Anchoring and Adjustment Biases and Local Government Referenda Language

Kenneth A. Kriz

Wichita State University

Author Contact Information:
Campus Box 155
Lindquist Hall 217
Wichita, KS 67260
Phone: 316.978.6959
Email: ken.kriz@wichita.edu

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Introduction

Local governments rely on referenda for many aspects of their finances. To take one example, local governments often use referenda as a way to gain permission from citizens to borrow for funding capital expenditures. The form of a typical bond referendum is as follows: "Should X jurisdiction be allowed to borrow \$Y to finance expenditures for the following purposes: Z, A, B?" Essentially, the question amounts to an invitation to the individual voter to perform a benefit-cost analysis. One can model the decision to vote yes for a referendum question as a binary decision model:

$$\left.\begin{array}{c} Vote\ Yes \\ Vote\ No \end{array}\right\} iff \begin{array}{c} u(Z, A, B) > y \\ otherwise \end{array} \tag{1}$$

Where u is the present value of utility from current and future benefits of the projects funded by the borrowing and y is the cost of the local government borrowing an amount Y realized by that household. In relying on citizens and their votes to decide whether the jurisdiction should have the authority to issue the debt, we are implicitly assuming that individuals will appropriately assess both the utility from the proposed uses of the funds and the cost of borrowing from their perspective. However, there are more than a few reasons to believe that this may not be the case.

In this paper, we concentrate on Y, on the amount borrowed, and on y, the perceptions of citizen voters of what a debt of size Y will cost them in their budgets. There is a very straightforward case to be made that citizens might systematically misperceive the cost of a jurisdiction borrowing on their household budgets. Typically, the value Y is a very large number, such as \$100,000,000. This number is unique both in that is of a magnitude that is unfamiliar to most voters and that the question surrounding it is filled with uncertainty. The uncertainties

include both operational uncertainties – how exactly the money will be spent – and financial

uncertainties – how much the $100,000,000 figure translates into a monthly or annual household

cost and whether the level of debt sufficiently high to cause the local government to default or at

least have to make cuts in services in order to pay the principal and interest on the debt. We study

whether individuals facing this uncertain decision systematically overestimate the cost of the

proposed program.[1]

The paper proceeds in the typical format. In the next section we review two strands of

literature, the first being the literature on voter behavior in referenda and the second the literature

on cognitive processes and biases. We find that there are many existing models of voter behavior

in referenda, but that most assume a rational voter using expected utility maximization. Then we

describe our methodology, which is an experimental approach, and data. Finally we test the

relationships between variants of the language in referenda and discuss the findings.

Literature Review

Studying the question of referenda language and voter reaction to changes in the phrasing

of questions requires a review of both the literature on referenda and the literature on cognitive

processes and their effect on responses to questions such as those asked in bond referenda.

Literature on Referenda and Public Spending

There has been much study of municipal bond referenda and the role that they play in the

financing of municipal services. Early examples of the literature include Hicks (1972) who

analyzed voting results of referenda on school finance proposals in the state of Ohio. He found

that the size of school districts had a negative effect on the percentage of positive votes for

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[1] We chose not to study the question of support for the proposed program because our sample will come from one area and therefore support for a particular program might be a product of the political culture of the area, therefore eliminating the ability to deal with a confounding threat through simple randomization.

proposals to increase spending and the median educational level of parents and the percent of

commercial property in a district had a positive effect on the positive vote percentage. Schroeder

and Sjoquist (1978) examine the results of voting on mass transit referenda in the Atlanta area in

1968 and 1971. They find that the use of transit, and the reliance on work in the central business

district (CBD) had a positive effect on support for transit (they also find some support for a

positive income effect on support), while the distance to the nearest train station relative to the

distance to the CBD had a negative relationship with support and the absolute distance to the

CBD had a parabolic relationship with support.

More recent articles have fleshed out the theory of voter behavior in referenda and

analyzed the effects of this behavior on different choices and behaviors. Strand, Giroux, and

Thorne (1999) examined the results from 398 bond referenda fielded by Texas school districts

from 1990-1995 using a public choice model. They find that the per capita bond amount, state

and federal aid per student, the percent of renter-occupied housing, the use of a large audit firm,

and the percent of students in a district who passed standardized tests had positive effects on

voter approval percentages, while the property tax price of a jurisdiction and the non-white

population share had negative effects on approval. They conclude that public choice models

adequately predict overall voting behavior in the referenda they observed.

Tedin, Matland, and Wieher (2001) use data from a post-election survey of 623 people

who voted in a 1996 bond election for the Houston Independent School District, combined with a

comparison group of 320 citizens that they interviewed after the election. Their study is

somewhat unique among studies of voting behavior in that they used separate subgroup

regressions for Non-Hispanic whites, blacks, and Hispanics. Using a logistic regression, they

find that across all groups the presence of children in the household that attend school, expressed

satisfaction with the performance of schools, and the perception of overcrowding in schools had a positive effect on the probability of voting yes on the referendum, while the perception that the referendum would cause a large tax increase reduced the probability of support.

Baldson, Brunner and Reuben (2003) test models of the demand for public school capital investment and also derive the objective function of school district officials using data on 304 school districts over the period from academic year 1995-6 to 1999-2000. They estimate logistic-regression models on the percent of voters supporting the bond referenda, controlling for selection bias in the form of the likelihood that a school district will propose a referenda and the amount of the referenda proposed. They find that bond proposals are not strictly exogenous, in fact that local school boards in communities with lower tax prices and/or higher incomes are more likely to propose bond issues and that they will propose higher spending. Failing to take into account what amounts to a selection bias will attenuate estimates for things like the price and income elasticities of demand for public school spending. They further find evidence that local school boards behave like risk-averse budget-maximizing agenda setters in terms of proposing referenda. Zimmer, et.al. (2011) build on the results of Baldson, Brunner and Reuben through examining the results of a similar selection-adjusted probit model but also controlling for the purposes of the bond issuance. They find that voters are more likely to support proposals that included funding for the maintenance of existing buildings and are less likely to support proposals that involve the funding of parking lots and band or art equipment. They suggest that the support for maintenance indicates that voters are keeping their support for proposals that are closer to their current perceived allocation of resources.

Other authors have examined support for referenda in other contexts. Filer and Kenny (1980) analyzed support for city-county consolidation referenda between 1949 and 1976. They

find that support for consolidation is positively related to the expected increase in family income due to the consolidation. They do not find a relationship between cost savings and support, and conclude that consolidation is better explained in terms of its wealth transfer effect rather than as a way to increase efficiency. Fort and Christianson (1981) examined the results of voting on referenda to authorize construction of hospitals in rural areas of ten states during the period 1946-1978. They find that the cost of hospital capital and the expenditures on health per capita had negative effects on support for the referenda and that the employment share in retail-wholesale sectors had a positive effect on support. Brink (2004) analyzed the results of referenda in 24 Swedish cities on the subject of municipal partition during the period 1977 – 1999. She finds a positive relationship between the expected change in tax base from the partition and the percentage of yes votes.

Literature on Cognitive Processes and Biases

The literature on cognitive processes, the use of heuristics by economic agents, and resulting biases in their decision making processes was initiated in the seminal paper by Tversky and Kahneman (1974). In their paper, they note that the traditional models of rational decision making such as using expected utility calculations produce several paradoxes and results that are not observed, and that also they rely on a level of precision that is not possible by most individuals. They instead propose that individuals instead make a two-step decision making process where problems that are complex and/or involve significant uncertainties are first simplified to create a reduced set of choices and then decisions are made on the reduced set. The first step of the process – simplification – involves the use of heuristics. Tversky and Kahneman identify three heuristics commonly observed:

1. Representativeness – attempting to draw a conclusion about the probability that event A originates from class B by evaluating how much A is representative of B (which they demonstrate by describing a very meek and mild person and stating that individuals would be more likely to assess that they are working in certain categories of occupations);

2. Availability – assessing the frequency of an event by the ease to which the can make references to a known event or class of event (demonstrated by how individuals assess the probability of a heart attack differently based on whether they have known or seen someone having a heart attack); and

3. Anchoring and Adjustment – making estimates by starting from an initial value that is adjusted to yield the final estimate (which Tversky and Kahneman illustrate with a discussion of individuals estimating a certain fact given either a different structure of information – a multiplication problem with lower numbers at the start or at the end of the values to be multiplied – or a "seed" in the form of a prompt for a value – asking the number of African nations in the United Nations after seeing a number that was randomly generated).

There has been much research into the use of heuristics in many different venues. In this paper, we are concerned with the role of the anchoring and adjustment bias on voting behavior in bond referenda so we limit our review to the literature on this bias. There is also a deep literature on the presence of anchoring bias and some of the factors that might affect it (see Epley and Gilovich (2006) for a good review). Some examples of this literature include Plous (1989), who finds over a course of six surveys involving 1,474 respondents over a two-year period that

anchoring effects play a significant role in estimates of the likelihood of a nuclear war and

Carlson (1990), who analyzed decisions made under conditions of risk through a set of

experiments on undergraduate students at the University of Michigan and Ohio University. He

found that the presentation and levels of probabilities and outcomes affects individual's choices

of whether to take a gamble. This suggests a deviation from the tenets of expected utility theory.

More relevant to our study are the results of papers on individual's stated willingness to

pay for public services. A prime example is the paper by Green et.al. (1998), who studied the

responses to referendum and open-ended contingent valuation method (CVM) survey questions

answered by 370 adult respondents recruited at a museum in San Francisco, California. They

were asked questions regarding their willingness to pay for a program to pay seabirds off the

California coast and a program to reduce traffic accidents in the state by 20 percent, along with

more innocuous questions such as the amount of rainfall in the wettest spot on earth. The

respondents were given anchors at various levels along with either a solicitation for an amount

that they would be willing to pay (an open-ended CVM question) or for approval of a proposal at

a prompted level (a referendum CVM question). They find strong evidence of anchoring bias in

the referendum questions and slightly weaker evidence in open-ended questions. Further they

find that referendum CVM estimates for the population mean willingness to pay are likely biased

by the cognitive biases and that the open-ended questions are statistically inefficient. They

conclude that problems such as anchoring bias plague CVM in a manner which makes them

inappropriate for their stated purpose of eliciting willingness to pay for public services.

Based on the work of Green et.al. (1998) on CVM responses and on the structure of

typical referendum questions, we can form hypotheses regarding the effect of differential

language on voter perception of costs of programs. The null hypothesis is that the language of

elicitation will have no effect on perception of cost. The alternative hypothesis is that the

magnitude of the program suggested by the size of the number embedded in the question will

have a positive reladtionship to perceptions of cost.

Methodology and Data

In order to test the hypotheses developed in the last section, we pursued an experimental

research design. We developed a questionnaire that asked respondents to assess how much they

thought a typical referendum question would raise their taxes. The questionnaire language is

shown in Figure 1. We developed three separate forms for the questionnaire. In the first form

(Form A), the referendum language portrayed the total cost of a proposal ($50,000,000). The

second form (Form B) broke the cost down to an annual per capita amount ($130 per capita). The

final form (Form C) showed an estimate of how much a typical household would pay per month

($1.50) to service the debt on the bond issue. The calculations for the amounts on forms B and C

use data for the population of the city of Wichita for 2013, the average property value for the

city, and an assumption of a level debt service structure. We also asked respondents their age and

nationality, and whether they owned a home or not. Prior to administering the survey, the forms

were shuffled to ensure that respondents received a random form. Respondents were instructed to

indicate a dollar value that they thought their property taxes would increase due to the

referendum, were prohibited from communicating during the questionnaire administration, were

prohibited from using calculators or cell phones to calculate amounts, and were asked to

complete the questionnaire within five minutes (Kansas currently has a time limit of five minutes

to vote once entering a voting booth). The reason for the restrictions was to emulate as close as

possible the voting procedures that voters would face.

Figure 1. Questionnaire Items (Bold Emphasis Added but Not on Original Form).

Form A:

For the purposes of this questionnaire, assume that you are a homeowner in the city of Wichita, Kansas. You own a house of average size, age, and quality. You go to vote in the upcoming local election. One of the issues on the election ballot is:

*"Should the city of Wichita, Kansas be allowed to borrow **$50,000,000** to finance expenditures for the purpose of improving the city's water infrastructure? Financing will come from an increase in the property tax."*

How much do you think your annual property taxes will go up if the property tax increase is approved?

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Form B:

For the purposes of this questionnaire, assume that you are a homeowner in the city of Wichita, Kansas. You own a house of above average size, age, and quality. You go to vote in the upcoming local election. One of the issues on the election ballot is:

*"Should the city of Wichita, Kansas be allowed to borrow an amount equal to **$130 per capita** to finance expenditures for the purpose of improving the city's water infrastructure? Financing will come from an increase in the property tax."*

How much do you think your annual property taxes will go up if the property tax increase is approved?

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Form C:

For the purposes of this questionnaire, assume that you are a homeowner in the city of Wichita, Kansas. You own a house of above average size, age, and quality. You go to vote in the upcoming local election. One of the issues on the election ballot is:

*"Should the city of Wichita, Kansas be allowed to borrow an amount that is expected to cost the owner of a house of median value **$1.50 per month** in increased taxes to finance expenditures for the purpose of improving the city's water infrastructure? Financing will come from an increase in the property tax."*

How much do you think your annual property taxes will go up if the property tax increase is approved?

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The questionnaire was administered to selected classes in the Master of Public

Administration and Master of Economics programs at Wichita State University. The goal was to

get 100 completed questionnaires, however to date we were only able to obtain 63 completed

forms. Despite the instructions to give a dollar value, 11 of the respondents indicated a percent

increase answer. Therefore we had 52 complete questionnaires. The descriptive statistics for the

sample are shown in Table 1. Additionally, the distribution of responses to the tax increase

question is shown in Figures 2 and 3. Several things stand out regarding the statistics. First, there

is a wide range of responses to the question of interest regarding the perceived tax increase. The

mean is many times larger than the median, indicating a strong upward skew in the variable that

is confirmed by the histogram. Some students evidently did not understand the question or

merely guessed (a similar rightward skew has been shown in CVM survey results (Green et.al.,

1998)). As Figure 3 shows, once the outliers are eliminated (we define outliers as values in

excess of $1,000), the distribution still has some skew but is much more to scale. The median age

of the respondents is somewhat younger than the US median age (37.5 years, U.S. Census,

2014). Home ownership rates are also somewhat younger than the national average of 63.5

percent (U.S. Census, 2014) but the differences are not dramatic. The overwhelming majority of

respondents are U.S. nationals so should be familiar with the financing of local government.

Table 1. Descriptive Statistics.

Variable	Mean	Median	Std Dev	Min	Max
Tax Increase	2140	130	7816	1.5	50000
Age	31	28	9	21	60
Home Ownership	0.4615				
Nationality					
US	0.86				
India	0.04				
Kenya	0.04				
Bangladesh	0.02				
Mexico	0.02				
Spain	0.02				

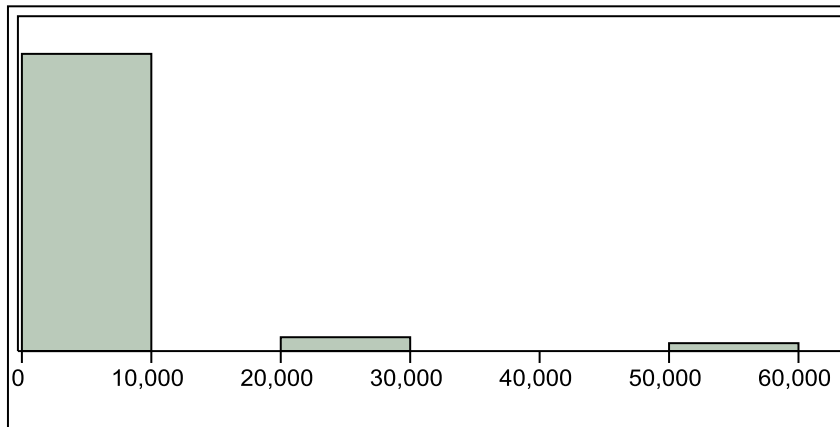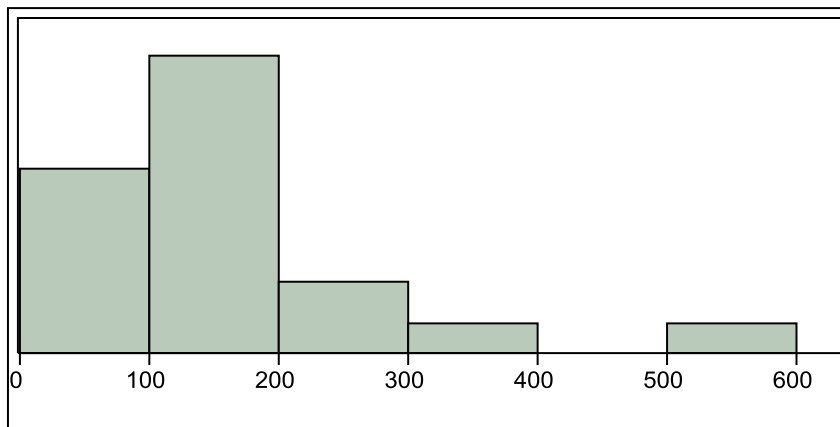*Figure 2. Distribution of Responses to Tax Increase Question.*

Figure 3. Detail of Response to Tax Increase Question, Response Less than $1,000.

We tested the hypothesis of anchoring bias using a difference of means test. We first excluded outliers as discussed above. The test procedure was an Analysis of Variance test to verify a difference in group means, followed by pairwise tests of differences using a Tukey-Kramer Honestly Significant Difference test (Cramer & Howitt, 2005, p. 175). Figure 4 and Table 2 show the results. The mean response for Form A is the highest ($198.18), with Form B in the middle ($161.47), and Form C the lowest mean response ($68.79), which is as predicted by the theory. The differences between the answers on Forms A and C and between answers on Forms B and C were statistically significant at the .05 level. Therefore we can say that the

responses to the full cost presentation of the question as well as the per capita presentation were

significantly higher than the responses to the presentation in monthly terms.
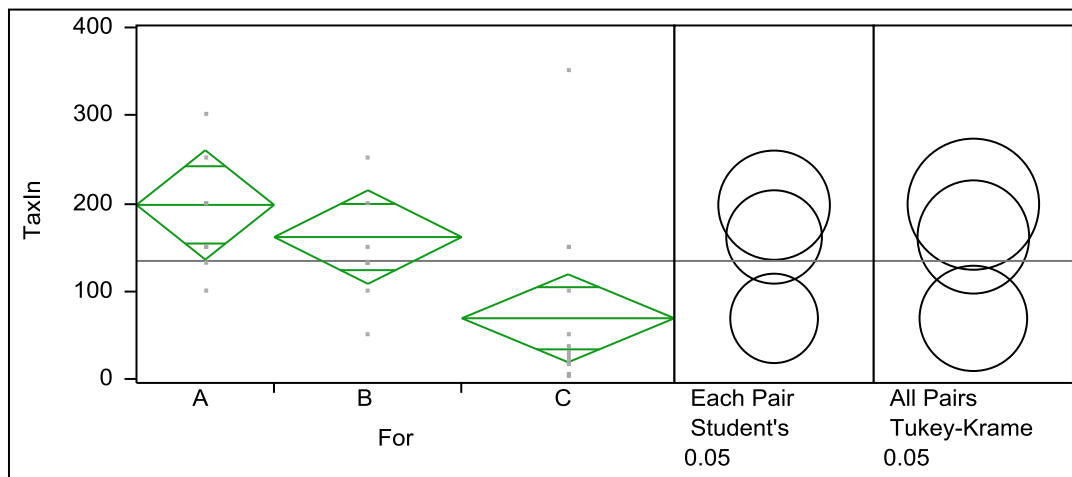
Figure 4. Results of Different of Means Tests.

Table 2. Results of Difference of Means Tests.

Analysis of Variance

Source	DF	SSE	MSE	F Ratio	Prob > F
Form	2	128907.25	64453.6	6.1512	0.0047
Error	40	419128.90	10478.2		
C. Total	42	548036.15			

Comparisons for all pairs using Tukey-Kramer HSD

Group 1	Group 2	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
A	C	129.3877	39.60974	32.9808	225.7947	0.0062
B	C	92.6725	36.26175	4.4144	180.9307	0.0378
A	B	36.7152	40.63390	-62.1845	135.6148	0.6412

Therefore, we can reject the null hypothesis that referenda language does not affect the

perceived level of costs for public programs. Within the results, there is an interesting pattern,

with Forms A and B (the "sticker price" and the per capita cost representation) having no

differences, but both of them being higher than the monthly breakdown amount. The true cost

per capita will be $130, but will be spread over the life of the debt instrument and split between

business property taxes and household property taxes. So the amount of the tax born directly by

the household with a home of median value will be the $1.50 per month value (the household

will bear a portion of the business property tax that is passed forward through higher prices or

backward through lower wages but reliable estimates of this effect are not present in the state of Kansas). So the true annual direct cost of the property tax increase would be somewhere in the range of $18. All of the group means are in excess of this amount, with the monthly breakdown having the smallest average upward bias ($50.79, $p < .01$).

Conclusion and Discussion

Based on our test results, we can say that the presentation of total cost values on municipal bond referenda tends to raise the perceived cost of the program or policy about which the referenda is being held. The implications of this for public finance are direct. Language is not neutral with respect to the perceptions of cost. Referenda results are not necessarily indicative of underlying opinion regarding the utility or cost-effectiveness of public programs and policies. Costs may be overestimated systematically based on the way that questions are asked.

In a practical sense, our results suggest that referenda questions should be asked in a more neutral way. The presence of large numbers in referenda questions can be shown to bias upward the perceptions of costs for the programs that are being asked about in the referenda, thereby reducing the percentage of "yes" votes for the referenda below what it would be with neutral questions (Tedin, Matland, and Weiher, 2001). Our research indicates that presenting a calculation of the monthly property tax increase (essentially "doing the math") for the voter produces the least upward bias in estimates of the cost of the property tax. Therefore, such a presentation is likely to produce referendum results that are closest to representing the true willingness to pay for the service presented.

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