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Corey Lang
*University of Rhode Island*, clang@uri.edu

Shanna Pearson-Merkowitz

Zachary Scott



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# Voter support for bond referenda: Does it matter if costs are presented as aggregate vs. personal costs?

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# Voter support for bond referenda: Does it matter if costs are presented as aggregate vs. personal costs?

Corey Lang
University of Rhode Island

Shanna Pearson-Merkowitz
University of Maryland

Zachary Scott
Washington DC Metropolitan Police Department

**Abstract**: We explore whether voters' willingness to approve government spending is affected by how costs are presented. Using an original survey experiment, we examine willingness to approve bonds, randomizing both the total cost of the bond and the framing of the cost as either a personal cost or an aggregate amount. We find that respondents are less supportive of bonds when it is framed as a personal expense and that respondents are more cost responsive when they see personal costs. There is also substantial heterogeneity based on the respondent's partisanship and the policy domain of the bond.

Keywords: referendum, bonds, framing, taxation

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## Introduction

On November 6, 2018, voters in Winston-Salem, North Carolina went to the polls and were met with a lengthy ballot. In addition to 26 different races for political office, voters were consulted on a series of questions including $43,700,000 in bonds to fund the maintenance of streets and sidewalks, $31,000,000 in bonds to fund the maintenance of parks and recreational facilities, $11,700,000 in bonds to fund the construction and maintenance of affordable housing, $21,100,000 in bonds to fund public safety facilities, and $14,500,000 in bonds for economic development. In total, voters were asked to approve or reject $122 million in bonds for projects in a city with a population of about 250,000 (97,869 households).[1] The voters approved them all.[2]

At the end of each of these bond referenda, there was a short disclaimer that informed voters of the personal cost of these expenditures. It read that, as a consequence of approving the bond, "…additional taxes may be leveled in an amount sufficient to pay the principal and interest on the bonds." Had these same bonds been up for a vote in the similarly sized Madison, Wisconsin, no such wording would have appeared. In contrast, had these same bonds appeared on the ballot in Reno, Nevada, because of a state law, the wording would have included an estimate of the increase in property taxes on a home with an assessed value of $100,000 if the bond passed.[3]

Voters across the country are frequently asked, directly, to make significant decisions on the allocation of sizable sums of public funds. However, states and municipalities have the ability to alter how much information voters receive about the relationship between the bond amount and their tax bill. The purpose of this paper is to assess whether that cost communication matters for approval.

Prior studies that focus on school bonds suggest that we should observe a meaningful change in voters support when costs are communicated in individual terms (Brunner, Robbins, & Simonsen, 2018, 2021). Emphasizing that approving the bond will result in an increase in one's taxes (a personal cost) as opposed to just stating the total amount of the bond (the aggregate cost), scholars argue, causes a decline in support as the word "tax" is unpopular (Hardisty,

[1] https://www.forsyth.cc/Elections/assets/documents/2018_gen.pdf
[2] https://er.ncsbe.gov/?election_dt=11/06/2018&county_id=34&office=REF&contest=0
[3] NRS 350.024: https://www.leg.state.nv.us/nrs/nrs-350.html

Johnson, & Weber, 2010; McCaffrey & Baron, 2006). While the existing literature utilizes experimental designs to provide good causal support, such studies have often been localized to the policy domain of schools and so have not considered if the results are broadly generalizable to a host of other issues on which voters are regularly consulted.

Perhaps more importantly, these studies do not consider how this informational framing interacts with the cost of the bond. Framing costs as personal expenses tends to invoke "sticker shock" (Citrin, 1979) against even popular policies relative to having no information about the cost of policies. Given the innumeracy of the American public (Conover et al., 1986; Lawrence & Sides, 2014; Wong, 2007), aggregate bond amounts may be closer to no information than to personal costs.

Given the debate both in state policies, as well as the work on this subject to date, we seek to address several related research questions: First, is voter approval meaningfully impacted by the decision to express costs on the ballot as in individual terms or as aggregate amounts? And second, does the effect of cost presentation vary with the amount of the bond? We have three hypotheses addressing these research questions. We posit that 1) bonds will have higher approval rates when the cost is framed in aggregate terms and 2) when the amount of the bond is smaller. We further hypothesize an interactive effect: 3) voters will be more cost-responsive when they are given information about personal costs.

We test these hypotheses via a pre-registered[4] survey experiment administered to a sample of 2309 respondents recruited from users registered with the crowd-sourced data collection platform Prolific. We find support for all three hypotheses. Increasing the cost of a bond causes lower support for the bond. Framing the cost of a bond in individual terms causes lower support for the bond than framing the cost as an aggregate amount. And respondents shown costs in individual terms will be more cost-responsiveness than respondents shown costs as aggregate amounts.

We also conducted a series of exploratory analyses examining heterogeneous effects. Republicans given the personal cost frame are more cost-responsive than Democrats. We also find that the effects vary based on the project the bond will fund. Across all three policies we tested, framing the costs as a personal expense reduced support relative to framing the cost in

aggregate terms, but the relationship between cost and framing was strongest when the bond involved affordable housing or streets and sidewalks, and much less so for land preservation.

**Cost Framing in Bond Referenda**

Across the United States, voters are frequently asked to directly weigh in on their state and local governments' spending policies and priorities through ballot questions. The questions put before them are often technical in nature and involve amounts of money beyond what most people can readily conceptualize. This may be problematic as most people are uninformed on such specifics of government operations (Delli Carpini & Keeter, 1996; Gilens, 2001; Lang et al. 2022). This lack of accurate information may be particularly pronounced when it comes to estimating both the magnitude of tax burdens as well as the benefits reaped from public spending, a phenomenon known as "fiscal illusion" (Heyndels & Smolders, 1995; Pommerhne & Schneider, 1978; Shi & Tao, 2018; Wildowicz-Giegiel & Kargol-Wasiluk, 2020).

It is possible for politicians to serve as the bridge between voters' true preferences and the policymaking process. Politicians are incentivized to know what voters want, even if the voters themselves struggle to identify or articulate their interests and are vested with the power to deliver policies that satisfy those true preferences. But such a middleman cannot work when voters are consulted directly. Given that most people seem to have considerable difficulty in understanding even the fundamental scale of taxation and spending, how do voters go about making decisions when asked how much their community should spend to renovate a park or to preserve a historic site? To build affordable housing? To maintain roads or bike lanes? When confronted directly with questions about if they support raising money, as voters are routinely asked to do, how do voters decide?

While some have looked broadly at preferences for government spending (Simonsen & Robbins, 2000), the predominant, but nascent, literature on bond referenda concentrates primarily on spending on public schools. It suggests that several factors come into play in voter decision making. Perhaps most obviously, the total cost of the bond is correlated with the likelihood of passage (Bowers, Metzger, & Militello, 2010a, 2010b; Holt, 1984; Kastory & Harrington, 1996).[5] Individuals may have an upper limit on how much they are willing to spend

[5] Additional factors include what the school bond will finance (Beckham & Maiden, 2003; Bowers & Chen, 2015; Bowers & Lee, 2013; Zimmer et al., 2011), when the election occurs (Bowers, Metzger, & Militello 2010a), voter

to fund their schools and their inclination to support bonds wanes once the cost surpasses that limit.

The mechanism behind such a finding is a robust principle of economics: an increasing price reduces the demand. Furthermore, the economics literature has applied this principle to outcomes of real-world referenda to understand voters' preferences for public goods. How referendum cost is handled varies across studies. Some articles simply do not include a cost measure in their model of voter choice (Altonji, Lang, & Puggioni, 2016; Holian & Kahn, 2015; Wu & Cutter, 2011), which is problematic because cost is correlated with socioeconomic characteristics that are included. Others make comparisons across jurisdictions and assess how aggregate support varies with the funding vehicle (e.g., property tax, bonds) and the amount of revenue to be raised (Banzhaf, Oates, & Sanchirico, 2010; Kotchen & Powers, 2006). As these authors note, interpretation of cost is difficult in these specifications because increasing cost also implies increasing public goods. In contrast, Burkhardt & Chan (2017), Anderson, Marinescu, & Shor (2023), and Lang & Pearson-Merkowitz (2022) study statewide referenda and examine how spatial variation in estimated household cost correlates with support. These studies tend to find a negative relationship between cost and approval, which is consistent with expectations. However, results depend on the assumption that voters understand personal cost; if this assumption fails, then estimates of cost responsiveness will be biased (Lang et al. 2022). Thus, our first hypothesis takes this principle of economic theory and tests whether voters are capable of putting cost-responsiveness into practice when evaluating costs on the ballot. Thus, we offer our first hypothesis:

*Hypothesis 1: Support for bonds will decrease as the aggregate amount of the bond increases.*

Evidence suggests that how policies are presented can have a significant effect on how people evaluate the policy. Specifically, experimental studies show that mentions of the word "tax" reduce support for policies, even when compared to substantively equivalent information that uses more technical or otherwise different language (Dineen, Robbins, & Simonsen, 2017; Hardisty, Johnson, & Weber, 2010; McCaffrey & Baron, 2006; Sussman & Olivola, 2011). This

turnout (Bowers, Metzger, & Militello 2010a), the presence of a "fiscal stress" label applied to the school district (Thompson & Whitley, 2017), and how often the school bond question has come before voters (Bowers & Lee, 2013; Bowers, Metzger, & Militello 2010b; Ehrenberg et al., 2004).

is pertinent given differences across states in how bonds are presented to voters. All states require that any bond ballot question include the total dollar amount of the bond.[6] Yet some states, like North Carolina, require that the bond mention that taxes may be raised as a consequence of approval. And a handful of states, like Indiana and Missouri, further require that the ballot question include an estimate of the average rate change in taxes necessary to finance the bond. Nevada goes the furthest, requiring the inclusion of the property tax increase on a home with an assessed value of $100,000 in the question wording if there is expected to be a tax increase as a result of the bond passing. If no tax increase is expected, the bond is required to state that "passage of this question is not expected to result in an increase in the existing property tax rate…"[7] However, no research to date clarifies if such detailed presentation matters to voter's willingness to support a bond.

Scholarship on ballot order (Augenblick & Nicholson, 2016; Kimball & Kropf, 2005; Matsusaka, 2016; Bechard, Lang, & Pearson-Merkowitz, 2023), survey methodology (Hyman & Sheatsley, 1950; Sudman, Bradburn, & Schwarz, 1996; Tourangeau, Rips, & Rasinski, 2000), and framing effects (Chong & Druckman, 2007a, 2007b; Druckman, 2001; Entman, 1993) provides ample reason for suspicion that the way bond referendum questions are posed can affect the answers voters give. In short, how information is presented can call particular attributes to mind, affecting how evaluations are made (Nelson & Oxley, 1999). In a particularly famous example, attitudes toward allowing the Ku Klux Klan to hold a rally varied dramatically depending on whether free speech or public safety was mentioned as a concern (Nelson, Clawson, & Oxley, 1997). If states' rules on referendum wording, namely posing bond questions in terms of personal tax increases (as opposed to aggregate amounts), makes different attributes salient, then it is likely that this will affect how voters decide.

How might personal or aggregate cost frames affect voters' evaluations? Costs that mention tax increases as a financing mechanism will likely decrease support as direct taxes (as

[6] In many cases, bonds will not increase a state's budget. As a result, not all bond approvals have a corresponding increase in taxes. For example, reduced expenditures in one area may be moved to paying off a bond. In other cases, paying off older bonds frees up money to take on new debt. In these cases, the passage of a new bond has no effect on one's tax bill. If there is reduced spending in one area, taxes could go *down* (as is the case with some local towns that tie each year's tax bill to expenditures). Overall, in most states and many local governments there is no relationship between one year's expenditures and the tax bill in the case of surplus revenue.

[7] https://tax.nv.gov/uploadedFiles/taxnvgov/Content/Boards/Committee_on_Local_Govt_Finance/BallotLanguageTemplates.pdf

opposed to taxes hidden in price increases) tend to be unpopular (Ferrari & Randisi, 2013; Kirchler, 2007) and so raising the salience of this attribute invokes tax-label aversion (Gamage & Shanske, 2011; Hill, 2010; McCaffrey & Baron, 2004). In contrast, recent research suggests that voters are fairly unresponsive to aggregate bond prices, with other ballot attributes like the number of bonds on the ballot, the bond order, and the issue the bond funds having a larger effect on voters' support (Bechard, Lang, & Pearson-Merkowitz, 2023). Collectively, this suggests that bond questions framed as personal tax increases should engender less support than bond questions posed as aggregate dollar amounts (Brunner, Robbins, & Simonsen, 2018, 2021) and that this effect may vary depending on the project type the bond funds (e.g. Pearson-Merkowitz & Lang 2020; Bechard, Lang, & Pearson-Merkowitz, 2023).

However, bonds and their tax consequences are more complicated. Bonds are often quite popular because they fund specific projects, enabling voters to connect the expense to concrete outcomes that they may support. They are not tax increases with unclear benefits. For example, voters who desire investment in public schools may have less concerns about voting for a tax increase that is explicitly tied to school construction than for a tax increase associated with the general budget. Bonds, even when they are worded in a complex nature, are still tied to specific spending so voters have a clear sense of if they support the project or not and if they are willing to pay for the project, which is not true of general tax increases. Take for example, the real ballots presented in Figure 1. In each of these, while they are aggregate presentations, the voter knows exactly what the bond will fund, which is very different from a general tax increase.

[Figure 1 Here]

Another complication for applying general economic theory to understanding voters' willingness to support is that while bonds may appear large in their aggregate presentation, when translated to a personal cost, they may or may not appear to be a large dollar amount. For example, in the case of the Rhode Island bond presented in Figure 1, $50 million in bond financing is roughly $50-100 per person in Rhode Island over the course of the life of the bond (depending on the interest rate and the rate at which the bond is repaid). If, for example, the bond takes 10 years to pay back, this would be between $5 and $10 per person, per year. This may not appear to be much to some voters, although to voters who struggle to meet their basic needs, it may be quite large. Add in the individual's likely benefit from an infrastructure investment, and the impact of dollar amount presentation on voters' willingness to support is even less clear.

What this suggests is a push-and-pull in expectations predicated on differing assumptions on voters' rationality. Voters might be discerning, evaluating the merits of what the bond will finance and converting aggregate costs into personal amounts (or vice versa) before making a decision. Or voters might be more reactive to how the question is presented. As a result, while we hypothesize that the latter is the case, we acknowledge that the question of how framing costs as personal tax increases or as aggregate amounts in bond wording affects voters remains unanswered.

*Hypothesis 2: Support for bonds will be higher when costs are framed as aggregate amounts than when costs are framed with an individual tax impact.*

Finally, we consider how the framing of ballot questions might interact with the bond cost. Prior literature suggests that informing people about the cost of a policy affects approval of the policy, but that this effect is conditional on the cost itself. Voters display "sticker shock" when confronted with the cost of policies they otherwise like when they see personal tax increases (Citrin, 1979; Sears & Citrin, 1982), so long as the cost is high. When the cost of a policy (again in terms of personal tax increases) is low, voters told of the cost may actually be *more* likely to approve of the policy than those not informed of the cost (Arrington & Jordan, 1982; Robbins, Simonsen, & Feldman, 2004). In such cases, voters evaluate the personal cost as reasonable for the services they receive (Simonsen & Robbins, 2003). In short, people struggle to be cost-responsive in the absence of direct information about the actual cost they will incur.

Is information about the aggregate amount of a bond more akin to information about a personal cost or more similar to telling people no information at all about costs? We suspect that it is closer to the latter. To illustrate why, consider the contextual information a person needs and the calculations they must perform in order to process what an aggregate cost means to them. First, they must know how many households are in the state (or county/municipality depending on the geographic until holding the election). That information is not necessarily common knowledge, and the public is notoriously bad at estimating large numbers (Conover et al., 1986; Lawrence & Sides, 2014; Nadeua, Niemi, & Levine, 1993; Wong, 2007). Second, they need to be able to do the math. If they have been provided the aggregate amount and can accurately estimate the number of households, this should be a simple matter of division. And yet, evidence

concerning financial innumeracy suggests that people perform poorly when asked to do even simple calculations (Chen & Rao, 2007).

Put together, what this suggests is that respondents will struggle to ascertain the real, practical difference between a bond of $100 million and a bond of $1 billion. We suspect that if people lack knowledge about the size of the population (or population that pays taxes) and are not used to performing the arithmetic necessary to translate the large number to an individual likely cost, they may basically ignore the cost of the bond and instead vote only on the substance of what the bond will pay for or on a gut reaction to government spending.

This leads us to expect that cost-responsiveness will be stronger among those who see costs framed as personal amounts than among those who see costs framed as an aggregate amount as the latter group will be unable to make direct sense of the amount or to translate it into a more accessible numerical equivalent. Formally stated, our final hypothesis is:
*Hypothesis 3: Respondents shown costs as personal tax equivalents will be more cost-responsive than respondents shown costs as aggregate amounts*.

In addition to these three formal hypotheses, we also consider a pair of exploratory research questions, both of which deal with potential heterogeneity among our hypothesized statistical relationships. First, we think it is possible that the effect of framing on cost-responsiveness will vary according to the respondent's partisanship. Republicans are, on average, more adverse to taxes, which could plausibly lead Republicans to be particularly affected by increasing costs framed on a per-person or household amount.
*Exploratory hypothesis 1: The individual vs. aggregate frame will be conditional on respondents' partisanship.*

Second, some polices are more popular than others, which may carry over into a willingness to bear personal costs to support particular programs. As such, it is possible that the hypothesized interactive effect between bond cost and cost frame is itself conditional on the subject of the bond.
*Exploratory hypothesis 2: The effect of cost frame on cost responsiveness will be conditional on the bond question.*

**Data and Methods**

To test these hypotheses, we conducted an online survey experiment. The design was pre-registered with OSF (link removed for blind review). We recruited a sample of 2309 survey respondents with Prolific.[8] Surveys were limited to respondents over the age of 18 and those residing in a set of pre-selected states: Alabama, Arkansas, California, Maine, Montana, New Jersey, New Mexico, New York, Oklahoma, Oregon, Texas, and Washington. We chose these states because they all hold bond referendum elections and because they provide a mix of regions, partisanship, and population size. We were largely successful at recruiting a sample balanced on partisanship, although the sample is unrepresentative of the US population in several other respects, most notably race, education, and age.[9] Due to randomization, we are not concerned about this impacting inference.

Having agreed to take part in the survey, respondents were first provided with a short description of bonds. This description read:

> "State and local (town, city, county, etc.) governments issue bonds to pay for large, expensive infrastructure or investment projects related to schools, roads, land conservation, recreation, and mass transit.
>
> In [Respondent's state], as in many states, voters must approve a bond referendum in an election for a government to be able to issue bonds.
>
> "In this section, we would like to know how you would vote on a few bond proposals if they were on your ballot."

Each respondent was shown two hypothetical bond referenda and asked how they would vote if given the chance to do so. For all respondents, the first bond was called the "Land Preservation Fund." The subject of the second bond question was randomly assigned to either the

[8] Respondents were paid $1-3 for completion of the survey. Rates varied according to the number of eligible respondents per state. All rates were well in excess of hourly minimum wage based on average survey completion time. Prolific is a crowd-sourced data collection platform similar to Amazon's Mechanical Turk. We choose Prolific because the platform allows greater filtering of respondents by characteristics such as state residency and partisan affiliation, which were necessary for our research design. Furthermore, respondents on Prolific tend to be more attentive and provide higher quality data than competitor platforms (Peer et al., 2022).
[9] Descriptive statistics are available in Appendix Table 1.

"Affordable Housing Fund" or the "Streets and Sidewalks Fund." The exact wording for the Land Preservation Fund is presented in Table 1, with the wording for the other two bonds in Appendix Table 3. Other than the title and subject, the second bond question mirrored the Land Preservation Fund question identically.[10] We choose the issues of land preservation, affordable housing, and streets and sidewalks because voters are commonly asked to vote on bonds for all three, as the examples from Winston-Salem, NC at the beginning of this paper exemplify. This helps the external validity of our research design. Furthermore, existing literature on voters' behavior on bond questions is almost exclusively related to k-12 education bonds, so studying three different subjects allows us to simultaneously branch out to new substantive domains while also examining if voters exhibit different behavior across issue areas. We assigned respondents to always see the land preservation bond first because we needed a sufficient sample size on just one topic to perform a confirmatory hypothesis test. We also wanted to ensure that the results for one bond question were free of bias from survey question order and we answered by a sufficiently large number of respondents.

[Table 1 Here]

In addition to the randomization of the subject of the second bond, there were two other randomizations. First, respondents were randomly assigned to see the cost of the bond framed in either personal or aggregate terms. For respondents assigned to the personal cost frame condition, the cost of approving the bond was expressed as a household tax increase to be spread over 10 years. For respondents assigned to the aggregate cost frame condition, the cost was instead expressed as an aggregate dollar amount. This random assignment between personal and aggregate costs, constitutes the independent variable to test H2.

The final randomization is the cost of the bond. We started by identifying a range of values to use as personal tax amounts (to be spread over 10 years): $20, $50, $100, $200, $500, $1000, or $2000. We then multiplied each of the seven personal cost amounts by the number of households in each of the states. The resulting numbers are unrealistically precise, and so we rounded the values to more realistic whole amounts, for example rounding $231,614,200 to $230

[10] For a separate experiment conducted on the same survey, the level of government sponsoring the bond was randomly varied as either the respondent's state government or the respondent's local government. All respondents assigned to the local government condition saw costs expressed only as an individual tax increase. To ensure consistency, all respondents assigned to the local government treatment group are omitted from the analysis of results.

million.[11] It is highly unlikely that these aggregate amounts would actually be true equivalents for the associated personal costs for several reasons: costs may not be dispersed among everyone in a state's population, some or all of the cost may be accounted for by means other than raising new revenue (such as the phasing out of older bonds), and the cost will vary based on unaccounted factors like interest rates. Ultimately, we are not interested in generating true equivalencies for personal and aggregate costs. We are only interested in generating amounts that voters, practicing naïve assumptions,[12] would realistically think are equivalent. To that end, we think this simplistic arithmetic approach is most appropriate.

Table 2 assesses the balance of respondent characteristics across the primary randomization between aggregate and personal cost. It is important to verify that the randomization worked to ensure confidence in the internal validity of our results. We find that the two sample populations are very similar across income, education, age, partisanship, homeownership, race/ethnicity, and state of residence. In Appendix Table 8, we additionally use regression methods to confirm covariate balance across the primary randomization, as well as confirming balance across cost levels.

[Table 2 Here]

Each respondent expressed their support for two bond proposals. Respondents then answered a series of political attitude questions as well as standard demographic questions.

*Analysis*

To test H1 and H2, we estimate the following linear probability model:

(1) $Approve_i = \alpha + \beta_1 Cost_i + \beta_2 Aggregate_i + \boldsymbol{T}_i\boldsymbol{\gamma} + \boldsymbol{X}_i\boldsymbol{\delta} + \varepsilon_i$

where $Approve_i$ is a binary variable equal to 1 if individual $i$ voted to approve the referendum, and zero otherwise. $Cost_i$ is the household cost of the bond shown to individual $i$ or household equivalent cost if the respondent is presented with costs in aggregate terms. $Aggregate_i$ is a

[11] These "exact" and "presented" aggregate amounts are available in Appendix Table 2. Due to a coding error in the programming of the survey, the lowest aggregate cost values are closer to equivalent to a $10 tax increase over 10 years rather than a $20 tax increase over 10 years. We treat this lowest aggregate amount as equivalent to $10, although the results remain consistent when treated as equivalent to $20. We also replicate the results omitting all respondents assigned to the lowest cost value (in either individual or aggregate terms) to simply remove the error entirely. The results are consistent between the two specifications. The omitted respondent models are presented in Appendix Table 5.

[12] We did consult a local interest group that regularly posts public reports on the cost of bond questions on the ballot to local taxpayers and this was the equivalency they use in their reports, but backwards (e.g. the cost of the bond/number of households).

binary variable equal to 1 if individual $i$ was shown the cost of the bond in aggregate terms. $\boldsymbol{T}_i$ is a set of binary variables for the type of bond being voted on because some topics are inherently more popular than others. Lastly, $\boldsymbol{X}_i$ is a vector of respondent characteristics including partisanship,[13] homeownership status, race and ethnicity, age, income, education, and sex, which have previously been shown to affect voters' support on ballot referenda (Altonji, Lang, & Puggioni, 2016; Holian & Kahn, 2015; Prendergast, Pearson-Merkowitz, & Lang, 2019). We expect $\beta_1 < 0$ and $\beta_2 > 0$, which if true, would support H1 and H2, respectively.

To test H3, we estimate the following regression model, which adds an interaction term between $Cost_i$ and $Aggregate_i$ to Equation (1):

(2) $Approve_i = \alpha + \beta_1 Cost_i + \beta_2 Aggregate_i + \beta_3 Cost_i * Aggregate_i + \boldsymbol{T}_i\boldsymbol{\gamma} + \boldsymbol{X}_i\boldsymbol{\delta} + \varepsilon_i$

In this model, we expect $\beta_3 > 0$ and $|\beta_3| < |\beta_1|$, which if true will support H3.[14]

Our primary analysis pools responses to both bond referenda shown to each respondent so that each respondent appears in our data twice: once for the Land Preservation Fund bond and again for either the Affordable Housing Fund bond or Streets and Sidewalks Fund bond. This gives us a final sample size of 3078. To account for this non-independence between observations, we cluster standard errors at the respondent level.

**Results**

We begin our analysis by plotting the average approval as a function of the cost of the bond (Figure 2A) and then the same figure but with personal versus aggregate cost presented separately (Figure 2B). These figures provide us with an initial, exploratory look at the data. In Figure 2A, the trajectory of the line suggests support for our first hypothesis: Support is very high at the lower cost amounts but declines rapidly after the personalized amount of the bond passes $100. Interestingly, after passing $200, support continues to decline but not as steeply. This lends some support for H1, but the relationship between support and price is not linear.

Figure 2B disaggregates those who saw the bond amount framed as a personal cost from those who saw the amount framed as an aggregate cost. The figure provides suggestive evidence in support of H2 and H3. Except for the two lowest amounts, those who saw the bond framed as an aggregate cost are more supportive of the bond than those who saw the bond framed in

[13] Throughout the analysis, we treat "leaning partisans" as Independents.

[14] Replication models using logistic regression are available in Appendix Table 4. The results are consistent with linear probability models presented in the main text.

personal costs. Furthermore, the gap between the two tends to increase as the cost of the bond increases. In general, those who see bonds framed as personal tax increases exhibit cost responsiveness, becoming less supportive as the cost increases. This negative relationship between cost and average approval is consistent but steepest at the low range of the randomly assigned costs. In comparison, those who saw bond costs framed in aggregate terms appear largely unresponsive to cost.

[Figure 2 Here]

These initial presentations of the data are useful, but they can also be imprecise in terms of specific effect magnitudes and they do not condition on other determinants of approval. To address this, we run a series of regression analyses. Table 3 presents the main results. The first model tests H1 (increasing the randomly assigned cost of a bond causes a decrease in approval) and H2 (framing the costs in terms of aggregate amounts instead of personal tax burdens causes an increase in approval). Both results find strong support. On average, moving from a $50 tax increase to a $1000 tax increase (or aggregate cost equivalents) causes a 5.7-percentage-point decrease in willingness to support. Framing the costs as an aggregate amount increases support by 7 percentage points. Both effects are substantively large in addition to statistically significant at conventional levels.

[Table 3 Here]

The second model in Table 3 introduces an interaction effect between cost and aggregate cost treatment assignment. This interaction effect is used to test H3 (framing costs as a personal tax increase causes greater cost-responsiveness). The size and magnitude of the interaction effect suggests that this is indeed the case. In fact, as the coefficients for cost and for the interaction effect are in opposite directions but of similar magnitude, it suggests that the negative effect of increasing bond amounts on the likelihood of support is borne almost entirely by those who saw the cost as a personal tax increase. Those who saw the cost as an aggregate dollar amount do not appear cost responsive at all, which mirrors the descriptive results from Figure 2B. To visualize this, Figure 3 plots the predicted approval using the Column 4 results.

[Figure 3 Here]

The results suggest that respondents' approval is unaffected by the total cost of a bond, whether it's $20 million or $4 billion. But an average tax increase of $500 over 10 years (or $50 a year) elicits a steep response. H3 therefore finds strong support; however, we note that while

the response is steep, the predicted probability line does not cross the threshold that would fail the bond (50%) in most elections until the outer bounds of our analysis and a very high personalized cost.

To situate these results in context, we used the coefficients from Table 3, Model 4 to estimate at what cost we would predict a bond referendum to fail (i.e., at what personal cost (or aggregate amount equivalent) would we expect to drop below 50% support among our survey respondents). Given the varied popularity of the bonds we examined, we generated these predictions separately for land preservation, affordable housing, and streets and sidewalks bonds. All other variables were held constant at the respondent's observed values. In other words, we use the coefficients from Table 3, Model 4 to estimate the probability that each respondent would approve of a bond, framed as a personal cost, with variable costs until the average probability of approval falls below a 50% majority. The costs that generate an average sub-majoritarian approval rate are presented in Table 4. We find that the cost threshold for generating sub-majoritarian support is a personal tax increase of $2,792 (Land Preservation), $2,126 (Affordable Housing), and $2,007 (Streets and Sidewalks) spread over 10 years. Comparatively, framing costs as aggregate amounts generates no cost responsiveness (and, in fact, the slope is slightly positive), and so there is no equivalent threshold amount.

[Table 4 Here]

As a final point, we note several relationships between bond approval and our control variables in Table 3. Democrats and Independents both appear more supportive of bond referenda than Republicans, with Democrats by far the most supportive. Support for bond referenda decreases with age. An 80-year-old respondent is 4-percentage-points less likely to approve of a bond than a 40-year-old respondent, on average. Homeowners also have lower support by about four percentage points, which is a consistent sign with prior literature but a smaller magnitude. Finally, there are big differences in average approval ratings, in the range of 8.9 to 10.6 percentage points, depending on the subject of the bond. Respondents are more likely to support land preservation bonds than either affordable housing or streets and sidewalks bonds, on average. Notably, our research design always posed the land preservation bond first. As such, it is possible that this difference stems from the order of the questions rather than the subject matter. Future studies should expand on our design by randomizing the order of all bonds to identify if there are real differences in cost responsiveness across bond issues.

That the slope of cost is slightly positive among those who see costs as aggregate amounts may raise questions about the precise mechanisms at work. We suggested that aggregate cost frames would elicit less cost responsiveness because it simply asks too much of respondents to do the math to convert an aggregate number into the personal cost equivalent. But perhaps it is not a mathematical issue at work but rather that an aggregate cost frame does not lend itself to viewing bonds as products to buy. After all, a larger aggregate amount may be interpreted as procuring more public goods rather than more money for the same quantity of public goods. This would indicate that larger aggregate bond costs remain broadly popular because voters want more spending rather than because of widespread innumeracy.

We investigate this puzzle further with an exploratory analysis that examines the relationship between bond approval and aggregate bond amounts (as actually presented to respondents, not as converted to personal cost frame equivalents) isolated to only those assigned to the aggregate cost frame.[15] A core assumption of the innumeracy argument is that respondents would struggle to convert an aggregate quantity to a per-household equivalent. If this is the case, then we should see that aggregate cost is negatively related to bond approval. This would suggest that respondents do perceive a difference between $2 billion and $26 billion, but this perceived difference is irrationally informed by a failure to comprehend that the population of California is simply 13 times larger than that of Arkansas. In contrast, if the slope is flat or positive, that would provide suggestive evidence that aggregate cost frames simply call to mind that the money is to be spent on highly valued public goods.

Table 5 presents the results. The first model serves as a baseline, while subsequent models introduce respondent-level controls and state fixed effects. The results are consistent across all models: higher aggregate bond costs do indeed lower support for bonds. That we do observe cost responsiveness among those who see bonds as aggregate amounts, but only when we model the randomly assigned cost as it was actually shown to respondents rather than as the per-household equivalent, suggests that this cost responsiveness is due to an irrational misestimation of what a cost means based on the population size of the respondent's state. This suggests that it is innumeracy that drives the differences between aggregate and personal cost frames.

[Table 5 Here]

[15] These models were not pre-registered.

*The Role of Party Identification and Specific Policy Issues in Cost Responsiveness*

We are additionally interested in two possible interactive relationships: We suspected that the effect of cost framing on cost responsiveness would be conditional on respondents' partisanship and the subject of the bond. Starting with the former, given Democrats' greater support for government spending (and Republicans' opposition toward raising taxes), we expected that Republicans would be more affected by increasing costs framed as personal tax increases than their Democratic counterparts. With regards to the latter, prior evidence suggests that voters are generally more supportive of land preservation ballot questions than affordable housing ballot questions (Pearson-Merkowitz & Lang, 2020) and so we expect that cost responsiveness will be lower for land preservation bonds than for affordable housing bonds. We have no *a priori* expectation regarding the Streets and Sidewalks Fund bond, however.

We estimate two regression models with different three-way interaction terms. Testing the first question required interacting respondent partisanship with the randomly assigned bond cost and the randomly assigned frame of the bond cost (aggregate v. personal costs). To test the second question, we instead interacted the policy topic of the bond (land preservation, affordable housing, or streets and sidewalks) with the cost of the bond. Because three-way interaction terms are frequently unintuitive, we rely on plotting the interaction effects and place the results of the models themselves in the supplemental appendix (Appendix Table 6 corresponds to Figure 4 and Appendix Table 7 corresponds to Figure 5).

Figure 4 presents the results of the three-way interaction between each respondent's party ID, assignment to the aggregate or personal cost frame, and the randomly assigned cost. We see a difference in the intercepts by partisanship. Democrats are inclined to be the most supportive of bond referenda, followed by Independents, followed by Republicans. All three categories of partisanship are unresponsive to increasing costs when they are framed as aggregate amounts; the interaction terms between both the Democratic and Independent partisan identity, cost, and assignment to the aggregate cost frame treatment are statistically insignificant, indicating no difference between either and Republican respondents. All three categories of partisanship are much more responsive to increasing personal costs. However, the degree of responsiveness is conditioned by partisanship: The slope of the effect of cost for both Democrats and Independents in the personal cost treatment group is about half the magnitude for Republicans. Telling respondents that their personal taxes will go up causes a decline in support for bond referenda,

regardless of partisanship, but this effect is more modest for Democrats and Independents than it is for Republicans. This is consistent with our exploratory expectations.

[Figure 4 Here]

Figure 5 presents the three-way interaction effects between bond subject, bond cost, and cost frame. For small costs framed personally, approval is similar for all three policies. Land preservation is the most popular, but the differences are 1.6 and 2.1 percentage points for affordable housing and streets and sidewalks, respectively, and all three are broadly approved. Regardless of the topic, higher costs framed in aggregate terms do little to dampen support. For all three, the magnitude of the interaction term between aggregate treatment assignment and cost is very similar to the magnitude of the cost coefficient but in opposite directions, meaning that the two cancel each other out. Similarly, higher costs framed as personal tax increases decrease support regardless of what the increase will pay for. But the slope of this effect varies across issue areas. Respondents appear more willing to tolerate tax increases when it is for land preservation than they are for affordable housing or streets and sidewalks. The coefficients for the effect of cost on bond approval among those assigned to see costs as personal tax increases are twice as large for the affordable housing and streets and sidewalks bonds than the land preservation bond. All of the coefficients are statistically significant, indicating that higher personal costs reduce support for the land preservation bond, but the decreases in support are *larger* for the other two issues areas. This supports our expectation that there would be greater cost responsiveness when the bond concerned affordable housing than land preservation and indicates that streets and sidewalks are more akin to the former in this regard.

[Figure 5 Here]

**Conclusion**

While governments are required to seek approval to issue bonds, they have options about how to present them to voters. Given how difficult it is to calculate an average tax impact, it is not surprising that most governments only present the amount of the bond and, often, how the money will be spent (e.g. $ amount per project). There is now a long literature on the effect of ballot wording and presentation on voter support (e.g., Augenblick & Nicholson, 2016; Kimball & Kropf, 2005; Matsusaka, 2016). In this paper we add to this understanding by investigating if decisions about presenting (or not presenting) tax implications to voters on bond ballots affects voter support for bonds. Drawing primarily on the literatures on tax aversion and sticker shock,

we hypothesized that voters are less likely to support a bond as the cost of the bond increases, that respondents are less likely to support a bond when the cost was presented in terms of personal tax increases, and that respondents are more cost-responsive when costs were expressed as personal tax increases. The results robustly supported all three of our hypotheses. Furthermore, exploratory analyses revealed significant heterogeneity across respondents' partisanship and across the policy issue of the bond.

Taken holistically, these results confirm concerns about the ability of citizens to reasonably evaluate spending when they are (routinely) asked to do so at the ballot box. In standard economic theory, as prices increase, demand should decrease, *ceteris paribus*. However, this relationship is more complex with voting for several reasons. First, *ceteris paribus* does not hold. An increase in price increases the goods and services provided, which may have a positive effect on support, meaning a price increase has an ambiguous effect (Banzhaf, Oates, & Sanchirico, 2010). It is possible that when presented with aggregate cost, voters see a large amount of money and think of all the good that will be done—new schools, new hospitals, better environment and cleaner streets. But when presented with a personal cost, voters focus on the personal cost and the other things they could buy with that money; even though the two options are functionally equivalent.

These results make multiple important contributions. First, we integrated theories on tax-label aversion with prior empirical demonstrations on how voters process the costs of programs to show how framing bond costs as either personal or aggregate amounts also interacts with other information that is simultaneously presented on any bond ballot question. Second, we situated the empirical tests of these hypotheses in an array of policy domains heretofore unexplored, an important contribution given that prior studies have focused primarily on the singular issue of school bonds. While the findings largely echo those from studies of school bonds, one need only look at how respondents in our land preservation bond, personal cost frame group were less cost-responsive than those who saw the same cost frame in our affordable housing bond or streets and sidewalks bond groups to see that heterogeneity across issues can and does exist. It should not be taken for granted that voters process all bond questions in a similar manner.

These results have implications for state and local political actors as well. They show that requirements for how bond questions must be worded can manifest large effects on vote choice. How this is interpreted normatively will likely depend on ideological preferences related to

government spending and taxes as well as the particular issue at hand within a specific community. For example, those interested in or in need of securing bond approval for programs and community and social investments where states require costs be expressed on the ballot as personal tax increases may want to note how cost responsiveness only appears to kick in at higher dollar amounts. Our results suggest that multiple, smaller bonds would likely be a more prudent course of action than a larger bond when personal costs are required to be on the ballot. Further, cost responsiveness will be lower in more ideologically liberal areas and on more valence issues. Thus, advocates for projects requiring bond financing should consider the demographics of the electorate and the ballot wording requirements when deciding if to pursue multiple small-dollar bond referenda or a large omnibus bond referendum.

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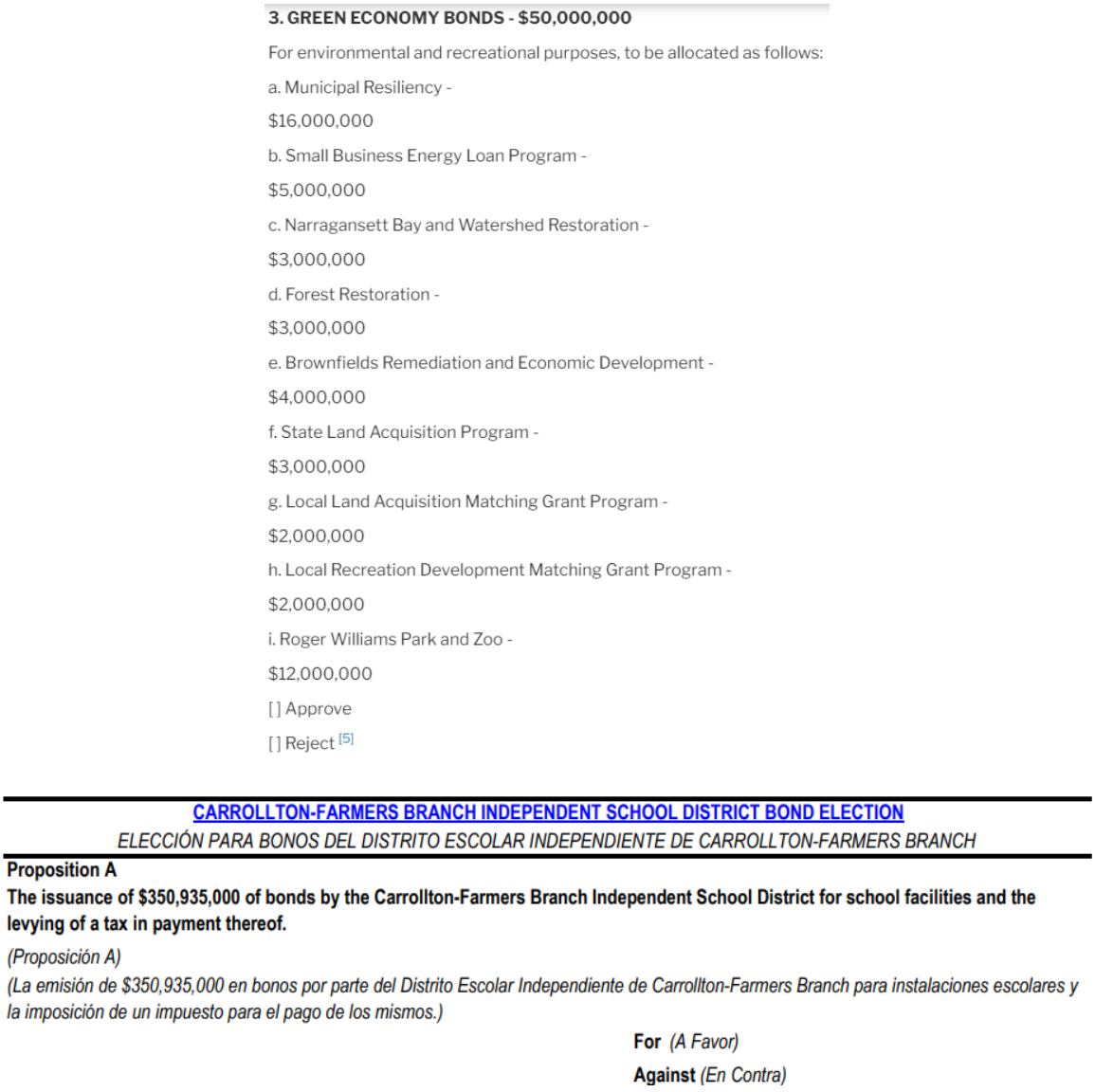
## Figures and Tables

### Figure 1: Example Bond Questions



**3. GREEN ECONOMY BONDS - $50,000,000**

For environmental and recreational purposes, to be allocated as follows:

a. Municipal Resiliency -

$16,000,000

b. Small Business Energy Loan Program -

$5,000,000

c. Narragansett Bay and Watershed Restoration -

$3,000,000

d. Forest Restoration -

$3,000,000

e. Brownfields Remediation and Economic Development -

$4,000,000

f. State Land Acquisition Program -

$3,000,000

g. Local Land Acquisition Matching Grant Program -

$2,000,000

h. Local Recreation Development Matching Grant Program -

$2,000,000

i. Roger Williams Park and Zoo -

$12,000,000

[ ] Approve

[ ] Reject [5]

---

**CARROLLTON-FARMERS BRANCH INDEPENDENT SCHOOL DISTRICT BOND ELECTION**

*ELECCIÓN PARA BONOS DEL DISTRITO ESCOLAR INDEPENDIENTE DE CARROLLTON-FARMERS BRANCH*

---

**Proposition A**

**The issuance of $350,935,000 of bonds by the Carrollton-Farmers Branch Independent School District for school facilities and the levying of a tax in payment thereof.**

*(Proposición A)*

*(La emisión de $350,935,000 en bonos por parte del Distrito Escolar Independiente de Carrollton-Farmers Branch para instalaciones escolares y la imposición de un impuesto para el pago de los mismos.)*

**For** *(A Favor)*

**Against** *(En Contra)*

*Notes: Example bond questions from Rhode Island Question 3, Environment and Recreation Bond Measure (2022) and Carrollton-Farmers Branch Independent School District, Texas, Proposition A, Bond Issue (2018)*

**Figure 2: Average Bond Approval as a Function of Bond Amount and Bond Cost Frame**

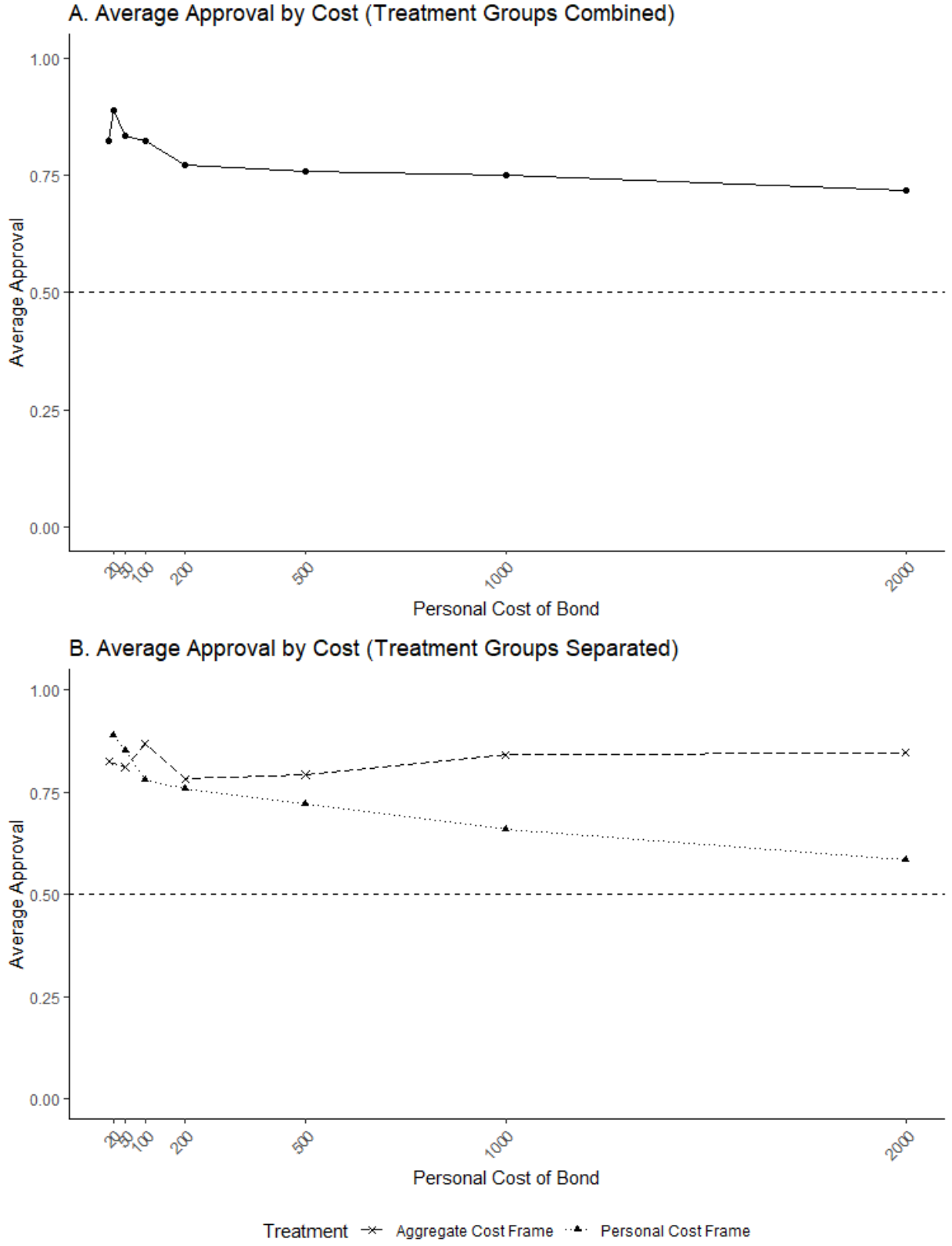
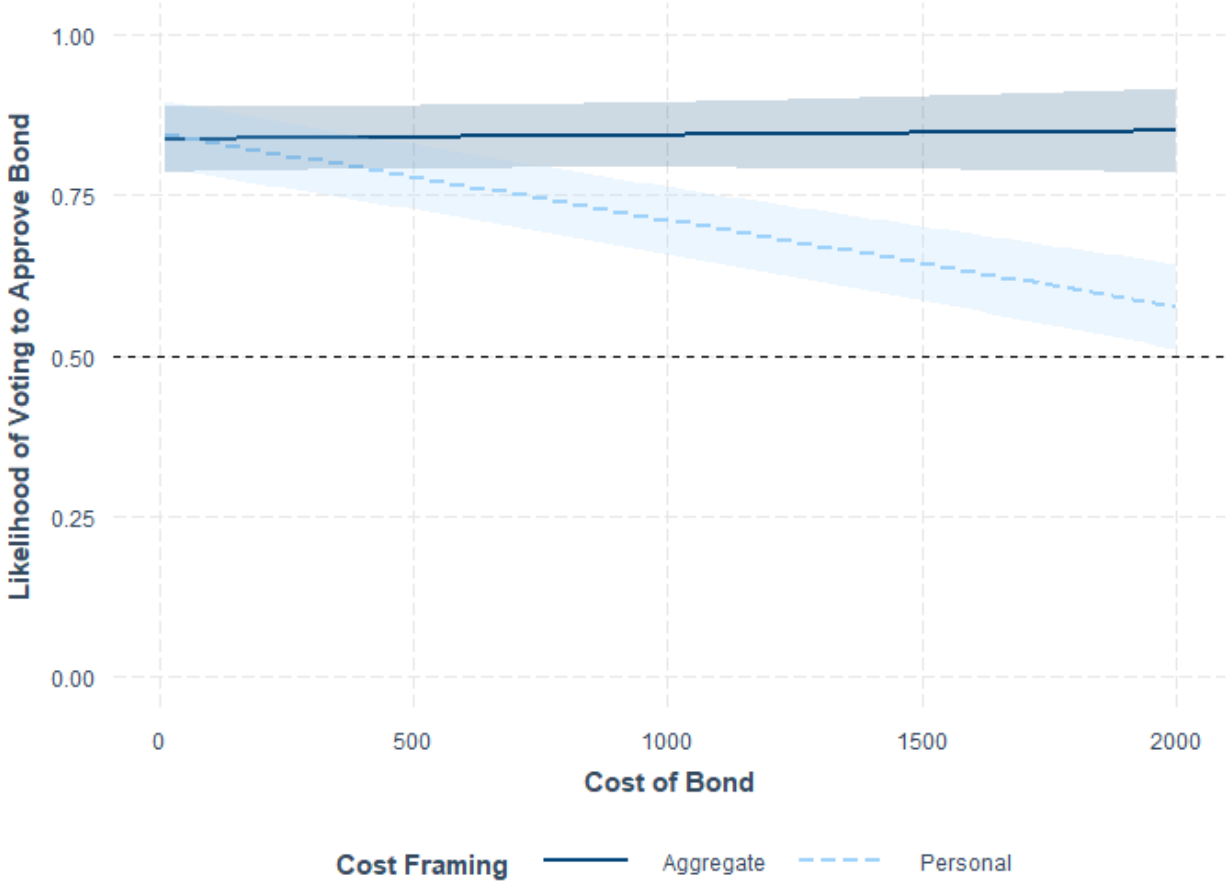
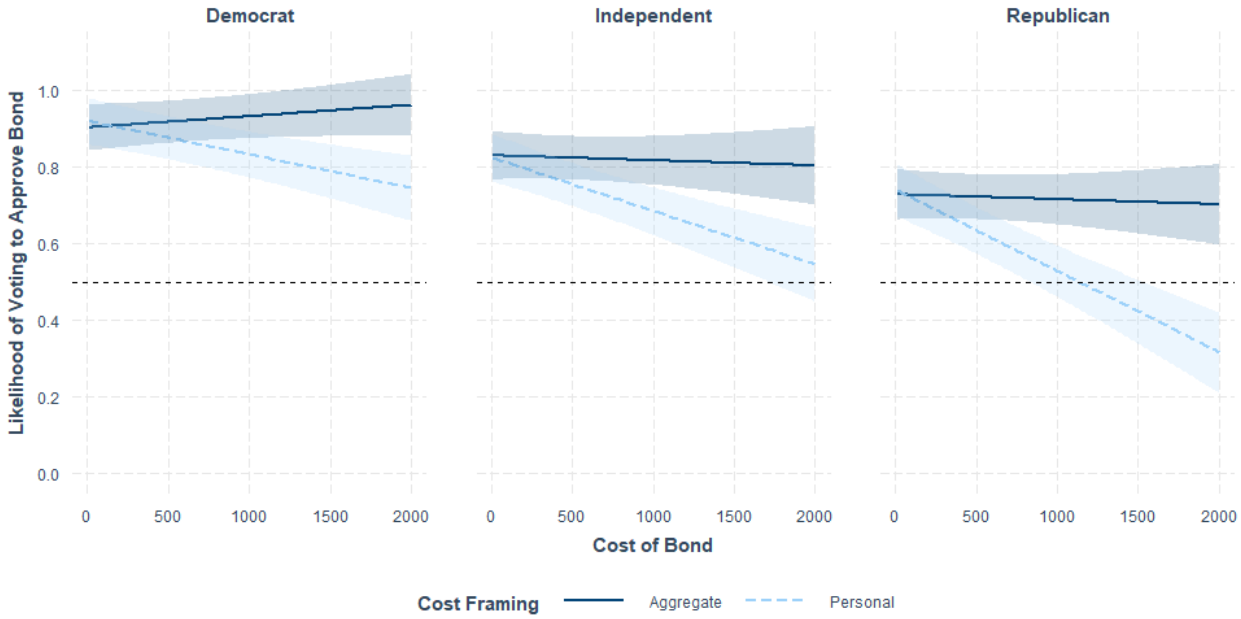


**Figure 3: Aggregate and Personal Cost Framing and Bond Amount on Probability of Supporting a Bond**



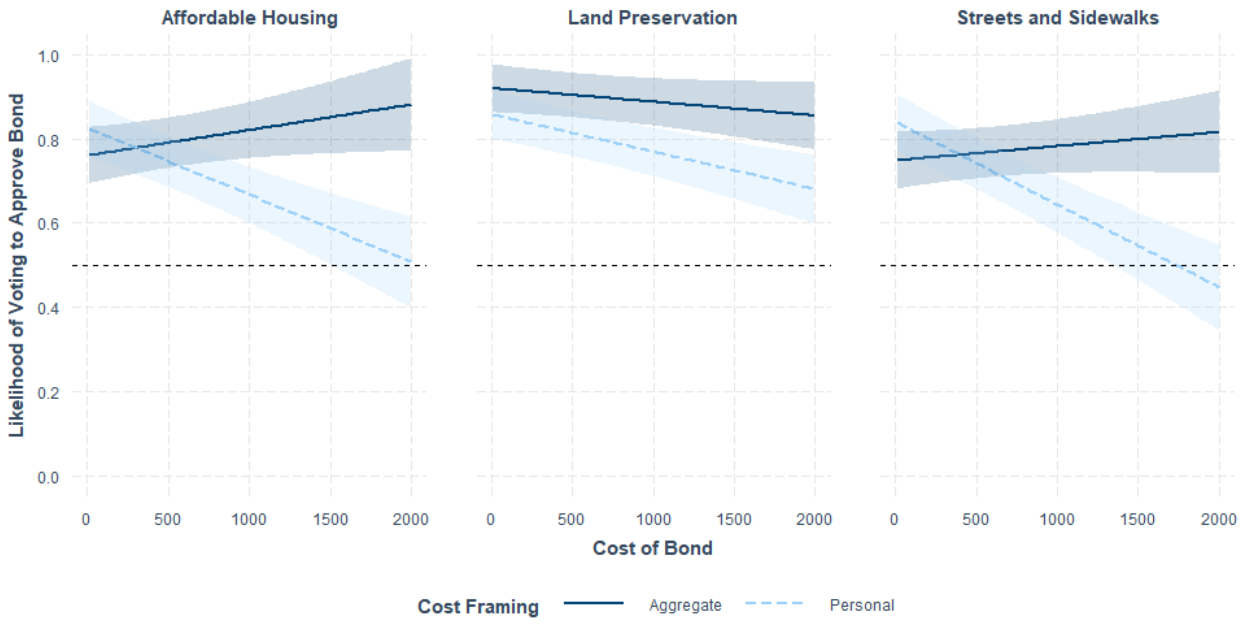

*Notes: 95% confidence intervals. Predicted probability of approval based on Table 3, Model 4. All other variables held at means.*

**Figure 4: Three-Way Interaction Effect between Aggregate v. Personal Cost Frame, Cost Amount, and Party ID on Likelihood of Approving of Bond Referendum**




*Notes: 95% confidence intervals. Predicted probability of approval based on Appendix Table 6, Model 1. All other variables held at means.*

**Figure 5: Three-Way Interaction Effect between Aggregate and Personal Cost Frame, Cost Amount, and Bond Issue on Likelihood of Supporting a Bond**




*Notes: 95% confidence intervals. Predicted probability of approval based on Appendix Table 7, Model 1. All other variables held at means.*

**Table 1: Bond Question Wording**

| Policy | Aggregate Cost Question | Personal Cost Question |
|---|---|---|
| Land Preservation | Suppose the **[Respondent's state] state government** placed a bond referendum on the ballot called the **Land Preservation Fund**. If approved, the state government would issue bonds to pay for the preservation and maintenance of parks, open space, and recreational areas.<br><br>If the referendum passes, the government would be approved to issue **[Aggregate Cost Amount]** in bonds for the Land Preservation Fund.<br><br>If given the chance, would you vote to approve or reject this referendum? | Suppose the **[Respondent's state] state government** placed a bond referendum on the ballot called the **Land Preservation Fund**. If approved, the state government would issue bonds to pay for the preservation and maintenance of parks, open space, and recreational areas.<br><br>On average, residents like you would pay a total of **[Personal Cost Amount]** in additional taxes spread over the next ten years for this fund if the referendum passes.<br><br>If given the chance, would you vote to approve or reject this referendum? |

**Table 2: Balance of Respondent Characteristics Across Treatment Conditions**

| Respondent characteristics | Aggregate Cost | Personal Cost |
|---|---|---|
| Age | | |
| 18-29 | 35.03% | 37.03% |
| 30-44 | 40.23% | 39.35% |
| 45-54 | 13.93% | 11.35% |
| 55-64 | 7.29% | 7.48% |
| 65+ | 2.99% | 4.00% |
| Sex | | |
| Female | 51.56% | 50.71% |
| Race/Ethnicity | | |
| Hispanic | 13.67% | 10.84% |
| Black | 6.25% | 7.74% |
| White (Non-Hispanic) | 67.45% | 65.68% |
| Asian | 11.20% | 13.03% |
| Party Identification | | |
| Democrat | 44.14% | 44.39% |
| Independent | 29.17% | 31.35% |
| Republican | 26.69% | 24.26% |
| Personal Income | | |
| Less than $25,000 | 14.58% | 17.03% |
| $25,000-$49,999 | 23.05% | 23.74% |
| $50,000-$74,999 | 19.92% | 21.03% |
| $75,000-$99,999 | 16.80% | 15.23% |
| $100,000-$149,999 | 13.02% | 14.58% |
| $150,000-$199,999 | 7.29% | 4.65% |
| $200,000+ | 5.08% | 3.48% |
| Education | | |
| Less than high school grad | 0.65% | 0.90% |
| High school grad | 12.37% | 10.06% |
| Some college | 23.44% | 25.42% |
| Associate degree | 9.38% | 10.06% |
| College grad | 40.10% | 37.81% |
| Graduate degree | 13.93% | 15.48% |
| Homeownership | | |
| Own home | 39.45% | 40.00% |
| State Residency | | |
| Alabama | 9.38% | 7.48% |
| Arkansas | 4.69% | 3.35% |
| California | 16.28% | 20.13% |
| Maine | 2.08% | 2.84% |
| Montana | 1.17% | 0.52% |
| New Jersey | 10.81% | 12.77% |
| New Mexico | 2.86% | 2.97% |
| New York | 9.11% | 8.26% |
| Oklahoma | 8.20% | 7.35% |
| Oregon | 8.33% | 6.84% |
| Texas | 18.23% | 14.58% |
| Washington | 8.85% | 12.90% |

**Table 3: Effect of Aggregate v. Personal Cost on Support for Bonds**

| | Dependent Variable = Approve | | | |
|---|---|---|---|---|
| Independent Variables | (1) | (2) | (3) | (4) |
| Personal Cost (in Thousands of Dollars) | -0.060*** | -0.135*** | -0.064*** | -0.134*** |
| | (0.011) | (0.018) | (0.011) | (0.017) |
| Aggregate Cost Frame (1=Yes) | 0.070*** | -0.010 | 0.067*** | -0.008 |
| | (0.015) | (0.018) | (0.014) | (0.017) |
| Personal Cost * Aggregate Cost Frame | | 0.149*** | | 0.141*** |
| | | (0.022) | | (0.022) |
| Affordable Housing Bond (1 = Yes) | -0.089*** | -0.089*** | -0.089*** | -0.089*** |
| | (0.018) | (0.018) | (0.017) | (0.017) |
| Streets & Sidewalks Bond (1 = Yes) | -0.105*** | -0.104*** | -0.106*** | -0.105*** |
| | (0.018) | (0.018) | (0.018) | (0.018) |
| Democrat (1=Yes) | | | 0.225*** | 0.222*** |
| | | | (0.020) | (0.020) |
| Independent (1=Yes) | | | 0.112*** | 0.111*** |
| | | | (0.022) | (0.022) |
| Woman (1=Yes) | | | 0.012 | 0.013 |
| | | | (0.014) | (0.014) |
| Age (Years) | | | -0.001** | -0.001** |
| | | | (0.001) | (0.001) |
| Income (1=Lowest, 7=Highest) | | | -0.002 | -0.003 |
| | | | (0.005) | (0.005) |
| White Non-Hispanic (1=Yes) | | | 0.006 | 0.002 |
| | | | (0.016) | (0.016) |
| Education (1=Least Education, 6=Most Education) | | | 0.002 | 0.003 |
| | | | (0.006) | (0.006) |
| Homeowner (1=Yes) | | | -0.041** | -0.039** |
| | | | (0.017) | (0.017) |
| Observations | 3,086 | 3,086 | 3,078 | 3,078 |
| Clustered Standard Errors | Yes | Yes | Yes | Yes |

*Notes: * denotes p<0.1; ** denotes p<0.05; *** denotes p<0.01, two-tailed. All models use OLS regression as linear probability models. Intercept coefficient not displayed. Standard errors clustered at respondent level.*

**Table 4: Predicted Personal Cost Amounts that Generate Sub-Majoritarian Support**

| Bond | Cost Frame | Majoritarian Support Threshold Cost Amount |
|---|---|---|
| Land Preservation | Personal Cost | $2,791.63 |
| Affordable Housing | Personal Cost | $2,126.35 |
| Streets and Sidewalks | Personal Cost | $2,006.95 |

*Notes: Table presents the estimated cost amounts that predict average bond approval of 50%. All predicted values based on Table 3, Model 4. All predicted amounts generated for those assigned to personal cost frame condition; amounts for those assigned to aggregate cost frame not presented given lack of statistical relationship. All other variables held at observed levels for each respondent.*

**Table 5: Effect of Aggregate Cost Amount on Support for Bonds**

| | Dependent Variable = Approve | | |
|---|---|---|---|
| Independent Variables | (1) | (2) | (3) |
| Aggregate Cost (In Billions of Dollars) | -0.007*** | -0.006*** | -0.006*** |
| | (0.002) | (0.002) | (0.002) |
| Affordable Housing Bond (1=Yes) | -0.112*** | -0.110*** | -0.110*** |
| | (0.024) | (0.023) | (0.023) |
| Streets & Sidewalks Bond (1=Yes) | -0.133*** | -0.135*** | -0.135*** |
| | (0.025) | (0.025) | (0.025) |
| Observations | 1,536 | 1,532 | 1,532 |
| Clustered Standard Errors | Yes | Yes | Yes |
| Respondent-Level Controls | No | Yes | Yes |
| State Fixed Effects | No | No | Yes |

Notes: * *denotes p < .1,* ** *denotes p < .05, and* *** *denotes p < .01, two-tailed. All models use OLS regression as linear probability models. Intercept* coefficient not displayed*. Standard errors clustered at respondent level.*