utility need not be fully instrumental, but could also be expressive or social, as noted by some of the examples in the paragraphs above.

The Follow-Through Model: Turnout with present bias

Applying the (β, δ) model to turnout yields the Follow-Through Model (FTM) of turnout and insight into why some people vote and others do not. Recalling that single-period expected utility $u_{it}(x_i) = \sum_{s_t \in S_t} p_i(s_t) U_i(x_i | s_t)$, the maximization problem when evaluated prior to the election is

$$\max_{x_i \in X_i} \left[[\beta_i \delta_i^e (u_{it=e}(x_i) - \mathcal{I}(x_i = V) c_i)] + \sum_{t=e+1}^{\infty} [\beta_i \delta_i^t u_{it}(x_i)] \right]. \tag{3}$$

However, on the day of the election, the maximization problem is

$$\max_{x_i \in X_i} \left[[u_{it=e}(x_i) - \mathcal{I}(x_i = V) c_i] + \sum_{t=1}^{\infty} [\beta_i \delta_i^t u_{it}(x_i)] \right],$$

where the present bias parameter β_i is not applied to election day utility (and $\delta^{t=0} = 1$). The FTM implies that some citizens with $\beta_i < 1$ will intend to vote, but when the time of the election arrives, they will fail to follow through because of changes in the net present value of voting relative to abstaining.[16] When the election is in the future, the costs to voting c_i are discounted by both β and δ, lessening the net present cost to voting, $U_i(x_i = V)$. On the day of the election, however, β is

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[15] Note that only *expected* welfare needs to vary by the action chosen. The solution to (2) depends upon the individual's forecast of experience in future periods. They may vote so as to mitigate a low-probability event with great disutility to abstention that does not ultimately obtain.

[16] When the utility to voting and abstaining are normalized to one and zero, respectively, intended voters are those for whom $\frac{1}{\delta_i(1-\delta_i)} > c_i > 1 + \frac{\beta_i}{1-\delta_i}$. See Appendix Section A.

Table 1: Classification of citizen voter types with the Follow-Through Model

	Prior to election $\beta_i\delta_i^t(u_{it=e}(V) - c_i) + \sum_{t=e+1}^{\infty} \beta_i\delta_i^t u_{it}(V)$ $> \beta_i\delta_i^t u_{it=e}(A) + \sum_{t=e+1}^{\infty} \beta_i\delta_i^t u_{it}(A)$	Day of election $u_{it=e}(V) - c_i + \sum_{t=1}^{\infty} \beta_i\delta_i^t u_{it}(V)$ $> u_{it=e}(A) + \sum_{t=1}^{\infty} \beta_i\delta_i^t u_{it}(A)$
Always Voters	✓	✓
Never Voters		
Intended Voters	✓	

no longer applied to $u_{it=e}(x_i)$ or c_i, leading to a corresponding increase in the net present cost to voting for those with $\beta < 1$. Evaluating (3) on the day of the election for some flips the solution from $x_i = V$ to $x_i = A$. When the reality of the costs to voting impose on the individual's present-biased self on the day of the election, a pre-election expectation to turn out does not translate to an actual vote. This discontinuity increases as β moves away from one such that the more present-biased the individual, the more the costs of voting may dissuade the translation of an intention to vote into an actual vote.

Table 1 classifies present-biased citizens into three types based upon their evaluation of election day costs and post-election day benefits to voting. The comparisons are evaluated separately t days prior to the election (first column) and on the day of the election (second column). The first row identifies Always Voters, those citizens for whom the net present benefits to voting outweigh the net present benefits to abstaining both with and without application of their present bias parameter β_i. The second row identifies the Never Voters for whom the net present benefits to abstaining always outweigh the net present benefits to voting. The final row presents Intended Voters who evaluate greater net present benefits to voting prior to the election when β is applied to day of election costs, but when β is removed on the day of the election their present-biased selves prefer abstaining to voting.[17] Citizens with time consistent preferences $\beta_i = 1$ are either Always Voters or Never Voters.

If some or most of those with present bias are not fully aware of the extent of their present

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[17] A fourth type would be Unintended Voters, citizens who derive net benefits on the day of the election that move their action into voting from anticipated abstention. This type would not compose a large proportion of the electorate if voting is generally costly and if β is generally less than or equal to one.

bias (as argued in Ali, 2011), the framework of Table 1 suggests an alternative interpretation of the observed over-report of intended turnout in pre-election opinion surveys. One common explanation is social desirability, i.e. respondents lie to surveyors knowing that they are unlikely to vote but not wanting to admit it to the interviewer. Table 1 and the FTM instead suggest that some of this over-report could be due to present biased citizens who truthfully report their intention to vote, only to not follow through on that intention when unanticipated present bias intervenes on the day of the election. Intended Voters mis-report if sufficiently unaware about the magnitude of their β_i when reporting their likelihood of voting prior to the election – they may know $\beta < 1$ but not by how much. Failure to accurately anticipate present bias would cause truthful reporting of an inaccurate forecast of future costly behavior such as voting.

With respect to SES and turnout, if present bias has a causal influence on education and income and present bias hinders follow through on an intention to vote, then present bias generates a correlation between SES and turnout. Imagine that those with present bias are more prevalent in the lower part of the SES distribution. If so, then absolute increases in SES for the entire distribution would not change the problems of follow-through for those in the bottom of the distribution.[18] Income and education may increase, even for those with present bias, but the increases do not lead to increases in ability to follow through on an intention to vote.

Mitigating present bias: Commitment devices

While some citizens may be entirely unaware of how present bias might prevent their turnout, others are partially or fully knowledgeable about the challenge of present bias for following through on their own motivation to vote. They may choose to adopt a commitment device.[19] In the FTM, a commitment device modifies the utility for x_i through changes to $U_i(x_i|s_t)$. Consider the citizen who has observed from previous experience that they often fail to follow through on plans they have made in the political context or, if they have limited experience in politics, suspects that they

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[18] Unfortunately, long time series with measures of present bias do not exist to evaluate this implication empirically. See Meier and Sprenger (2015).

[19] Note that a single individual who is partially aware of his or her present bias may both adopt a commitment device *and* report an intention to vote that will not be followed through upon. Unfortunately, the data I use below does not provide indication about self-awareness of present bias.

might fail to follow through based on their experience in non-political contexts. That individual might infer that they are likely to be an intended voter who will not follow through. One option to mitigate this lack of follow through is investment in a commitment device ν_i that modifies their utility to voting to offset present bias on the day of the election. Such commitment devices might include norms for turnout such as civic duty or allowing social pressure to modify individual utility.[20] Investing in the commitment device changes the utility function from $U_i(x_i|s_t)$ to $U_i'(x_i, \nu_i|s_t)$. These norms might increase the utility to voting at the time of the election $u_{it=e}'(V)$, e.g. the positive utility from performing a civic duty, increase the disutility to having not voted e.g. guilt from not having participated in support of group interests, or might increase the utility to having voted in post-election states s_t where the election is discussed or politics is experienced $U_i'(x_i = V, \nu_i|s_t)$. Norms of voting help turn Intended Voters into Always Voters. Civic duty – and other voting norms – can thus be interpreted as individually-constructed technologies to promote good individual behavior.

Of course, such norms are not only valuable to those with present bias. Those without present bias but with sufficiently high discounting of future utility may still develop such norms to help overcome the costs to voting on election day. The FTM's consideration of over-time utility provides a framework for interpretation of such norms. The data analysis below suggests voting norms help both those with and without present bias vote at higher rates.

In sum, the FTM provides a framework for reasoning about why individuals might develop personal norms of behavior that increase their incentives to vote, provides a micro-foundation for political participation that is consistent with the paradox of SES and turnout and a new interpretation of pre-election over-reports of anticipated turnout. In the next section, I bring the model to data and evaluate three empirical implications. First, individuals with present bias are less likely to vote, all else equal. Second, individuals who hold the norm of duty to vote and are present biased are more likely to vote than those with present bias who do not believe in such a norm. Third,

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[20] Ali (2011, p. 861) suggests that "social mechanisms" may serve as commitment devices for economic decision makers. Note that individuals are not required to care what others think about them. Social sanctions and rewards only sanction or reward to the extent the individual lets them. Norms seem reasonable to interpret as technologies each individual has discretion over adopting.

those who express an intention to vote are more likely to do so if not present biased.

Data

I evaluate three implications of the Follow-Through Model with individual observations of present bias and turnout. I fielded questions to measure present bias on two modules to the 2014 Cooperative Congressional Election Study (CCES, Ansolabehere, 2014) and match these measures to self-reported and validated turnout in 2014 midterm elections. The 2014 CCES data set combines two nationally-representative samples for observation of 2,004 individuals. Each survey was fielded in two phases surrounding the November, 2014 midterm election. In the pre-election survey, present bias was measured using a series of three questions. The questions were introduced with the text "Imagine you are offered the following choices from a person that you trust. For each choice, please indicate which you would prefer." Respondents were asked if they would prefer: (a) $26 today or $30 in one month; (b) $13 today or $30 in six months; and (c) $26 in six months or $30 in seven months. Respondents who chose $26 to the first question but $30 to the third question were classified as present-biased (1=yes, 0=no) for the analysis below.[21] I include the second question to distract participants from being overly sensitive to pick the same amount in the first and second questions. These simple question address time inconsistency in economic preferences, and so it may be surprising to find, as I do below, that the construct is strongly related to turnout. That it is related so strongly suggests this economic trait is similarly important for political decisions. To measure belief that voting is a civic duty, measured prior to the election to mitigate ex post rationalization, I asked the version of the question from recent American National Election Studies.[22] After the election, the CCES successfully matched 1,295 respondents to statewide voter files to create validated records of turnout. Below, I analyze the relationship of present bias to validated turnout in the 2014 midterm general and congressional primary elections among those

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[21] This is a common survey item to measure present bias (e.g. Ashraf, Karlan, and Yin, 2006).

[22] "Different people feel differently about voting. For some, voting is a choice – they feel free to vote or not to vote, depending on how they feel about the candidates and parties. For others, voting is a duty – they feel they should vote in every election no matter how they feel about the candidates and parties. For you personally, is voting... (a) Mainly a choice; (b) Mainly a duty; (c) Neither a duty nor a choice."

successfully matched to voter files (N=1,295).[23]

It is important to observe that though the survey questions to classify present bias are well-used in the literature, they are likely to measure present bias with some error. In addition to the usual error induced by survey question wording and inattentive participants, there is also likely to be systematic error due to heterogeneity in discount factors (δ_i) across participants. The simple questions asking participants to choose between \$26 versus \$30 will identify only those with present bias with discount factors in a specific range. Individuals with discount factors outside of this range will always strictly prefer \$26 to \$30 or \$30 to \$26 regardless of present bias and so these questions do not identify the present bias of respondents with such discount factors. We should expect that these two questions systematically produce *false negatives* of unknown magnitude. I explore the consequences of measurement error in a section following the main results.[24] Measurement error makes it more difficult to detect the influence of present bias.

There are two important considerations specific to the FTM with a measure of present bias subject to error. First, measurement error means that some individuals who are present biased will not be so classified. For these individuals, civic duty may still help them mitigate their present bias, meaning that civic duty should still have a positive effect on turnout even among those not classified as present biased. Second, measurement error in present bias means that SES variables that are better-measured, correlated with, and potentially causally subsequent to present bias could pick up the effect of present bias when included in a multiple regression model. That is, measurement error would lead the coefficients on SES variables to pick up some of the mismeasured influence of present bias on turnout. For this reason, my preferred specification is to excluded SES variables, though I show that present bias continues to affect turnout with controls for SES.

In the CCES, 21.3 percent of respondents give answers that indicate present bias. Present bias is correlated with income and education. Twenty-six percent of those with present bias report owning stocks compared to 42 percent of those without present bias, and the proportion present

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[23] All analysis uses the post-stratification weights provided by the CCES. Analysis of self-reported turnout (N=2,004) is available in the Appendix, with similar results.

[24] Outside opportunities for arbitrage may also lead to the instrument misclassifying those with present bias as time consistent.

biased decreases with each category of family income by 0.005 and with each category of education by 0.02, on average.

Results

This section shows that those with present bias are less likely to turn out than those without present bias by about 10 to 15 percentage points. It then shows that belief that voting is a duty rather than a choice mitigates much of this negative effect.

In Figure 1, I plot turnout in the 2014 primary and general elections by present bias and belief that voting is a duty. In each frame, turnout is measured by administrative voter files for general and primary election turnout. For example, the bar to the farthest left in the top frame shows that respondents who did not exhibit present bias were validated to have voted in the 2014 general at a rate of 72.6 percent. Those with present bias voted at a rate of 62 percent. This lower turnout for the present biased holds in both elections.

The bottom frame in Figure 1 presents evidence that belief that voting is a duty mitigates the negative effect of present bias on turnout. For each election, the first two bars present turnout among the non-present biased for those who do and do not believe that voting is a duty. The difference replicates the strong correlation between civic duty and turnout (e.g., Campbell et al., 1960; Blais, 2000). The third and fourth bars present turnout among those with present bias and who do and do not believe voting is a duty. Belief in duty increases turnout among both groups, but the boost appears to be larger for those with present bias, at least for the general election. Among the present biased, the rate of turnout among those who believe that voting is a duty is closer to the rate of turnout among the non-present biased, consistent with the argument that belief in voting norms mitigates the negative consequence on voting of present bias.

For numerical summaries and statistical tests of this graphical result, in Table 2 turnout (1=yes, 0=no) in each election is regressed on the indicator that the individual is present biased. Columns one through four present the direct relationship of present bias to turnout with and without controls for SES, with the present-biased 6.6 to 13 percentage points less likely to turn out in these

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Figure 1: Present bias, turnout in 2014 elections, and civic duty as commitment device
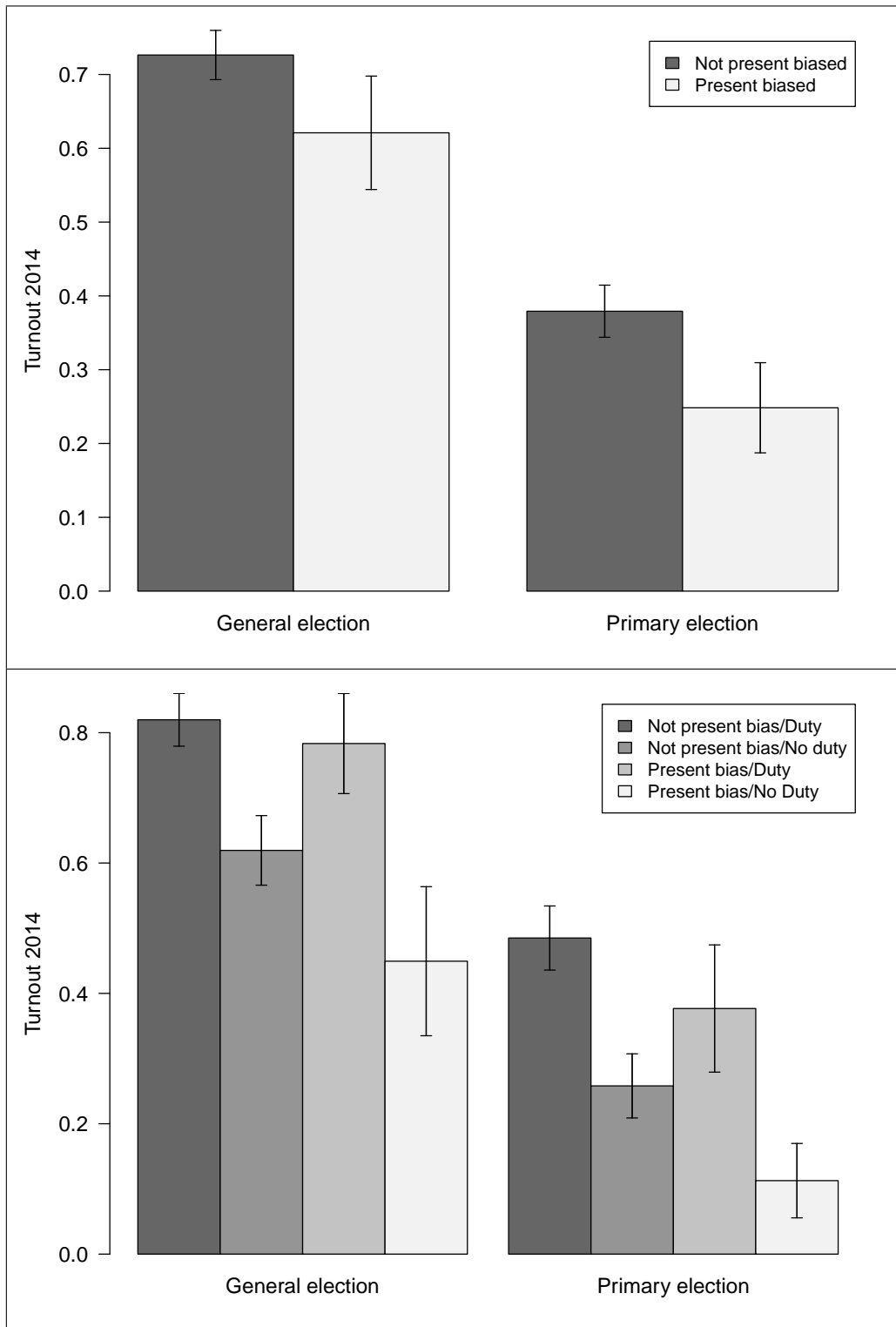
Note: Bar heights represent turnout among CCES respondents, weighted by stratification weights. Error bars extend to 95 percent confidence intervals for each subset. First frame partitions only by present bias, second frame by present bias and belief that voting is a duty.

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elections.[25] The point estimates indicate a stronger negative influence of present bias on turnout in the 2014 primary election (columns three and four) than in the general, but this difference is not statistically significant.

Columns five through eight test for civic duty as a commitment device. The specifications include an indicator for the respondent believing that voting is a civic duty along with the interaction of civic duty and present bias. This interaction tests whether the norm of civic duty moderates the influence of present bias on turnout. The direct effect of present bias is of larger magnitude than in columns one through four, varying from 11 to 17 points. The interaction terms indicate that those with present bias who believe voting is a duty are more likely to vote than those with present bias who believe voting is a choice. The magnitudes of the interactions indicate that most of the direct effect of present bias in general elections is mitigated for those who believe voting is a duty. For the primary election (columns seven and eight), the point estimate for the interaction is in the appropriate direction, but of smaller magnitude. This suggests that norms of voting mitigate present bias less for primary than general elections.

Overall, Figure 1 and Table 2 provide evidence that present bias in time preferences decreases turnout in general and primary elections, and that those who believe in a norm that voting is a civic duty are less affected when present biased than those without such a norm. These results are consistent with the FTM, where present bias inhibits following through on an intention to vote but norms of voting can serve as commitment devices to overcome present bias on election day.

Those with present bias vote at rates 10 to 15 points lower than those without present bias, which is large relative to external influences one might consider as benchmarks. The largest GOTV message to date increases turnout by about 8 percentage points (Gerber, Green, and Larimer, 2008). Providing actual monetary incentives for voting increases turnout by up to 7 points (Panagopoulos, 2013). The large relationship here is particularly striking given a simple measure of present bias from a few questions on economic choices. This suggests the potential importance of time

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[25] The controls for income and education are likely post-treatment, that is present bias is likely to influence the educational attainment and income of the individual, and so such specifications would understate the influence of present bias on turnout – particularly if present bias is measured with more error than education or income (see, e.g. Acharya, Blackwell, and Sen, 2016*a*).

Table 2: Present bias, validated turnout in 2014 elections, and civic duty as commitment device

VARIABLES	(1) General	(2) General	(3) Primary	(4) Primary	(5) General	(6) General	(7) Primary	(8) Primary
Present biased (1=yes,0=no)	-0.11**	-0.066*	-0.13**	-0.084**	-0.17**	-0.12**	-0.15**	-0.11*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)
Present biased * Voting a duty					0.13*	0.10	0.037	0.053
					(0.06)	(0.06)	(0.06)	(0.06)
Believes voting mainly a duty not choice					0.20**	0.15**	0.23**	0.17**
					(0.03)	(0.03)	(0.03)	(0.03)
Constant	0.73**	0.38**	0.38**	-0.046	0.62**	0.32*	0.26**	-0.12
	(0.01)	(0.14)	(0.01)	(0.15)	(0.02)	(0.14)	(0.02)	(0.15)
Observations	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295
R-squared	0.008	0.172	0.012	0.164	0.074	0.205	0.072	0.199
Demographic controls	No	Yes	No	Yes	No	Yes	No	Yes

Standard errors in parentheses
** p<0.01, * p<0.05

Note: Dependent variable in each column is turnout validated to voter files of those CCES respondents matched, 1=yes 0=no. Alternating columns include SES and demographic indicators for age in decades, for each category of education, and for each category of family income.

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inconsistency to political decision making.

Following Through on an Intention to Vote

I next evaluate how present bias hinders follow through for those who express an intention to report prior to the election. Respondents were asked in the pre-election wave of the CCES, "Do you intend to vote in the 2014 midterm election on November 4?," to which 65 percent chose "Yes, definitely." Table 3 shows that present bias hinders turnout among the sample who definitely intended to vote, and that civic duty partially mitigates this failure to follow through. Point estimates indicate that present bias decreases follow through on an intention to vote by 7.3 points (5.9 points with demographic controls). In columns three and four, the point estimates indicate that the norm of civic duty helps mitigate this negative effect, but standard errors are large partially due to smaller sample.

The results indicate that many of those with present bias do not anticipate the costs on election day when formulating an intention prior to the election. At the same time, the point estimate in column one of Table 3 is almost 4 points smaller than the corresponding effect on turnout in column one of Table 2. Some of those with present bias are aware that it will hinder their turnout and do not report that they will definitely vote when asked prior to the election. For example, tabulating intention by present bias, those with present bias were 5 points less likely to report a definite intention to vote, 61 versus 66 percent, and 12 versus 8 percent "undecided" about turnout.

In sum, Table 3 provides evidence that present bias not only has a negative influence on turnout, but that it hinders follow through among those expressing an intention to vote.

Magnitude of the effect of present bias: Measurement error

Classification of respondent present bias from the CCES survey questions is likely to suffer from measurement error. Measurement error in this key explanatory variable will bias the regression estimate of the influence of present bias on turnout. In this section, I explore the potential consequences of this error.

With a binary predictor, measurement error manifests as classification error. I apply the cor-

Table 3: Following through on an intention to vote, 2014 general elections

VARIABLES	(1) General	(2) General	(3) General	(4) General
Present biased (1=yes,0=no)	-0.073*	-0.059	-0.12*	-0.081
	(0.03)	(0.03)	(0.05)	(0.05)
Present biased * Voting a duty			0.086	0.040
			(0.07)	(0.07)
Believes voting mainly a duty not choice			0.087**	0.061*
			(0.03)	(0.03)
Constant	0.82**	0.84**	0.77**	0.80**
	(0.01)	(0.23)	(0.02)	(0.23)
Observations	940	940	940	940
R-squared	0.005	0.145	0.023	0.151
Demographic controls	No	Yes	No	Yes

Standard errors in parentheses
** p<0.01, * p<0.05

Note: Sample limited to respondents responding "Yes, definitely" to a pre-election question asking if they intended to vote. Dependent variable in each column is an indicator for following through on the intention to vote in the 2014 general election based on validated voter file turnout of those CCES respondents matched, 1=yes 0=no. Alternating columns include SES and demographic indicators for age in decades, for each category of education, and for each category of family income.

rection for measurement error in binary predictors of Savoca (2000). The procedure statistically corrects the OLS coefficient estimated from the observed data as a function of false negative and false positive rates (either assumed or brought from some external validation) and the true rate of the binary indicator in the population (Savoca, 2000, Eq. 3).[26] Figure 2 explores what the true effect of present bias on turnout would be for various values of false positive and false negative rates given the OLS estimates from the CCES for validated 2014 general election turnout. The top frame explores the influence of error on the estimate for the full population and the bottom two frames explore the influence separately for those believing voting is a duty and for those believing voting is a choice. Each figure plots the implied effect as the false negative rate is varied along the x-axis from 0 to 0.4 and for four values of false positive rate (separate lines).[27]

Figure 2 shows that if this measure suffers from small to modest amounts of measurement error, the OLS estimates in Table 2 (and Table 3) likely understate the true effect of present bias on turnout. In each frame, the horizontal dashed line is the estimated effect from the observed classification. The point at which the line with false positive rate zero (solid black) intersects with the OLS estimate occurs where the false negative rate equals zero – the OLS assumption of error-free regressors. For a false positive rate of zero, there are only minor changes in the estimator as the false negative rate increases towards 0.4, and in fact at some values of false negative the magnitude of the true effect would be smaller. However, if the CCES has false positives and false negatives due to respondent misunderstanding or inattentativeness in addition to false negatives due to heterogeneity in discount factor, the figure suggests this combination almost certainly leads to an underestimate of the true effect, potentially on the order of 50 or 100 percent.

At many values of false negative above 0.15 (meaning that 15 percent of respondents are actu-

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[26] Specifically, Savoca (2000) shows that for a true effect β of a binary regressor measured with classification error, $\text{plim}\hat{\beta}_{OLS} = \beta\big[\frac{P(1-P)(1-r_o-r_1)}{\tilde{P}(1-\tilde{P})}\big]$, with P the true rate in the population, $\tilde{P}$ the sample proportion, r_0 the sample false positive rate, and r_1 the sample false negative rate.

[27] I explore values where the false negative rate is greater than or equal to the false positive rate because the systematic error is likely to mostly generate false negatives while the survey measurement error is likely more symmetric, generating both false positives and false negatives. This suggests that the sample should suffer from more false negatives than false positives. A given combination of false negative and false positive rate, along with the sample observed proportion present biased, implies a true rate of present biased in the population. I limit to combinations where the implied true rate of present biased is between 0 and 0.8.

Figure 2: Effect of present bias on turnout with correction for measurement error
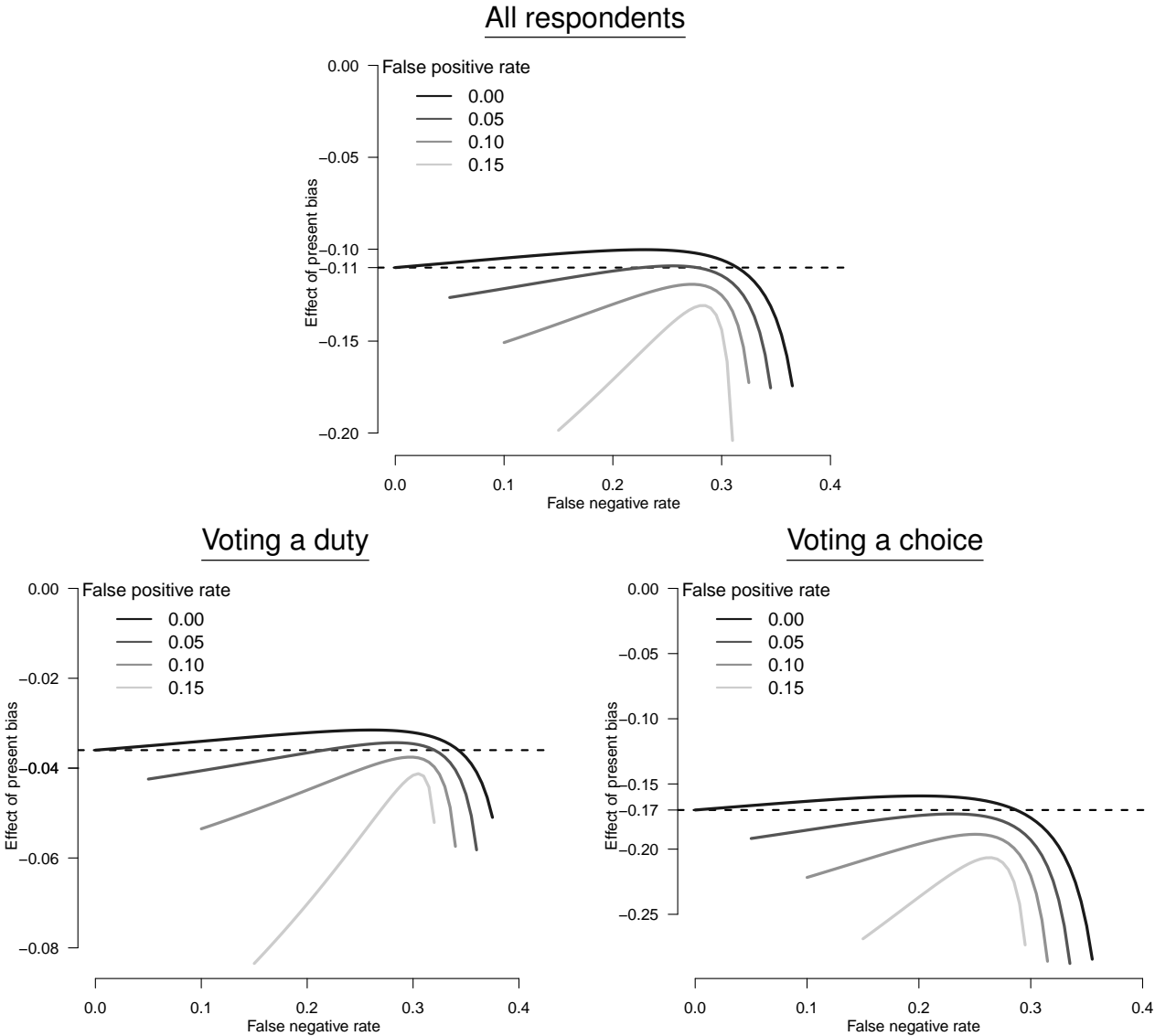
Note: Each frame plots the effect of present bias on validated 2014 general election turnout from the CCES when applying the measurement error correction for binary regressors of Savoca (2000) at given false negative and false positive rates. Dashed lines are the uncorrected OLS effects. Limited to combinations that generate an implied present bias rate in the population of 0.8 or less and where the false negative rate is greater than or equal to the false positive rate. The graph shows that at modest amounts of measurement error, the effect of present bias on turnout can be one and a half or two times larger.

ally present biased but coded as time consistent due to either survey measurement error or discount factor), true effects of present bias are one and a half or two times greater than the OLS estimate. For example, if for all respondents the false positive rate is 0.15 and the false negative rate is 0.20, the correction suggests that those with present bias are 17 percentage points less likely to turn out, about 1.5 times the OLS estimate of 11 points. For the subset who do not believe voting is a duty with this combination of 0.15 and 0.20, the true effect would be 24 points, again about 1.5 times the OLS estimate.

The importance of civic duty as a commitment device holds in this analysis. Even with the worst case measurement error considered here, the effect of present bias for those who believe voting is a duty is not much greater than 8 points.

In sum, this exploration suggests that measurement error is likely to attenuate the estimated relationship between present bias and turnout. Future research should field measurement instruments with multiple indicators of present bias so that measurement error is minimized and the relationship is most accurately characterized. The evidence here is that present bias likely has a large influence on political participation.

Reforms to mitigate present bias

Those who are motivated to increase participation, especially the participation of lower-SES Americans, may find the results above helpful in developing policy interventions. In particular, efforts might be tailored to address the problem of time inconsistency highlighted in the FTM.[28] A large amount of reformers' effort goes towards lowering the costs of voting on and before election day. While the FTM highlights that this is a relevant influence to translating intentions to vote into action, for those with $\beta_i \ll 1$ in (3), changes to the election day costs to voting must be of sufficient size to overcome the switch from the planning to the present self, which may be a large hurdle because most reforms do not drive costs to zero. This may be why reforms to election institutions such as early or absentee voting have only small effects on aggregate rates of turnout (e.g., Gerber,

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[28] Of course, there may be some normative questions about increasing turnout of those with time inconsistent preferences who may also have different preferences over government policy such as accumulating debt.

Huber, and Hill, 2013; Gronke et al., 2008). Convenience voting reforms may lower the costs to voting, but for those who always value today more than tomorrow, voting early or by absentee will be delayed similarly to voting at the polls.

The FTM suggests an alternative path for those interested in increasing turnout. For the present biased, focus on commitment devices and informational campaigns targeting the post-election world may be particularly useful. The election day self, when present bias parameter β_i is no longer applied to election day utility, does not change discounting with respect to post-election utility. This suggests trying to change either citizens' utility to voting and abstaining in future states of the world or citizens' probability distribution over states (i.e., beliefs). This may be why a recent meta-analysis of GOTV interventions finds that the most effective messages offer praise for previous turnout or highlight social consequences to turnout (Green, McGrath, and Aronow, 2013, p. 36-7). For example, the largest effect on turnout comes from a social pressure message that informs voters that the turnout choices of registrants on their block (including their own) are matters of public record that could be disclosed after the election. An interpretation of these results within the FTM is that this information modifies recipients' beliefs about the likelihood of post-election states of the world where their turnout choice might be discussed. If they anticipate experiencing these states more favorably had they turned out relative to abstained, then modifying the probability distribution can change the solution to the FTM maximization in (3) – i.e. the GOTV message changes p_i to p_i' with corresponding consequences for the solution to (3).[29]

Panagopoulos (2013) shows that offering financial incentives to participation increases turnout. While such financial incentives are not legal in federal elections, other legal carrots or sticks targeted at post-election states could be developed. To take advantage of present bias, an intervention might have participants commit to vote in a pre-election period and agree to some post-election hardship (e.g., delivery of text messages at odd hours) triggered if they do not vote. Alternatively,

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[29] The second most effective class of messages found by Green, McGrath, and Aronow (2013) were those that ask voters to consider how they intend to translate intentions to vote into action (i.e., "make a plan" messages). These seem most consistent with modifying the costs to vote on the day of election, but might also be relevant to post-election utility if citizens prefer to avoid the cognitive dissonance (e.g. Acharya, Blackwell, and Sen, 2016*b*) of having had a plan yet not following through.

reformers might deliver information about how common others in the individual's social network discuss voting, or how many bumper stickers "Don't blame me, I voted for the Democrats" are produced to change the individual's probability distribution over post-election states. The FTM and consideration of time inconsistent preferences provides a framework for developing GOTV messages to mobilize and help those with an intention to vote translate that intention into action.

Implication of FTM for candidate strategies

Because the consequences of voting and abstaining play out with uncertainty over future time periods, candidate communications aimed at increasing (or decreasing) turnout may target beliefs about the costs and benefits to voting. Particularly for citizens with present bias, beliefs (p_i) about what states of the world are likely to be experienced have direct consequences on the choice to vote. So, candidates who would like to encourage turnout may play up or exaggerate the enjoyment from voting on the day of the election. They may do so through high profile voting drives or asking their supporters to make promises to vote. Candidates who would like to discourage turnout may play up or exaggerate the costs to voting on the day of the election. Rhetoric about voter fraud and the need for careful supervision of access to the ballot may increase citizen beliefs about the likelihood of a state of the world with great discomfort at the polling place. Notably, this highlights the importance of perceptions and beliefs over the actual facts on the ground.[30] In general, this suggests incentives for candidates to exaggerate and highlight certain aspects of the voting experience over others, and to persuade citizens that specific post-election states of the world are more likely than the citizens currently believe.

Conclusion

While I have shown here that present bias is relevant for turnout and following through on political intentions to vote, this is not the only form of political participation likely hindered by time

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[30] This may be why it has been difficult to identify effects of electoral reforms such as voter identification laws. If these laws discourage turnout more through beliefs about the voting experience than through actual rejection of voters at the polling place, the negative influence may not be limited to the places where the laws have been passed, i.e. the effect spills over across geographic boundaries, undermining comparisons across incidence of legal rules.

inconsistent preferences. The same process that prevents some from voting on election day may also prevent attendance at Parent Teacher Association meetings, contact of representatives, or registration to vote. More broadly, political coalitions need members to show up when called upon. Citizens who fail to follow through on commitments are likely to be less valuable members of political coalitions, which may also undermine representation of the interests of the present biased in the political process.

The results suggest a new way to interpret survey reports of vote intention prior to elections. For some Intended Voters in Table 1, vote intentions prior to the election are not predictive at the time given. Unless they perfectly anticipate their own present bias, Intended Voters may accurately report their *intention* to turn out or abstain in the election even though no change in beliefs or utility function is required for the opposite action to obtain when the day of the election arrives. This model does not require social desirability or purposeful evasion to generate inaccurate survey reports of turnout prior to the election.[31] The FTM clarifies what might change after a pre-election interview that would modify either the intention to vote or the translation of that intention into action.

Present bias is also a candidate spurious variable confounding the observed relationship between SES and turnout. If those with present bias attain less education and have lower incomes (see, e.g., Banerjee and Mullainathan, 2010; Bernheim, Ray, and Yeltekin, 2015, for citations to extensive evidence on this relationship) and if, as I argue here, present bias also limits participation in politics, then it may be present bias and not SES that drives much of the correlation between SES and turnout. Present bias is related to location within the distribution of SES at any point in time, and also partly determines variation in who follows through on their intention to turn out. This generates a spurious correlation between SES and turnout. In the regression models with SES covariates, including present bias does not fully mitigate the relationship of income and education to turnout. Future research should explore the causal place of present bias in this process.

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[31] Post-election over-reporting does still require evasion of some kind if citizens accurately recall their turnout behavior. In the 2012 American National Elections Survey face-to-face sample of 2,054 Americans, 76.3 percent reported intending to vote in the pre-election survey and 65.4 percent reported having voted in the post-election survey.

The result here on norms as commitment devices is potentially applicable to other fields of inquiry. It suggests a new way to think about personal norms of behavior, synthesizing economic models of behavior with sociological and psychological perspectives. Psychological research finds the importance of norms, while economists tend to focus on individual instrumental inputs to choices. The idea that personal norms of behavior serve as commitment devices for present biased individuals, and may be actively developed by such individuals, may be a useful model for social behavior outside of politics. The model also clarifies how to interpret research on issues of self-control and regulation from the psychological perspective. For example, Holbein (2016) finds a relationship between individual ability to self-regulate and turnout, which might be interpreted within the framework of the FTM.

This essay also provides a new perspective on the economic theory of turnout, though with a certain irony. Present bias is part of the canon of behavioral economics, which offers revisions to the neoclassical economic model of individual behavior. The neoclassical microeconomic model of voting behavior suggests that if costs are non-zero, turnout should be near zero in large elections. Ironically, my application of the revisionist model with time preferences subject to present bias leads citizens to participate at lower rates, closer to the classical equilibrium. More research might explore how present bias fits into the other modifications that have been applied to the economic model of political participation.

With respect to political behavior, the FTM and present bias suggest new paths for both observational and experimental research. I highlighted above the connection between the results here and GOTV interventions for those interested in increasing turnout. Academic questions on the nature of coalitions, the decision rules for individual political choices, and preferences for government fiscal policy are all implicated by an intertemporal utility function with present bias. In the realm of voting, many have questioned the apparent myopia of voters with respect to candidate choice, where more recent economic performance is more strongly related to vote choice than full-incumbent-term performance. It may be that present bias generates this myopia. Finally, as others have begun to note theoretically in a new literature on "behavioral political economy" (e.g., Bisin,

Lizzeri, and Yariv, 2015), citizens with present bias may have different preferences over fiscal policy than those with less present bias, leading to larger government fiscal deficits and less long-term investment than would be otherwise demanded. My results, however, highlight that models that assume universal turnout when evaluating the consequences of present bias for fiscal policy may be missing a key aspect of behavioral political economy – that those with present bias are less likely to be part of the voting electorate. Future theory might want to model differential participation.

Along with broader implications, the FTM is particularly relevant to studies of turnout. Because turnout is the most basic choice made by citizens in American elections, it is the subject of large amounts of research in political science. We know surprisingly little about the individual causal process that generates voting by some individuals in some elections while others abstain. Extending the cost-benefit model to intertemporal comparisons with uncertain beliefs about future consequences to the turnout choice may stimulate new empirical and theoretical developments. Understanding who votes, when, and why, generates knowledge for both those motivated to understand political choice and those who aim to broaden and deepen political participation.

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Appendix

A Parameters of Intended Voters

Given the decision problem represented by the Follow Through Model in Equation 3, one can specify the relationship between the individual's present bias parameter β_i, discount factor δ_i, and cost to voting c_i and their classification as an Intended Voter, a citizen who intends to vote prior to the election but who, absent some commitment device, will not be able to follow through on the day of the election. For simplicity of exposition, normalize $u_{it}(V) = 1$ and $u_{it}(A) = 0$. Then, the net expected utility to voting, following (3), evaluated the day before the election is

$$
\beta_i \delta_i^1 (1 - c_i) + \sum_{t=2}^{\infty} [\beta_i \delta_i^t]
$$

$$
= \ \beta_i \delta_i + \sum_{t=2}^{\infty} [\beta_i \delta_i^t] - \beta_i \delta_i c_i
$$

$$
= \ \sum_{t=1}^{\infty} [\beta_i \delta_i^t] - \beta_i \delta_i c_i
$$

$$
= \ \frac{\beta_i}{1 - \delta_i} - \beta_i \delta_i c_i. \tag{A1}
$$

(The net utility to abstaining evaluated at any point in time, by assumption, is zero.) The net utility to voting on the day of the election with this normalization of utility – i.e. when β_i is removed from the election day costs and benefits – is

$$
\delta_i^0 (1 - c_i) + \sum_{t=1}^{\infty} [\beta_i \delta_i^t]
$$

$$
= \ 1 - c_i + \frac{\beta_i}{1 - \delta_i}. \tag{A2}
$$

The citizen is an Intended Voter when two conditions hold. First, prior to the election their evaluation of the net utility to voting exceeds the net utility to abstaining. Second, on the day of the election their evaluation of the net utility to voting is less than the net utility to abstaining. This first condition holds when, from (A1),

$$
\frac{\beta_i}{1 - \delta_i} - \beta_i \delta_i c_i \ > \ 0
$$

$$
\frac{\beta_i}{1 - \delta_i} \ > \ \beta_i \delta_i c_i
$$

$$
\frac{1}{\delta_i (1 - \delta_i)} \ > \ c_i. \tag{A3}
$$

The second condition holds when, from (A2),

$$
\begin{aligned}
0 &> 1 - c_i + \frac{\beta_i}{1 - \delta_i} \\
c_i &> \frac{1 - \delta_i}{1 - \delta_i} + \frac{\beta_i}{1 - \delta_i} \\
c_i &> \frac{1 + \beta_i - \delta_i}{1 - \delta_i}.
\end{aligned}
\tag{A4}
$$

Thus, Intended Voters are citizens with present bias, discount factor, and cost parameters such that

$$
\frac{1}{\delta_i(1 - \delta_i)} > c_i > \frac{1 + \beta_i - \delta_i}{1 - \delta_i}.
\tag{A5}
$$

B   Other tables and figures

Table A1 reproduces the specifications of Table 2 for self-reported turnout.

Table A1: Present bias, self-reported turnout in 2014 general, and civic duty as commitment device

VARIABLES	(1) Self-report	(2) Self-report	(3) Self-report	(4) Self-report
Present biased (1=yes,0=no)	-0.095**	-0.019	-0.13**	-0.051
	(0.03)	(0.02)	(0.03)	(0.03)
Present biased * Voting a duty			0.12*	0.079
			(0.05)	(0.05)
Believes voting mainly a duty not choice			0.21**	0.14**
			(0.02)	(0.02)
Constant	0.69**	0.041	0.59**	0.0063
	(0.01)	(0.07)	(0.02)	(0.07)
Observations	2,004	2,004	2,004	2,004
R-squared	0.007	0.215	0.069	0.241
Demographic controls	No	Yes	No	Yes

Standard errors in parentheses
** $p < 0.01$, * $p < 0.05$

Note: Dependent variable in each column is self-reported general 2014 turnout, 1=yes 0=no. SES and demographic controls are indicators for age in decades, for each category of education, and for each category of family income.