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## Insights

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### RATIONAL RESPONSE TO IRRATIONAL ATTITUDES: THE LEVEL OF THE GASOLINE TAX IN THE UNITED STATES

Thomas L. Brunell and Amihai Glazer

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#### INTRODUCTION

Retailers often price items at \$9.99 rather than \$10.00. They may do so to fool consumers into viewing the price as closer to \$9.00 than to \$10.00, or to signal consumers that the product is on sale (e.g., Stiving and Winer, 1997). Similarly, workers highly desire a six-figure income—a salary of \$100,000 sounds much more impressive than a salary of \$99,999.

This paper explores related behavior by government. Suppose legislators attempt to reduce the salience of increases in the gasoline tax by avoiding moving gasoline taxes into double digits, and suppose that once taxes are moved beyond the double-digit threshold, legislators might as well raise them a little more than just the threshold increment to compensate for the increased visibility they have incurred. Two patterns might result: relatively few states imposing a tax of exactly 10 cents, and a more general avoidance of double-digit taxes. The data confirm this pattern.

Such attention to nominal values can lead to peculiarities. Consider the following thought experiment. A state is observed to impose a tax of 8 cents on a gallon of gasoline. But were it forced to specify the tax as so many cents per quart, it would impose a tax not of 2 cents per quart, but of 3 cents per quart. Were such behavior common, then to explain the level of taxes it would be necessary to consider not only the usual economic and political explanations, but also the nominal value of taxes.

In the following we present two different ways of testing for the importance of nominal values. Our focus is on gasoline taxes in the different states in the United States. Such taxes are both substantively important, and well suited for study since much data are available on them.

## AVOIDANCE OF 10-CENT TAXES

Our test of whether states avoid setting taxes of exactly 10 cents per gallon is given by Table 1, which lists the frequency of taxes. We see, for example, that in 72 cases the tax lay in the interval of 9.5 cents to 10.5 cents inclusive. Of these, the number of observations with a tax of exactly 10 cents was 30 (41.67 percent of the taxes in the interval between 9.5 and 10.5). Inspection of the table shows that 10 cents was far less likely to be chosen within an interval than any other integer within an interval. The next closest integer to this is 14, in which 58.14 percent were at the integer level. A  $\chi^2$  test shows that the proportion of integer values within a range differs for 10 cents compared with all other ranges at better than the 1 percent significance level. States avoid a tax of 10 cents far more than they avoid any other integer value.

## AVOIDANCE OF DOUBLE-DIGIT TAXES

The data above referred to taxes of exactly 10 cents. To test more generally for avoidance of double-digit taxes we turn to a statistical test for violations of Benford's Law. This law describes how often we expect the leading digit in a distribution of numbers to take on each value from 1 through 9, showing that for scale invariant measures, or measures where nominal values play no role (that is for measures which can be stated in miles or kilometers, gallons or quarts, and so on) the proportion of numbers beginning with digit  $d$  is  $\log(1 + 1/d)$ ; for example, the digit 1 occurs with a probability of about 30 percent<sup>1</sup> (Benford, 1938; for a recent exposition see Hill, 1998). The Dow-Jones index and the Standard and Poor index fit well the distribution Benford's Law describes. So do populations of the counties in the United States. Indeed, violation of Benford's Law has been used to detect tax fraud (Hill, 1998).

Figure 1 shows the distribution of the most significant digits for state gasoline taxes (on the left) and the distribution predicted under Benford's Law (on the right). For example, 3.7 percent of the taxes were 2 cents, 0.01 percent were 2.5 cents, and 3.7 percent were 20-something. So in total, in 7.4 percent of the cases the first digit of the tax was 2. Visual inspection suggests that Benford's Law is grossly violated.  $\chi^2$  tests confirm that the distribution predicted by Benford's Law is violated at better than the 1 percent significance level. Most noticeable is a shortage of taxes that begin with the digit 1. Since the taxes rarely exceed 20 cents per gallon and are rarely set at 1 cent, the avoidance of taxes with 1 as the most significant digit corresponds to avoidance of double-digit taxes.

## CONCLUSION

We demonstrated that states care about nominal values of taxes, showing a strong bias against a gasoline tax of exactly 10 cents, and more generally to double-digit taxes.

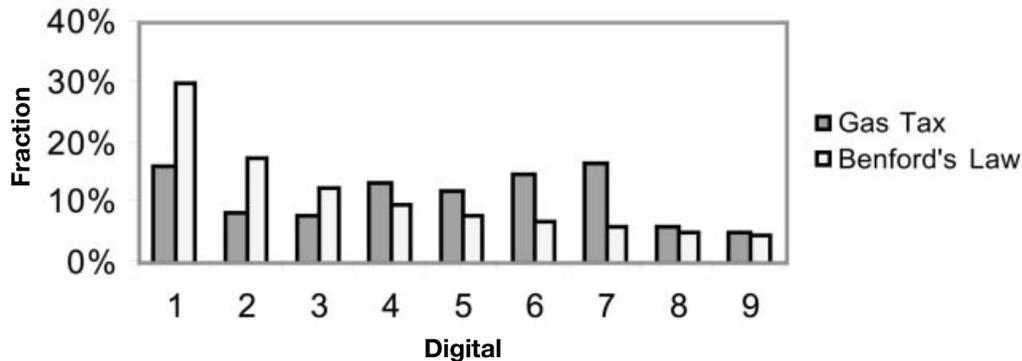
Gas taxes can be politically significant (think of the protests against such taxes in Europe in the summer of 2000, or the proposal by congressional Republicans to

<sup>1</sup> One way to understand the invariance of the distribution of significant digits when measurement units are changed is to think of a histogram of each of the distributions. They should be identical. Consider what happens to the measurements in switching from a tax on half-gallons to a tax on gallons. Under scale invariance, all the taxes should double. This means that all taxes which used to start with 1 will now start with 2 or 3, and all measurements which used to start with 2 will now start with 3, 4, or 5. But measurements which used to start with 5, 6, 7, 8, or 9 will now all start with 1. The only distribution of the most significant digits which is invariant under such a unit transformation is the one described by Benford's Law.

**Table 1.** Distribution of gasoline taxes, 1919–1995, all 50 U.S. states.

Range (cents)	Number of Observations		Fraction at Integer
2.5–3.5	289		
3		274	94.81%
3.5–4.5	491		
4		462	94.09%
4.5–5.5	446		
5		404	90.58%
5.5–6.5	538		
6		408	75.84%
6.5–7.5	708		
7		529	74.72%
7.5–8.5	289		
8		179	61.94%
8.5–9.5	208		
9		154	74.04%
9.5–10.5	72		
10		30	41.67%
10.5–11.5	95		
11		66	69.47%
11.5–12.5	37		
12		30	81.08%
12.5–13.5	65		
13		54	83.08%
13.5–14.5	43		
14		25	58.14%
14.5–15.5	66		
15		45	68.18%
15.5–16.5	55		
16		48	87.27%
16.5–17.5	42		
17		31	73.81%
17.5–18.5	71		
18		47	66.20%
18.5–19.5	38		
19		23	60.53%
19.5–10.5	50		
20		46	92.00%
Total	3603	2855	79.24%

*Note:* In addition, in 267 cases the tax was exactly 0, in 64 cases the tax was exactly 1 cent, and in 145 cases the tax was exactly 2 cents. Source: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics.



**Figure 1.** Distribution of the first significant digit of taxes.

reduce the federal tax that year). But we also think that the effects can appear in other areas. Consider the content of President Clinton's weekly radio addresses. In them he used the number 8 in 27 addresses, and the number 9 in 16 addresses; but he used 10 in only nine addresses, and 11 in only one. Successful politicians have divined that the public is sensitive to particular numbers, which students of public policy should heed. And so we might also ask whether new programs are long limited to budgets below \$1 billion, or whether high schools avoid enrolling more than 1000 students. If the answer is yes, then analyses should note that nominal values constrain public policy.

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## GIVING, VOLUNTEERING, AND MISTRUSTING GOVERNMENT\*

Arthur C. Brooks and Gregory B. Lewis

Is confidence in government a spur or an obstacle to voluntarism and charitable giving? Does cynicism about the public sector lead to skepticism about other collective actions to improve society? Or does dissatisfaction with government lead people to step into the breach, giving money and time to alternative providers of social and human services in the nonprofit and voluntary sector?

Political liberals frequently characterize people's lack of confidence in the public sector as a symptom of their discouragement with society in general. As such, confidence in government and the fortunes of the nonprofit sector should rise and fall together. In the words of Robert Putnam (1995, p. 68), "Every year over the last decade or two, millions more have withdrawn from the affairs of their communities. Not coincidentally, Americans have also disengaged psychologically from politics and government over this era."

On the other hand, many conservatives would argue that people take matters into their own hands when they lose confidence in government. As the public sector seems a less attractive provider, nonprofit alternatives become more appealing. Loss of confidence may actually *benefit* private charity. Initiatives ranging from George Bush Sr.'s "thousand points of light" to George Bush Jr.'s White House Office of Faith-Based and Community Initiatives thus call for government to enable, rather than displace, charitable activity in the nonprofit sector.

In this paper, we test the relationship between trust in government and civic participation. To do so, we employ the 1996 General Social Survey (GSS) to examine whether low confidence in the federal government encourages or discourages contributing time and money to the nonprofit and voluntary sector.

### DATA AND MODELS

In addition to its standard battery of socio-demographic, political, and economic questions, the 1996 GSS included a module on volunteering and giving to many types of nonprofit organizations (Davis, Smith, and Marsden, 1999, 619–642). The GSS asked separately about volunteering time and giving money to religious organizations; health; education; human services; environment; public/society benefit; recreation - adults; arts, culture, and humanities; work-related organizations; political organizations or campaigns; youth development; private and community foundations; international/foreign; informal-alone-not-for-pay; and other. Overall, 72 percent donated money and 58 percent donated time to at least one charitable organization during the previous year. Religious organizations were by far the most common recipient, with 46 percent of the respondents giving them money and 25 percent giving them time. Education was a distant second (17 percent and 18 percent, respectively), but 53 percent gave time and 61 percent gave money to at least one of these 14 nonreligious causes.

To see whether determinants of religious and nonreligious giving and volunteering are different, we created four dummy dependent variables indicating whether a

respondent had contributed time or money to any religious or nonreligious charitable organization in the previous year. Because giving and volunteering were measured dichotomously, we used binary choice models, assumed logistic distributions, and estimated the equations with logit models.

Our key independent variable was the amount of confidence respondents expressed in the executive branch of the federal government.<sup>1</sup> The GSS asked, “As far as the people running [the executive branch of the federal government] are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them?” We used two dummy variables to indicate whether respondents had “hardly any” or “only some” confidence; those with “a great deal” of confidence were the reference group. This question probably taps two attitudes: confidence in the ideology and politics of the current administration and perceptions of the government’s efficiency and managerial competence. Thus, those who hated President Clinton’s politics and character *and* those who perceived the federal bureaucracy to be especially wasteful and unresponsive were likely to express hardly any confidence in the people running the executive branch.

We controlled for most of the demographic characteristics generally found to predict giving and volunteering (Smith, 1994). Previous research indicates that both giving and volunteering increase with economic status (Bell and Force, 1956), educational attainment (Auslander and Litwin, 1988), and age (Florin, Jones, and Wandersman, 1986). Currently married people are more likely than others to donate time and money (Palisi and Korn, 1989). Whites tend to participate more than minorities (Hodgkinson and Weitzman, 1986). Evidence on the effects of gender is mixed (Curtis, Grabb, and Baer, 1992, Hodgkinson et al., 1992). We also controlled for religion, political ideology, and region of residence.

The descriptive statistics for the data are contained in Table 1.

## FINDINGS

We found no evidence that confidence in government is positively related to civic participation.<sup>2</sup> On the contrary, the less confidence respondents had in the people running the executive branch of the federal government, the more likely they were to volunteer with either religious or nonreligious organizations. In all models, those with “a great deal of confidence” were significantly less likely to volunteer than those with either “hardly any” or “only some” confidence.<sup>3</sup> Confidence in the executive branch had a weaker relationship with donating money, although the effect of “hardly any confidence” on religious donations was negative and statistically significant.

To illustrate the practical impact of having “hardly any” confidence on volunteering, Table 2 translates the logit estimates into probabilities of volunteering for people with the same demographic characteristics, but different levels of confidence in government. The first column shows arbitrarily chosen probabilities of volunteering

<sup>1</sup> We tried several specifications of the models using alternative measures of confidence in government. The results were not always consistent with the findings about the executive branch. For example, confidence in Congress and the Supreme Court were not related to giving or volunteering, suggesting that people react most strongly to what is arguably the most “visible” branch of government.

<sup>2</sup> The full presentation of the logit results is available from either author, and posted at: <<http://www.gsu.edu/~padgbl/>>.

<sup>3</sup> We should note a potential problem with endogeneity. We assume that confidence in government affects volunteering, but one might plausibly argue that some volunteering affects confidence in government. For example, involvement in some religious sects might foster mistrust for the public authorities. This effect could theoretically be corrected with instrumental variables, but appropriate instruments are not available in these data.

**Table 1.** 1999 GSS data on giving and volunteering.

Variable	Definition	Mean	Min.	Max.
VOLUNTEER NONRELIGIOUS*	Respondent volunteered for a nonreligious organizations over the past year	0.53	0	1
VOLUNTEER RELIGIOUS*	Respondent volunteered for a religious organizations over the past year	0.25	0	1
GIVE NONRELIGIOUS*	Respondent gave money to a nonreligious organizations over the past year	0.61	0	1
GIVE RELIGIOUS*	Respondent gave money to a religious organizations over the past year	0.46	0	1
NO CONFIDENCE*	Respondent has "hardly any" confidence in the federal government	0.43	0	1
SOME CONFIDENCE*	Respondent has "only some" confidence in the federal government	0.47	0	1
INCOME**	Respondent's annual income	\$39,124 (\$25,971)	\$500	\$90,000
EDUCATION	Respondent's years of education	13.34 (2.92)	0	20
AGE	Respondent's age	44.73 (17.04)	18	89
CHURCH WEEKLY*	Respondent attends church weekly	0.30	0	1
CATHOLIC*	Respondent is Catholic	0.24	0	1
PROTESTANT*	Respondent is Protestant	0.57	0	1
JEWISH*	Respondent is Jewish	0.02	0	1
OTHER RELIGION*	Respondent is Catholic	0.05	0	1
NO RELIGION*	Respondent has no religion	0.12	0	1
CONSERVATIVE*	Respondent self-identifies as a politically conservative	0.37	0	1
MALE*	Respondent is male	0.45	0	1
WHITE*	Respondent is white	0.81	0	1
BLACK*	Respondent is black	0.14	0	1
OTHER RACE*	Respondent is neither white nor black	0.05	0	1
MARRIED*	Respondent is married	0.49	0	1
EAST*	Respondent resides in the eastern U.S.	0.19	0	1
MIDWEST*	Respondent resides in the midwestern U.S.	0.24	0	1
SOUTH*	Respondent resides in the southern U.S.	0.35	0	1
WEST*	Respondent resides in the western U.S.	0.22	0	1

Note: standard deviations in parentheses. \* Dummy variable. \*\* Data are coded categorically in the GSS, and converted into a continuous measure by taking the midpoints of categories.

for someone with a "great deal" of confidence. The other two columns show the probabilities of volunteering for religious and nonreligious organizations predicted by the model for people with the same demographic characteristics, but with "hardly any" confidence. In the first row, for example, if someone with a great deal of confidence had a 10 percent probability of volunteering, then a person with identical demographic characteristics but hardly any confidence would have a 22 percent probability of volunteering for a nonreligious organization and a 25 percent probability of volunteering for a religious organization.<sup>4</sup> Even with all control variables taken into account, the marginal impacts of confidence in government on the propensity to volunteer are significant in both a statistical and a policy sense.

<sup>4</sup> These probabilities were estimated by using the logistic function  $\ln[p / (1 - p)] = \beta x + \theta$ , where  $x = \{0, 1\}$  denotes hardly any confidence in government, and  $\beta$  is estimated in the logit models.

**Table 2.** Sensitivity analysis on the volunteering models.

If the probability that a person with a <i>great deal</i> of confidence in government volunteers is...	...then the probability that a person with <i>hardly any</i> confidence in government will volunteer for a nonreligious organization is...	...and the probability that a person with <i>hardly any</i> confidence in government will volunteer for a religious organization is...
.10	.22	.25
.20	.39	.43
.30	.52	.56
.40	.63	.67
.50	.72	.75
.60	.79	.82
.70	.86	.87
.80	.91	.92
.90	.96	.96

Several other variables had significant impacts in our analysis. Giving and volunteering rose with income, education, and regular religious observance. Giving rose with age, while volunteering dropped. Blacks were less likely than whites to volunteer or donate money to nonreligious causes, while Catholics volunteered less for religious organizations than members of other faiths. Married people were more likely than others to give to religious organizations. Residents of the East Coast were less likely than others to volunteer with nonreligious organizations. Neither gender nor political ideology was significantly related to participation in the nonprofit sector.

## CONCLUSION

A common hypothesis embedded in much of the current discussions on “social capital” is that low confidence in government harms civil society as well as the public sector. We found the opposite: People with little confidence in the executive branch of the federal government are more likely to volunteer time to both religious and non-religious nonprofit organizations (and to donate money to religious organizations) than those with a great deal of confidence. Although confidence is somewhat less strongly related to giving than to volunteering, both types of charitable behavior appear to fall rather than rise with confidence in the federal government. We conclude that those who are frustrated with the federal government seem more likely than others to take matters into their own hands, contributing directly to the services they think are necessary.

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