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Heuristics and Biases in Thinking about Tax

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Abstract

The principal findings of behavioral economics and cognitive psychology over the past several decades have been to show that human beings deviate from ideal precepts of rationality in many settings, showing inconsistent judgment in the face of framing and other formal manipulations of the presentation of problems. This paper summarizes the findings of original experiments about subjects' perceptions of various aspects of tax-law design. We show that in evaluating tax systems, subjects are vulnerable to a wide range of heuristics and biases, leading to inconsistent judgment and evaluation. The prevalence of these biases suggests that there is room for skillful politicians or facile political systems to manipulate public opinion, and that tax system design will reflect a certain volatility on account of the possibility of eliciting preference reversals through purely formal rhetorical means. More troubling, the findings suggest the possibility of a persistent wedge between observed and optimal public finance systems.

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Introduction

This paper reports the general results of a series of experiments we have conducted over the past several years, testing for the consistency of subjects' perceptions of issues of relevance to tax and public finance. The results strongly suggest that ordinary citizens suffer from a wide range of biases in understanding basic features of tax-law design and reform, akin to the perceptual biases far more commonly studied in private market domains, such as in the evaluation of risky choice (Kahneman & Tversky 1984, Tversky & Kahneman 1986) or in regard to the understanding of consumer finances (Thaler 1980 and 1985). In private markets, arbitrage mechanisms, which allow some to profit from the biases of others, with overall prices showing little effect, can be expected to reduce the effects of bias (but see Barberis and Thaler, forthcoming, for a discussion of the limits of arbitrage even in private markets). In the public sector, however, the absence of any simple, general arbitrage mechanism, such as the market itself — indeed, the absence of any clear incentive to develop such a mechanism — gives reason to believe that the adverse effects of cognitive biases can persist for long periods of time. Not only are the resolutions of certain public finance matters fragile, because of the potential for framing manipulations to lead to citizen preference reversals, but there is also reason to believe that persistent inefficiencies and inequities will result from the interactions of political systems and cognitive error.

Before we present the experimental findings, we set forth some background on the disciplines and subject matters in play.

Cognitive Heuristics and Biases

Modern economics is based on a rather simple set of axioms about subjects' rationality. Perhaps the most basic tenet of the standard theory is consistency: people should not change their preferences based on irrelevant matters such as the purely formal labeling of a state of affairs (Kahneman & Tversky, 1984).

But they do. The field of behavioral economics or cognitive theory, with important roots in the "bounded rationality" work of Herbert Simon (1955) has shown that individuals deviate, often systematically, from ideal precepts of rationality. Daniel Kahneman and Amos Tversky played significant roles in expanding the field and its insights (Kahneman & Tversky 1974, 1979, 1984), which achieved a more mature status with the awarding of the Nobel Prize in economics to Kahneman in 2002. For good general background on the field, see Kahneman & Tversky 2000, Baron 2000.

Behavioral economics or cognitive theory rests on social scientific observations of actual human judgment and decision-making. Various types of deviations from ideal rationality have been chronicled. For example:

- *framing* refers to the effect whereby the same question or choice set, described differently (as in "half empty" versus "half full"), can elicit different answers (Tversky & Kahneman 1986, Levin, Schneider & Gaeth 1998);

- the variously described *endowment affect*, *status quo bias*, or *reference-dependent utility* refers to the fact that losses from the status quo are weighed more heavily than otherwise-equivalent gains, even after controlling for wealth effects, and thus evaluations and choices vary with the specification of the "status quo" or "reference point" (Kahneman, Knetsch & Thaler 1991, Bateman et al. 1997);

- *over-generalized heuristics* include extensions of principles that serve good purposes most of the time to situations in which they seem to cause harm, for example, the favoring of harmful omissions over less harmful acts (Spranca et al., 1991);

- *distortion of probabilities* refers to a set of phenomena in which subjects make decisions as if they distorted stated probabilities, and, when they are not given numerical probabilities, their probability judgments, and decisions based on them, are incoherent (Kahneman & Tversky 1979, Tversky & Fox 1995);

- *distortion by desires* refers to a set of results in which beliefs (or probabilities) are distorted by desires or motives, including "wishful thinking" and "self-serving bias" (Babcock et al. 1995); and

- *judgment biases* are a class of very general distortions of numerical judgment, a prime example being under-adjustment after anchoring on a salient value (Tversky & Kahneman 1974, Chapman and Johnson 1994).

The list goes on (see Baron 2000).

Skepticism has reigned in some quarters in the face of this catalog. Cognitive theory is a "skeleton of empirical facts around which a theory is draped," according to one leading practitioner of the field (Camerer 1990, at 792). The early attempts of Kahneman and Tversky (1979) to generate a grand theory of the field, in the guise of "prospect theory," have not been altogether successful (McCaffery, 1994a; but see Camerer, 2000). Such explanations capture some but not all of the cognitive phenomena now known to exist, and fail to give a "deep" explanation, as the emergent fields of neuro-cognition or evolutionary, adaptive psychology might one day provide.

But the absence of system does not mean the absence of truth. If people really do think in ways that deviate from ideal precepts of rationality, then social science or political theory that aims to take into account how people think should consider the findings of contemporary behavioral psychology and economics (McCaffery, 1994b).

Much of our work has coincided with the growing realization of other researchers that at the center of many heuristics and biases is what we might term an *isolation effect* (Camerer, 2000; Read, Loewenstein & Rabin 1999; McCaffery & Baron, 2003). Subjects focus on one especially salient aspect of a choice or evaluation problem and ignore or fail to integrate other less salient items. The result can be a function of framing and salience, an overgeneralized heuristic (such as ignore irrelevant information, applied in a setting where the ignored information is relevant), a normative sense of constraint (decide only what you are being asked to decide), or yet other factors (McCaffery and Baron 2003). In a wide range of cases the isolation effect leads to inconsistent judgment and decision-making.

Tax

Our experiments have concerned taxes broadly conceived, and have generally been set up with the American tax system in mind.

Under any conception, taxes today are large. In the United States, taxes account for approximately one-third of Gross Domestic Product (GDP), a figure actually low by the standards of other developed countries. At the highest level of generality, taxes have two dimensions: their magnitude, size, or level, and their distribution. Distribution is a function of the tax's base and its rate structure.

More particularly, the United States today (as other developed countries), has multiple

taxing jurisdictions, and multiple taxes. The largest taxing jurisdiction is the federal system, and the largest single tax is the personal income tax. A close second in magnitude is the social security or payroll tax system. A distant third is the corporate income tax (U.S. Census Bureau 2002, at table no. 454).

On the state and local level, the largest tax in the aggregate is the sales and use tax, followed by property and income taxes (U.S. Census Bureau, 2002, at table no 416).

Our experiments have asked about the appropriate level of tax, and the appropriate distribution of taxes, specifically the appropriate degree of progression in the tax system. We have asked such questions in the context of family structure (whether or not a couple is married, whether or not they have children); broad tax law design (whether there is one tax system or two, and what the properties of the current system(s) are); and also relative to the funding of various public, or potentially public, goods. We have investigated attitudes towards more specific features of tax-law design, such as the accommodation (or not) of children and marriage. We have also explored the various reasons behind taxes — the provision of various possible public goods, redistribution in and of itself — as well as attitudes towards government revenue-raisers whether or not they are commonly conceptualized as "taxes."

Heuristics, Biases, and Tax

There is a still-raging controversy as to whether or not the insights of behavioral economics matter, or whether, instead, a social science such as economics can proceed to model real-world problems "as if" subjects were fully and ideally rational. One hope for reconciling theory and practice comes from the presence of various arbitrage mechanisms in the real world, most importantly, the market. Even if some — most? — economic actors are irra-

tional, as long as markets clear at the margin with rational actors, prices can be efficient, and all can live in an economic setting as if all were rational. There is, however, good and mounting evidence not to believe this simple happy tale (Barberis & Thaler, forthcoming).

Be that as it may in the *private* sector, there is simply no market at all in the public sector — indeed, "public" finance can been defined as the study of nonmarket economic mechanisms. While political entrepeneurs, groups, parties, and other actors may attempt to reveal and exploit inefficiencies in socio-economic processes, the returns to them from this activity are uncertain at best, and the costs high.

Consider as a thought experiment the existence of "hidden" fees or costs in the two sectors. Administrative charges and bid-asked spreads on mutual funds are two such hidden costs. These are problematic, to be sure, but they are also small, and diminishing. Now consider, as we have, the role of "hidden" taxes in the public sector. These are quite large, indeed, and growing. When it turns out that no one is quite certain who pays a tax, such as the corporate income tax, the tax ends up being attractive, without obvious opponents (Arlen and Weiss 1994), an effect that can lead to a larger government, *ceteris paribus* (see Hines and Thaler 1995 on the so-called "flypaper effect," whereby government grows with new revenue sources) (McCaffery 1994b).

Our most general hypothesis is that we expected to find a wide range of heuristics and biases in people's understanding of and attitudes about tax. The general complexity of the subject matter, the low benefits for any individual to obtain on a personal level from fully understanding it, the absence of any general, widely available mechanism to debias or educate people about tax, can all be expected to, if anything, make the usual heuristics and biases more acute in the field of tax.

Experimental Method

We followed a similar procedure in all of the studies reported below.

About 50–100 subjects, depending on the study, completed a questionnaire on the World-Wide Web. Subjects were paid $3 or $4 each. Subjects came to the studies through postings on various Web sites or Usenet news groups, or through prior participation in other studies. Subjects were paid by check (after some minimum amount was accumulated), and they had to register their address and (for U.S. residents) their Social Security number in order to get paid, but they identified themselves only with their email address after they registered, and the email address was stored separately from the data, to assure privacy and anonymity.

Note that, consistent with standard methods in cognitive psychology, our experimental designs were all within-subject (Baron, 2000). That is, we are testing whether or not the very same people, asked the same question in different ways, react differently. In all cases, the null hypothesis is simply that subjects should be consistent—and we find repeatedly that they are not, with strong statistical significance. Our interest is in the existence of such inconsistencies, and their nature, not in how widespread they are in any particular population. In some cases, we find inconsistencies in both directions; when this happens, we are unable to say with certainty which direction will "win" in any particular population, but we can at least ask whether the direction is correlated with such variables as sex and age. As it happens, our subject pool is roughly representative of the adult U.S. population in terms of income, age, and education (Babcock et al., 2003), but not in terms of sex, because (for unknown reasons) women predominate in our respondent pool.

In terms of precise methods, the studies were programmed in JavaScript so that one

case was presented on each page, and subjects were required to answer all questions appropriately before proceeding. We recorded the time spent on each response, and we usually eliminated subjects who went noticeably faster than everyone else (outliers, usually 2–3%). Many of our experiments have had internal checks to assure that subjects understand the questions, and answer in the appropriate range.

An Extended Case Study: Tax Aversion

Both to get a feel for our general method and to present the results of one interesting study, we here describe at some length one particular experiment. The following section canvasses the results of several more.

Tax Aversion

At the simplest level, it matters what something is called. For some people, and for some kinds of programs, the label "tax" is enough to arouse a negative reaction, with everything else held constant .

We did an experiment to assess the effect of simply calling something a tax. We contrasted cases in which a service was funded by government through a tax with otherwise identical cases in which the users of the service paid its provider without government acting as an intermediary. We used 15 cases that we thought might differ in various factors that might be relevant: the status quo, whether the services are provided more efficiently by government or others, the subject's perceived self-interest, the extent to which the rich should pay more, whether people differ greatly in their use of the service, and the extent to which they involve public goods (such as vaccinations, which often prevent the spread

of diseases to others).

We also asked about attitudes toward the relevance of these factors in the real world. Of course, our hypothetical cases were not like the real world because we held many factors constant by assumption. But we suspected that subjects' general attitudes may affect the way the respond to whether the mechanism is called a tax or not.

Method

The questionnaire was completed by 106 subjects, ages 19–66 (median 40); 38% were male. The questionnaire began:

> **Paying for services**
>
> We are interested in your views about how various services should be paid for. Some services can be paid for either through taxes or through payments made directly to the businesses or individuals who provide each service.
>
> There are 15 screens, each with 13 questions.

The questions on each screen were as follows, using social security as an example. Questions 1, 3 and 5 differed from 2, 4, and 6, respectively, only in whether the way of raising funds was called a "tax" or a "payment." Each pair (1-2, 3-4, and 5-6) varied the distributive properties of the tax/payment: the first was lump sum, the second progressive (based on ability to pay), and the third based on use of the service in question.

Questions 7 and 8 assessed the status quo, and the remaining questions assessed general attitudes toward arguments for and against the use of taxes. Of course, these arguments were not relevant to the comparisons between tax and pay questions (1 through 6),

because the factors were held constant — we were testing for the effects of a rather transparent framing manipulation. But we suspected that these attitudes may affect the general preference for what is nominally called a "tax." Specifically, questions 9–13 assessed the following rationales or beliefs: efficiency; self-interest; graduation (the extent to which the rich should pay more); use (the relevance of whether people differ greatly in their use of a service), and, public good, respectively.

To give a better sense of what the subjects saw, here is the text of a sample screen:

> The service in question is SOCIAL SECURITY (BASIC PENSIONS).
>
> Rate each of the following methods of providing this service. The average cost per person of providing the service is the same for all methods, and the quality and amount of the service is also the same.
>
> 1. Government pays. All residents pay a tax that is earmarked for social security (basic pensions). The tax is the same number of dollars for everyone.
> [7 point scale from Awful to Excellent, for each item]
>
> 2. Every resident pays a fixed amount of money directly to the service provider. The cost is the same as in #1.
>
> 3. Government pays. Residents pay a tax that is earmarked for social security (basic pensions). The tax is adjusted based on ability to pay.
>
> 4. Residents pay the provider directly. The cost is adjusted by law based on ability to pay, and is the same as in #3.
>
> 5. Government pays. Residents pay a tax that is earmarked for this. The tax depends on each person's use of social security (basic pensions).
>
> 6. Residents pay the provider directly. The cost depends on each person's use of social security (basic pensions) and is the same as in #5.
>
> Where you live now, how is social security (basic pensions) funded?
> 7. Through taxes.
> Not at all Partially Fully
> 8. Through payments to providers.
> Not at all Partially Fully
> 9. In real life, who can provide social security (basic pensions) with less waste?

Government.
Neither one is generally better than the other.
Private providers.

10. How are you and those in your household affected financially by whether social security (basic pensions) is funded through taxes or payments to providers?
Better off if funded through taxes.
It doesn't matter.
Better off if funded through payments to providers.

11. How should the cost of social security (basic pensions) be distributed between those with high income (the 'rich') and those with low income (the 'poor')?
The rich should pay more for this and the poor should pay less.
The rich and poor should contribute equally.
The poor should pay more and the rich should pay less.

12. How much do people differ in their need for social security (basic pensions)?
Needs are approximately equal.
Some people need this more than others.
Some people need this a lot and others do not need this at all.

13. How important is it that social security (basic pensions) be used by as many people as possible?
It is important for the public good that essentially everyone use this.
It is better for everyone if more people use this.
Not important at all.

The services used were: primary and secondary education, theft insurance, basic telephone service, mail delivery, basic health care, vaccinations, connection to a sewer (or equivalent), drinkable running water, trash collection, services of a fire department, nursing home care, social security (basic pensions), insurance for income loss from disability, unemployment insurance, natural disaster insurance. They were presented in a random order chosen for each subject.

Results

As we have throughout our experiments on perceptions of tax, we found that labels mattered. Subjects reacted differently to levies called a tax to those called payments, even where the economics were identical.

The main measure of interest is whether subjects favored funding through the explicit "tax" option, which we defined as the mean difference in attitude responses (on the 7-point scale) between questions 1, 3, and 5 and questions 2, 4, and 6, with a positive difference meaning that the subject favored "tax" over "payment."

In general, there was no overall preference for or against taxes when we tested across the 15 services or the 106 subjects. Subjects favored taxes in 25% of the adjacent pairs and opposed taxes in 22%, leaving 52% entirely "consistent." The proportion of consistent responses was highest (57%) for the third pair, where pay was according to use in both cases, and the number of pro-tax responses was lowest (21%). Perhaps subjects thought that taxes were infeasible in this case.

As we expected, however, particular goods or services differed in whether subjects favored taxes to pay for them. (In some cases, such as social security, subjects may have considered the very nature of the "service" to vary with the payment mechanism.) Those significantly favorable for taxes were fire (0.72 mean difference, $p < .001$), education (.61, $p < .01$), and social security (.55, $p < .01$). Least favorable for taxes were phone service (-1.15, $p < .001$) and theft insurance ($-.66$, $p < .001$). We tested for the significance of differences with a correction for multiple tests (the step-down re-sampling procedure of Westfall and Young 1993, as implemented by Dudoit and Ge 2003).

The subjects also differed among themselves. Twelve subjects were, individually, sig-

nificantly anti-tax ($p < .05$), correcting for multiple tests, and 14 were significantly pro-tax. This is consistent with other research showing that subjects fall into clusters in terms of their attitudes towards progressivity, with some liking flat taxes, others moderately progressive, still others steeply progressive ones (McCaffery & Baron 2003, Hite & Roberts 1991).

These differences among subjects could be predicted from their general attitudes. We regressed each subject's tax-attitude measure—the mean difference between the odd (tax) and even (payment) questions 1 through 6, as above—on all the other attitude measures, questions 10–13. The overall regression was significant ($R^2 = 0.34$, $p = .0000$), but the only individually significant predictors were self-interest, question 10, ($t = 3.26$, $p = .0015$) and efficiency, question 9 ($t = 2.08$, $p = .0399$). This latter finding suggests that attitudes towards the service provision affect attitudes about the payment mechanism.

A parallel analysis across the 15 services was also significant ($R^2 = 0.96$, $p = .0000$), but the only (nearly) individually significant predictor was self-interest ($t = 2.40$, $p = .0534$, two tailed). However, in this analysis, several predictors were highly correlated, so separate correlations may be more informative. Significant predictors (at $p < .01$) of preference for taxes were: status quo ($r = .89$), efficiency (.86), self-interest (.95), and use (.65), all in the direction to be expected (e.g., taxes were viewed as less desirable with greater differences in use).

The main finding is that calling something a "tax" affects people's attitude toward it, and their attitude is predictable from properties of the service and of the subject. Some people are indeed anti-tax for some services, and others are pro-tax. Because in this particular experiment we cannot always tell if the subjects were reacting to the payment label, alone, or to some sense that the service itself might vary with different payment mechanisms, we

intend to further explore this tax label effect in subsequent studies.

More Heursitics and Biases in Tax

In this section, we quickly canvass the results from many other experiments, all done along the same general lines as the tax aversion study just described.

Metric Effect and Progressivity Illusions

Throughout our experimentation, we found interesting interactions between subjects' perception of or desire for progressivity — a norm of expecting the better able to pay more, in absolute and/or percentage terms — and other effects. Perhaps these begin with some basic inconsistencies over what "progression" even means. Specifically, answers varied systematically based on whether the question was asked using dollars or percents, in what we (and others) call a *metric effect* (McCaffery and Baron 2003 and in press). Subjects consistently want more progressivity in percent than in dollars. The reason is not hard to surmise: there is a sort of progressivity illusion under dollars, because the high income pay more: at a constant 20% rate, a $100,000 household pays $20,000 in taxes, whereas a $20,000 household pays $4,000. In dollars alone, this can appear to be progressive.

The first two tables come from an experiment in which we asked subjects about their attitudes about both the level of taxation, as in Table 1, and the slope of its distribution, as in Table 2 (McCaffery & Baron, in press). There were four types of taxpayers: single persons, married equal-earner couples with incomes presented on a per person basis (Equal 1), married equal-earner couples with incomes presented per couple (Equal 2), and married one-earner couples, all with and without children. The experiment was concerned

with how subjects accommodated for marriage and children, but also gives a good look at the metric effect.

We asked subjects simply to fill in blanks for how much they thought each household/couple ought to pay, at four income levels: $25,000, $50,000, $100,000 and $200,000. Sometimes we asked the subjects to use dollars, others times percents. Table 1 gives the mean responses across all income categories for the various household types, with the answers given in dollars converted into percent — that is, with the metric effect eliminated from the presentation of the results.

	Single	Equal 1	Equal 2	One-earner
Answer in dollars:				
No child	14.7	14.0	13.8	13.4
Child	12.4	13.3	12.5	11.9
Answer in percent:				
No child	17.5	17.6	17.3	16.5
Child	15.1	17.4	15.2	14.7

Table 1. Mean responses (in percent) to question about fair taxes.

Note that the levels are consistently and significantly higher when the answers were given in percent.

Table 2 shows that the *slope* of desired progression is also higher when the question is asked in percent. There is a "progressivity" illusion, of sorts, when the values are given in dollars.

	$25,000	$50,000	$100,000	$200,000
Dollars	9.3	11.7	15.2	16.8
Percent	9.2	13.0	18.8	24.6

Table 2. Mean fair taxes (in percent) as a function of income

Penalty Aversion and the Schelling Effect

People do not like "penalties," they do like "bonuses." But in standard economics, these are simply two sides of the same coin: a bonus is the absence of a penalty, a penalty the absence of a bonus. Thaler (1980) famously observed that real people will use cash to avoid a "penalty" on using credit cards to buy gas at the pumps, but will foreswear the cash and use credit cards when it is "only" a matter of not getting a bonus for using cash — with both choices on the very same facts (e.g., $1.90 for cash, $2.00 for credit card).

The problem abounds in tax. A child bonus is a childless penalty, a marriage bonus is a singles penalty, and so on. We hypothesized that subjects would have a more positive impression of a policy stated in its "bonus" than in its "penalty" frame. Following a classroom demonstration from Thomas Schelling (1981), we also suspected that the effect would be exacerbated by progressive rates. Schelling asked his students if they thought that there should be a larger child bonus for the rich or for the poor. Students answered for the poor. But he next pointed out that this rule presumed a childless default; if we start with the assumption that people have children, what is needed is a childless penalty to achieve the same result. Should this penalty be steeper for rich or for poor? Students predictably, and quickly, reversed their preferences, in what we dub the *Schelling effect*, an interaction of penalty aversion and a certain progressivity illusion.

In McCaffery and Baron (in press), we found several instances of this effect, involving penalties and bonuses for marriage as well as for children (or childlessness). We presented items like the following:

> A married couple with one income of $25,000 pays $3,000 in taxes. The same income earner, if not married, would pay a surcharge of $2,000.
>
> A married couple with one income of $100,000 pays $30,000 in taxes. The same income earner, if not married, would pay a surcharge of $6,000.

For each item of this sort, another item had exactly the reverse situation, in which the taxes of the unmarried earners were $5,000 and $36,000, respectively, and the *bonuses* were $2,000 and $6,000, respectively.

The subjects were asked the following question (with "bonus" substituted for "surcharge" when needed):

How fair is the allocation of the surcharge to high and low income taxpayers?	How fair is this surcharge on the whole?
Much too much for high income, much too little for low	As fair as possible
Too much for high, too little for low	Very fair
A little too much for high, a little too little for low	Somewhat fair
A little too much for low, a little too little for high	Somewhat unfair
Too much for low, too little for high	Very unfair
Much too much for low income, much too little for high	As unfair as possible

In every case, far more subjects showed the predicted pattern than the reverse pattern. That is, first, they judged bonuses as fairer than penalties, even though they were identical but simply described using different baselines (married or single, with or without children). Second, they judged the bonus as too high for high income and too low for low income, but they judged the surcharge (penalty) as too low for high income and too high for low income. We thus confirmed the existence of both penalty aversion and the Schelling effect in tax.

Disaggregation Bias

One of the striking features of the U.S. tax system in the last half century has been the rise of social security and medicare contributions, or payroll taxes. Such taxes now account for

roughly 80 percent as much income as personal income taxes. The facts that the payroll tax is flat, even regressive, has led to an increasing number of criticisms, and suggestions that the system should be integrated with the income tax.

But it should not matter, were people fully rational. Whatever the level of progressivity in the payroll tax can be counterbalanced by changes in the income tax. As long as a policymaker has full degrees of freedom in one tax having the same base as another tax, she can effect the same global distribution of tax burdens as if she had control over the whole. It should not matter that taxes are split in two.

Yet it does matter. In the strongest confirmation of the *isolation effect* we found, our experiments showed that subjects were apt to focus on the one tax they were asked to evaluate, not factoring in a parallel tax easily available to their recall.

In one experiment reported in McCaffery and Baron (2003), we simply asked subjects to fill in the blanks. After an initial page in which we gave instructions, stipulating that the bases of the "income" and "payroll" taxes were identical, we presented a series of screens. Sometimes we listed a payroll tax, other times an income tax. For each tax, we had four levels and rates of graduation, across households with incomes of $20,000, $40,000, $80,000, $160,000, and $320,000, including one 0 option. In half the cases, we asked subjects to set a total distribution; in the other half, we asked them to set only the "other" tax. (Also, in half the cases, we asked for the answers in dollars, in the other half in percent. We do not discuss those results here, but they provided further examples of the above-discussed metric effect.) There was no rational reason why the responses to the screens would vary *at all*. But they did.

In general, subjects failed to adjust fully for whether they were asked about the total tax or one of the two taxes. For example, across all cases, when subjects answered in percent,

the mean total tax rate was 17.35% when they adjusted the total tax and 21.87% when they adjusted one of the two taxes.

Subjects were also insufficiently responsive to changes in the given rates. They anchored on whatever rates they were given and did not adjust enough to make all the net outcomes the same. For example, total taxes were lower when the given rate was zero than when it was not.

We also looked at graduation, which we define as the slope of the percent tax as a function of income step, with each income step (i.e., each doubling of income) defined as one unit. This is logically independent of the level of taxation. Once again, the frames mattered. Subjects could have — and to be consistent, should have — adjusted what they could to produce the same level of graduation in each instance. They did not. Subjects were insufficiently sensitive to the extent to which the given, "other," tax was graduated: the aggregation frame mattered. Subjects appeared to focus only on what they were asked to judge. For example, in one case, the income tax was given as 10% for all income levels, from $20,000 to $320,000 per year. In another case, the income tax was graduated: 0% for $20,000, 5% for $40,000, 10% for $80,000, 15% for $160,000, and 20% for $320,000, leading to an impression that the average was about 10%. In the former, flat tax, case, the mean graduation rate assigned by the subject, when the subject adjusted the payroll tax and answered in percent, was 5.68% (expressed as the increased tax for each step in the scale). In the latter, graduated, case, the graduation rate was 8.33%.

Conclusions: Towards a General Theory

We continue to work on additional experiments, to refine and expand our understanding of cognitive heuristics and biases in the understanding of tax, on the general grounds that knowledge is good. Ultimately, however, there is interest in advancing a realistic normative theory of taxation. It is here, eventually, that we hope our work has its greatest payoff. What follows are some preliminary thoughts towards this end.

Why it Matters

Why does it matter that subjects have inconsistent, biased understandings of real-world tax systems? We can think of at least three reasons. These relate to the two major features of any aggregate tax system, its size and its distribution. Each can be illustrated with the example of a hidden tax, such as the corporate income tax (McCaffery, 1994a).

One, since citizens never feel that they were endowed with the money that they do not have on account of the hidden tax, cognitive psychology suggests that they will underreact to its loss. Hidden taxes will flourish. In general, the tax system will gravitate towards taxes that impose the minimal psychic pain, and expenditures that maximize psychic pleasure. But to the extent that money is a real good, capable of financing real improvements, there can be an opportunity lost for betterment. If citizens can come to understand the true incidence of hidden taxes, they will insist on the same level of welfare economic improvement in the use of these funds as any other.

Two — on the other side of the same coin — the intuitive judgments that we have found will also lead citizens to oppose new tax initiatives that will increase taxes but save money elsewhere. Pure tax aversion might have this effect, if (as we tentatively found)

it is stronger when taxes are not the status-quo. Also, the new taxes would be explicit, not hidden. Thus, for example, increased funding of health care from taxes might save more money elsewhere. And more use of taxes to fund research and development into new drugs could assure a more equitable distribution of the benefits of research, and also lower prices for drugs. Finally, invention and creation could be subsidized in various ways through taxes (as scientific research often is subsidized now), thus leading to lower costs through reduced use of monopoly pricing. All of these reforms cannot occur unless people learn to think about taxes without the isolation effect that we have found. They need to see the big picture.

Three, moving from allocation to distribution, we note that there is no clear, objective, universally accepted benchmark for optimal distribution or redistribution. But there is reason to believe, as we have found, that the degree of public support for distribution or redistribution is sensitive to the purely formal mechanisms of public finance — again contrary to the dictates of standard welfare economics. How much we redistribute resources or promote equality as a society should depend on matters more fundamental than whether we are asking if the glass is half full or half empty.

What is to be Done?

We propose to continue our research agenda, and we hope that others join us. We have begun to explore the possibilities of various *debiasing* mechanisms, or techniques to lessen or eliminate the effects of the heuristics and biases we have found. But there is reason to be skeptical that these will fully succeed, given the depth of some of the mental habits, the complexity of tax, and the low payoffs for individuals for fully understanding tax. Absent effective public education and debiasing, researchers may begin to consider various in-

stitutional mechanisms for constraining legislators from exploiting widespread cognitive error.

The alternative, an unhappy one we fear, is to do nothing.

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