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THE PRICE ELASTICITY OF MASS PREFERENCES

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I compare the price elasticity of economic and political preferences. My central hypothesis is that willingness to pay, whether expressed verbally or through cash transactions, is more price-elastic for economic consumption goods than for public goods. I find that increases in price greatly diminish the proportion of people willing to pay for consumer goods, such as housing or hardback books; whereas the proportion willing to pay more in taxes to support a public good, such as environmental protection or shelter for the homeless, is much less responsive to changes in price. I conclude by discussing the theoretical and political implications of willingness to pay for public and private goods.

Voters and customers are essentially the same people. Mr. Smith buys and votes; he is the same man in the supermarket and in the voting booth.

—Tullock, *The Vote Motive*

One of the most provocative findings in public opinion research is that tangible personal interests are seldom correlated with policy opinions. The opinions of the employed and unemployed differ only slightly on issues such as whether government should guarantee employment or expand public works programs (Sears et al. 1980; Schlozman and Verba 1979). Much the same may be said of the differences between parents and nonparents on the issue of busing (McConahay 1982; Sears, Hensler, and Speer 1979), men and women on women's rights or the Equal Rights Amendment (Mansbridge 1985; Shapiro and Mahajan 1986), and the medically indigent and those with health coverage on the question of national health insurance (Green 1988; Sears et al. 1980). True, homeowners are at times significantly more receptive to property tax reductions than renters (Sears and Citrin 1985), and smokers more hostile to cigarette taxes and smoking restrictions than non-smokers (Green and Gerken 1989). But such discrepant cases are overwhelmed by evidence showing the limited influence of narrow self-interest on opinions toward policies such as bilingual education (Sears and Huddy 1987), affirmative action (Kinder and Sanders 1990), energy conservation (Sears et al. 1978), escalation of the Vietnam War (Lau, Brown, and Sears 1978), income redistribution (Kluegel and Smith 1982; Verba and Schlozman 1977), and social security (Beck and Dye 1982; Lau and Sears 1981). In sum, although policies are invariably more costly to some individuals than to others, personal costs and benefits are poor predictors of how people wish government to act.

Such findings run counter to the widely held assumption that political preferences are rooted in selfish and materialistic motives, an assumption that turns up in the writings of Aristotle, Locke, Madison, Marx, Schumpeter, and others (see Green 1988; Mansbridge 1990). But what makes these results especially intriguing is that self-interest seems to fare

quite well in other disciplines, notably economics. The empirical literature on the behavior of consumers and firms is replete with illustrations of how ordinary people respond to prices in an effort to buy cheap and sell dear (Bolton 1989; Monroe 1979; Tellis 1988). Even scholars who emphasize the moral or affective dimensions of economic behavior (Collard 1978; Etzioni 1986, 1988) acknowledge that as a rule, a rise in price reduces quantity demanded.

However plausible it may be to suppose that direct personal costs have more force in economics than politics, one must be cautious about comparing the empirical work in the two disciplines. There are important methodological differences between economists' and political scientists' ways of assessing the influence of tangible personal costs. Economists tend to examine the extent to which price changes affect aggregate sales, whereas political scientists tend to study how individuals react to changing incentives. Moreover, economists typically study situations in which prices are stated explicitly to consumers, whereas in public opinion research voters are left to figure out for themselves what a policy will mean for their pocketbooks. Thus, in the absence of a direct empirical test, one cannot rule out the possibility that the apparent contrast between economic and political decisionmaking is to some degree artifactual.

I shall attempt a systematic comparison of the price elasticities of economic and political preferences. I begin with a discussion of the definition and measurement of the key terms in this study: *willingness to pay*, *asking price*, and *price elasticity*. Using a combination of survey data collected between 1940 and 1990, experimental evidence about consumer behavior, and records of employee contributions to the United Way, I assess the hypothesis that willingness to pay (whether expressed verbally or through cash transactions) is more price-elastic for economic consumption goods than for public goods. Small increases in price are found to reduce sharply the proportion of people willing to pay for consumer goods. By comparison, the proportion willing to pay more in taxes to shelter the homeless or protect the environment is less responsive to price changes. I consider a number of potential explanations for the contrast between public

and private goods, then conclude by discussing some of the political implications of the electorate's inelastic demand for public goods.

CONCEPTUALIZATION AND MEASUREMENT

Willingness to Pay

Research on the public's willingness to pay for various goods and services spans several disciplines. Market researchers ask people how much they would be willing to pay for new products. Pollsters interested in the popularity of certain policy initiatives test the depth of public support by asking citizens whether they would be willing to pay more in taxes in return for certain government services. Students of consumer behavior measure the price ranges that shoppers find acceptable for various products. Economists, too, have employed survey research methods in order to assess the public's contingent valuation of various public, or nonmarket, goods.

Notwithstanding the frequency with which it is used, *willingness to pay* remains a somewhat ambiguous construct.¹ The fact that someone verbally expresses a willingness to pay a given price for a certain good implies neither that a purchase at that price is imminent nor that the individual intends to make the purchase in the future. In this sense, verbal expressions of willingness to pay are distinct from behavior, as well as from behavioral intention. Nevertheless, willingness to pay is thought to have behavioral implications. In the economic realm, one would expect those who say they would pay \$50 for a hand calculator to be more likely to make such a purchase than those who express unwillingness; in the political realm, one would expect those expressedly willing to pay \$50 more in taxes for local schools to be more likely to vote in favor of such a ballot measure than the expressedly unwilling.

Just how well behavior may be predicted by willingness to pay is a matter of considerable disagreement. Some scholars regard utterances of this sort with suspicion, arguing that people have strategic incentives for concealing or misrepresenting their true behavioral predispositions (Samuelson 1954). Economists, in particular, opine that in the absence of real budget constraints, talk is cheap, and purported willingness invariably outstrips effective demand. Another common criticism is that people have strategic incentives to understate their willingness to pay "if they believe they will actually have to pay the amount they reveal, and believe also that there is a good chance the good will be provided even if they understate their true [willingness-to-pay] amount" (Mitchell and Carson 1989, 128). In spite of these measurement problems, there seems to be a persistent correlation between these kinds of verbal expressions and actual purchasing behavior (Banks 1950; Gabor 1985; Green and Tull 1978; Udell 1965). Moreover, experimental evidence suggests that people

tend to report essentially the same willingness to pay regardless of whether they are required to back up their responses with cash payment (Bohm 1972; Dickie, Fisher, and Gerking 1987).

In order to satisfy both sides of this dispute, I examine actual spending behavior, as well as verbal expressions of willingness to pay. Interestingly enough, the distinction between economic and political decisions is about as clear for cash transactions as it is for verbally expressed willingness to pay. This is not to deny the potential differences between payment and willingness to pay. The point is, rather, that analyses of both dependent variables support the theoretical argument.

Price Elasticity

By *price elasticity*, I mean the rate at which willingness to pay declines as price increases. Placing asking price on the x-axis and the proportion of people willing to pay on the y-axis (Figure 1), one may draw the distinction between *inelastic demand* (the near-horizontal line) and *elastic demand* (the near-vertical line). In the former case, large increases in price produce little change in willingness to pay; in the latter, small price increases produce large changes.²

I have chosen to draw curves in Figure 1 rather than straight lines for two reasons. First, I wanted the diagram to reflect the fact that willingness to pay a given price is a dichotomous dependent variable. Since probabilities range between zero and one, it is conventional to conceive of the dependent variable in logistic terms, wherein each unit along the y-axis represents a one-unit change in the log-odds of willingness to pay (Maddala 1988).³

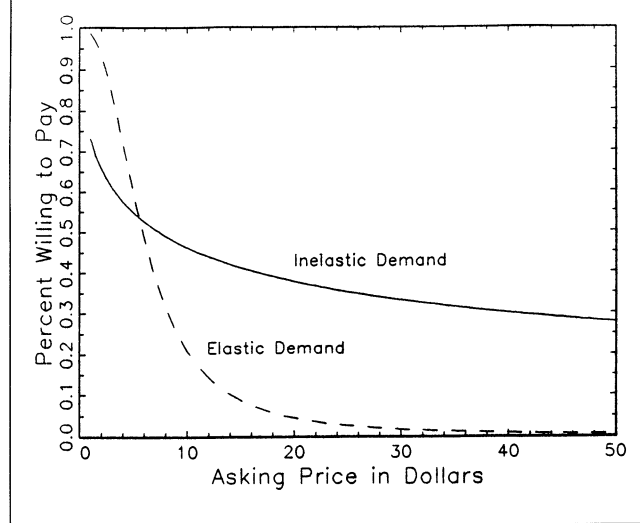
Second, intuition suggests that the independent variable (price measured in dollars) will not bear a linear relationship to the dependent variable. To measure price in dollars implies that a \$1 change in price has the same impact on willingness to pay regardless of whether this change is from \$1 to \$2 or from \$101 to \$102. Previous work on price perceptions and historical patterns of demand shows this assumption to be implausible (Cameron and Huppert 1989; Nicholson 1984, 179–80). This research, as well as the data I shall examine, indicates that the fit between actual and predicted willingness to pay is vastly improved when the natural log of price is used in place of the absolute dollar value. My analyses therefore assume that the log-odds of willingness to pay is a linear function of the log of price. Had I redrawn Figure 1 with logits on the y-axis and the log of price on the x-axis, the two curves would have been straight lines.

How is an analysis of this sort constructed? By way of illustration, suppose n people are asked

1. Would you be willing to pay \$10 for a bundle of good X?

Those who respond *no* are then asked

2. Would you be willing to pay \$5 for a bundle of good X?⁴

Figure 1.**Elastic Versus Inelastic Willingness To Pay**

The frequency distribution of the responses, where A , B , and C are the numbers of people responding in different ways, is

yes to question 1 (willing to pay \$10)	A
yes to question 2 (willing to pay \$5 but not \$10)	B
no to question 2 (unwilling to pay \$5)	C
Total	n

A cross tabulation of price with willingness to pay would look like this:

Willingness to pay	\$5	\$10
Willing	$A+B$	A
Unwilling	C	$B+C$

Thus, the log-odds ratio is

$$\ln \left[\frac{A \cdot C}{(A+B) \cdot (B+C)} \right]. \quad (1)$$

Equation 1 has three implications. First, the slope is undefined if either A or C equals zero. In other words, if the asking prices are too high or too low, it will be impossible to determine the elasticity.⁵ Second, if B is zero, the slope estimate will be zero. This, too, makes intuitive sense; for if no one settles for an intermediate price, price lacks causal power.⁶ As a practical matter, it is important for the survey researcher to select a range of prices that will produce at least some degree of variability in willingness to pay. Finally, it is apparent that for a given A and C , the slope estimate decreases (becomes more elastic) as B increases. Thus, the more people who settle at an intermediate price (*ceteris paribus*), the greater the price elasticity.

In order to calculate the price elasticity for good X , one divides the log-odds ratio by the change in the natural log of price, in this case .69.⁷ Provided the

log-odds ratio is not undefined, this elasticity represents the change in the log-odds of willingness to pay that results from a one-unit change in the log of the asking price. Or, to state the result more cautiously, the estimate reflects the best guess of the price elasticity within the range of prices bounded by A and C .

Three other methodological caveats are in order. For this analysis to be meaningful, respondents cannot be exempt from the asking price. The fact that between 80% and 87% of nonsmokers favor raising cigarette taxes 5, 10, or 20 cents says little about willingness to *pay* (Green and Gerken 1989). More relevant would be the views of smokers, who are subject to the tax. Second, it is important that the distribution of willingness to pay not be truncated or censored by the use of "filter questions" that are themselves measures of willingness to pay. For example, a 1976 General Electric Quarterly Survey asked respondents whether they would be likely to purchase an electric car and if so, how much they would be willing to pay. This procedure leaves unmeasured the willingness to pay of those not likely to buy. It would be hasty to impute to them a willingness to pay of zero, since they may have had in mind an anticipated purchase price when answering the filter question. To discard these observations would almost certainly lead to biased estimates (Maddala 1988). Therefore, I have excluded a handful of survey items that were preceded by filter questions of this kind (see end of Appendix B).

Finally, in order to facilitate a comparison of demand for public and private goods, it is best to minimize extraneous substitution effects. Appliance stores, for example, feature many comparable brands of consumer durables, so that if one brand goes up in price, people will switch to others (Abrams 1964; Jones 1975). In this situation, price elasticity for a particular brand is greater than the elasticity for the product class (e.g., refrigerators) as a whole. Thus, when gathering data on consumer preferences for private goods, I have ignored the literature on market share and restricted my attention to cases in which people are asked whether they would pay for a type of product.

DATA AND MEASURES

The data analyzed in this paper are drawn from three sources: surveys, experiments, and United Way fund-raising records.⁸ In each case, people are asked whether they would be willing to pay for a particular good, be it hardcover books, shelter for the homeless, or commercial-free radio.⁹ The survey data were obtained from on-line searches of the Harris, Roper, and Inter-University Consortium for Political and Social Research question text data bases and from manual searches of local, state, and national polls archived at the Roper Center. Experimental data were gleaned from secondary sources. United Way records

were made available to me by the payroll departments of three large firms in the greater New Haven area.

Over the past 50 years, pollsters and market researchers have devised several ways to offer people different prices. One is to divide the sample into random subgroups and pose a different price to each subgroup. Another approach is to present all respondents with a single price and then ask a follow-up question at a higher or lower price, as in the good X example. Another is to present respondents with a range of different prices simultaneously and ask which is the highest price they are willing to pay. Finally, one may simply ask respondents how much they are willing to pay, without offering any response categories.

Although equivalent in principle, the psychological effects of each question format are likely to differ. When two randomly assigned groups confront different prices, the effects of price tend to be weaker than when the same people face a series of prices (Ehrenberg and Mills 1990; Kosenko 1989; Monroe 1977; Petroschius and Monroe 1987). In the former case, subjects receive no initial price with which to contrast subsequent prices; and the difference between \$20 and \$25 may fail to produce variation in willingness to pay. The effect of asking respondents to name their prices probably falls in between these two formats. As long as there is variation in the prices named, willingness to pay will fall with price; there is no such guarantee that this will happen when groups are randomly assigned a single price. On the other hand, in the absence of structured response options, responses may become less reliable, and therefore less price-elastic.

One also needs to guard against framing effects that may distort the results. When respondents are asked a long battery of questions concerning their willingness to pay for various goods, they gradually become more thrifty. Thus, willingness to pay becomes confounded with the extent of one's prior expressions of willingness. Similarly, how people react to prices may be conditioned by the prices they received earlier for previous goods. For these reasons, two cases have been dropped from the analysis.¹⁰

In sum, various methodological considerations led us to restrict the analysis to just 45 items, covering 38 different kinds of goods. These survey questions are described in Appendix B. Despite my selectiveness, this data set remains methodologically heterogeneous. For this reason, I shall now evaluate the robustness of elasticity estimates across time, question format, and question sequence.

DATA ANALYSIS

The Robustness of the Elasticity Estimates

Before taking up the question of whether political goods are less price-elastic than economic goods, one

must first ask whether it is meaningful to speak of enduring "parameters" that represent the price elasticity of willingness to pay for a given public or private good. After all, if the estimated price elasticity for a particular good varies substantially from one setting to the next, the utility of studying patterns in the public's willingness to pay is called into question. On the other hand, if parameter estimates display stability over time, then a minimum condition for proceeding with the analysis has been met.

Three sets of questions are available for across-time comparison.¹¹ Californians in 1988 and 1989 were exposed to virtually identical questions about paying more in taxes to provide shelter for the homeless. Willingness to pay proved to be significantly greater in 1988 than in 1989 ($p < .05$); yet the elasticities are quite similar across the two samples ($-.27$ vs. $-.35$), and the difference between them is not significantly different from zero ($p > .05$). Michigan respondents were asked in 1972 and 1974 about their willingness to pay more in state and local taxes for law enforcement. The only variation in question wording was that 1972 respondents were informed that average per capita expenditures in this area were \$36, whereas in 1974 this amount was changed to \$45 (see Appendix B). Although respondents were significantly more willing to pay higher taxes in 1974 than in 1972 ($p < .05$), the elasticities ($-.65$ and $-.54$) are not statistically distinguishable from one another ($p > .05$). Finally, four national surveys between 1973 and 1987 asked Americans whether they would be willing to pay more in taxes in order to fund artistic and cultural activities. Question wording and order varied somewhat; and again, the mean level of public support changed significantly from one survey to the next. Yet the four elasticities are almost identical ($-.53$, $-.46$, $-.52$, $-.54$). Pooling the data and comparing constrained and unconstrained likelihoods shows that the small differences between elasticities may be attributed to sampling variability ($p > .05$).

Elasticity estimates also seem to be quite robust across variations in question wording at any given point in time. Kahneman (1986) conducted an experiment in which Ontario respondents were asked about their willingness to pay higher taxes to fight water pollution and preserve fishing in the region. The definition of the region, however, varied from one experimental group to the next. Some respondents were asked about their willingness to pay to preserve fishing in Muskoka; others, Haliburton; others, Ontario as a whole. The three elasticities are quite similar (-1.39 , -1.50 , -1.47 ; $p > .05$), despite the fact that the cleanup of all of Ontario was 5–15% more popular than the other cleanup proposals.

These results suggest that the price elasticities associated with particular goods have an enduring quality; for even as goods grow or diminish in attractiveness, their elasticities remain stable over time and amid variations in question wording. Adding to the strength of these results is a recent study of the British public's willingness to pay for British Broadcasting Corporation channel 1 television on a sub-

scription basis, indicating that elasticity estimates also tend to be relatively insensitive to the form in which prices are stated. Respondents to different surveys conducted during 1989 and 1990 were offered prices ranging from £44 to £240 per year on an annual or monthly basis, depending on the survey (Ehrenberg and Mills 1990, 13). These data yield elasticities of -1.70 and -1.76 ($p > .05$) for annual and monthly question formats, respectively. In essence, the shape of the willingness-to-pay distribution remains unchanged across equivalent price ranges expressed in different units, despite the fact that the mean level of willingness to pay is significantly higher ($p < .05$) when prices are asked in terms of monthly rates.

Finally, one may gauge the robustness of price elasticity estimates across variations in question sequence. The results concerning cultural activities give a preliminary indication that variations in question order do not alter the results dramatically. A more rigorous test is made possible by a 1963 National Opinion Research Center split-ballot experiment in which people were asked whether they would be willing to pay for a household device designed "to alert the population in case the United States were to be attacked by an enemy." Respondents were randomly assigned to one of four initial asking prices ranging from \$5 to \$20. After responding to the first price, subjects were asked to respond to the three other prices; thus, some respondents received the prices in ascending order, others in descending order. As one might expect, random assignment of price generates an elasticity estimate that is somewhat weaker than that produced by an ordered series of price offers ($-.76$ vs. -1.00 ; $p < .05$).¹² But (as I shall demonstrate) this range of variation is dwarfed by the variation between the elasticities of consumer goods and public goods. In other words, question format may alter the estimates somewhat, but not enough to affect the overall pattern of results.

The Consistency of Price Elasticities across Subgroups

My procedure for evaluating price elasticity presupposes that the influence of price is constant across all the individuals within a sample. Ignored, therefore, are variations in cost sensitivity that might arise because some people are strapped for cash or committed to a political ideology that stresses fiscal restraint. Before turning to the comparison of public and private goods, I take note of the fact that elasticity estimates seem not to vary markedly from one subgroup to another.

Consider, for example, willingness to pay to support the arts and cultural activities in 1973. As one would expect, the frequency with which people attend artistic performances is a strong predictor of willingness to pay: 62% of those Farrell characterizes as "frequent cultural attenders" were willing to pay \$50 more in taxes, as opposed to 17% of "cultural nonattenders" (1975, pp. 6, 112). But despite the

sharp difference in *mean* willingness to pay, the elasticities for the two groups were $-.54$ and $-.48$, respectively.¹³ Very similar results obtain when one stratifies the sample by income, age, education, region, or race. For example, although willingness to pay increases sharply with income, elasticities for those making less than \$5 thousand, \$5–10 thousand, \$10–15 thousand, and over \$15 thousand turn out to be quite close ($-.49$, $-.48$, $-.51$, and $-.57$, respectively) and not significantly different from one another ($p > .05$).

These results are corroborated by other investigations of this sort. In an earlier work, I analyzed willingness to pay for (1) shelters for California's homeless, (2) an expanded subway system in Los Angeles, and (3) reductions in water pollution. In each case I found that elasticity estimates varied little across categories of income, ideological self-designation, and region (Green 1988). Similarly, Ehrenberg and Mills (1990) found that the elasticity of willingness to pay for subscription television varied little among groupings of social class and amount of television viewing; results presented by Cameron and Huppert (1989) indicate that the dispersion of anglers' willingness to pay to support fish hatcheries in the San Francisco Bay did not change when controls were added for income, number of fishing trips in the past year, and boat ownership; and Adam's (1958) study of willingness to pay for clothing and durable goods turned up little variation in elasticity across income and occupational strata. In short, while groups vary with respect to their mean level of willingness to pay, the rate at which willingness to pay changes with price is remarkably consistent across groups. In light of these findings, I feel confident that the strategy of treating samples in an undifferentiated way does not distort my conclusions.

THE CONTRAST BETWEEN POLITICAL AND ECONOMIC GOODS

Are public/political goods more price-elastic than private/economic goods? Let us begin by developing standards by which to distinguish between public and private goods. Four criteria suggest themselves:

1. *Excludability versus equal entitlement.* Who is entitled to use the good? In the field of economics, public goods are defined as those which, once produced, may be consumed by anyone. National defense and wildlife preserves, for example, represent public goods because no citizen may be prevented from consuming them (Nicholson 1984).¹⁴
2. *Individual versus collective payment.* Is payment to be an individual or collective act? One may distinguish between purchases that are made in concert with others (e.g., through taxes or contributions) and transactions in which the purchase results from an individual's action (e.g., an exchange transaction). The former brings to mind an additional psychological

TABLE 1

Classification of Goods along the Public-Private Continuum

<i>Private.</i> Exclusive and personal consumption and individual payment; not associated with the public welfare: toilet soap, subscription television (BBC channel 1), lottery tickets, pay-per-view baseball television, newly introduced communications product, refrigerators, nylon stockings, hardcover books, newspapers, housing, and health insurance.
<i>Semiprivate.</i> Exclusive and personal consumption and individual payment; associated with the public welfare. Exclusive and personal consumption but collective payment; not associated with the public welfare. Or personal consumption and individual payment but semiexcludable. Examples are safety caps on prescription bottles, Swedish television comedy show, and recreational fishing.
<i>Mixed.</i> Exclusive and personal consumption of the product to be taxed but nonexclusive personal consumption of the good funded by the tax; collective payment imposed only on those who consume the product; associated with the public welfare: cigarette tax designed to reduce a budget deficit gasoline tax designed to build roads gasoline tax to reduce dependence on foreign oil sales tax to fund World War II war effort civil defense alarm increase in monthly electricity bills for pollution abatement increased taxes and consumer prices for clean drinking water increased gasoline prices to sustain Iraq oil embargo anglers' support for fish hatcheries and habitat restoration
<i>Semipublic.</i> Nonexclusive consumption and collective payment; associated with the public welfare. However, the good may be consumed personally: preserving fishing in Ontario lakes fighting pollution in the state's fresh water lakes artistic and cultural activities building a subway to combat pollution and traffic congestion commercial-free radio planting trees in a nearby park fighting crime in one's state cleaning the environment in one's state increased family expenses to improve the environment
<i>Public.</i> Nonexclusive consumption and collective payment; associated with the public welfare; unlikely to be consumed personally: shelter for the homeless, reducing the federal deficit, cleaning up the environment, clean air, clean water, and saving endangered species.

cal consideration: To what extent should the collectivity take action on behalf of this objective?

3. *Personal versus social consumption.* Is the good in question of personal use to the person being asked to pay? Or does it primarily meet social needs that are more or less independent of the personal needs of the purchaser? When one pays to supply coffee in one's office or clean up air pollution in one's locality, the benefits of doing so are likely to be felt personally. At the opposite end of the continuum are donations designed to combat starvation in a distant country, a program that is likely to have no tangible impact on the donor.¹⁵

4. *Public welfare goods versus non-public welfare goods.* What ends are served by the good in question? Even goods that are consumed personally, such as safety caps on prescription bottles, may serve a broader social purpose.

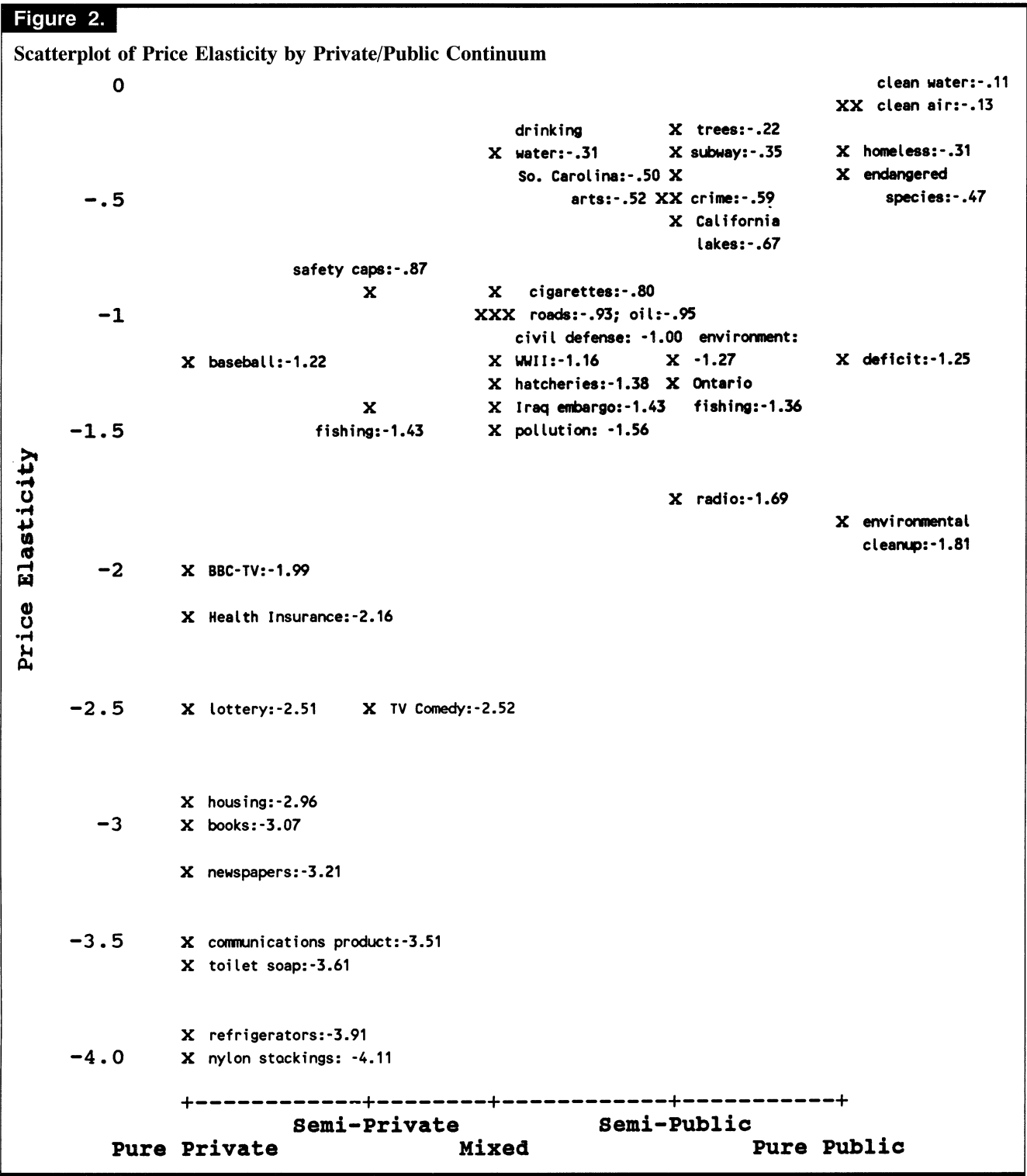
Using these criteria, I classified the 38 types of goods along a five-point scale (See Table 1). On one end of the continuum are goods that may be classified as private by all four criteria; on the other, those which are wholly public.¹⁶

Is there a relationship between the public-private

continuum and price elasticity? Price elasticities were calculated for each good. Where duplicate questions existed, the elasticity estimates were derived from analyses in which the data sets were pooled. Figure 2 presents the elasticity estimates in the form of a scatterplot. The strong upward tendency of the points (Spearman's $\rho = .74$) indicates that the elasticity of private/economic goods is considerably greater than the elasticity of public/political goods.¹⁷

SOME STATISTICAL REFINEMENTS

Although it is gratifying to see the contrast between public and private goods emerge so clearly, the analysis requires some refinement, since the elasticities for certain public goods are so weak as to be anomalous. Take, for example, a good such as shelter for the homeless, which has an elasticity of $-.31$ and, in 1988, an intercept of 2.3. The hypothesized linear relationship between the log-odds of willingness to pay and the log of price fits the data quite well within the \$5-\$50 range of prices presented in the survey ($\chi^2_{(2)} = 1.95, p = .38$); yet if one were to extrapolate



beyond the range of the data, one would draw the implausible conclusion that 54% of the California public were willing to pay a thousand dollars more in taxes.

This kind of anomaly would seem to suggest that elasticities increase at higher price ranges. To test this proposition, I took a closer look at three goods in my data set that were offered at widely varying price ranges: British Broadcasting Corporation subscriptions (a private good), anglers' support for fish hatcheries (a mixed good), and efforts to preserve endangered species (a public good). In each instance, there is strong evidence of acceleration of price elasticity. As shown in Table 2, a significant improvement in fit occurs when one models the process of acceleration by including a quadratic logged price term.¹⁸ Inter-

TABLE 2		
The Effect of Price on Willingness to Pay, Accounting for the Acceleration in Price Elasticity		
VARIABLE	LOGIT ESTIMATE	STANDARD ERROR
Preserving endangered species ^a		
ln(Price)	.479	.088
ln(Price) ²	-.190	.018
Intercept	-.327	.044
Anglers' support for fish hatcheries ^b		
ln(Price)	.101	.298
ln(Price) ²	-.210	.047
Intercept	1.865	.475
Subscriptions to BBC channel 1 ^c		
ln(Price)	.136	.794
ln(Price) ²	-.244	.092
Intercept1	4.190	1.730
Intercept2	4.764	1.720

Note: Estimates were obtained by maximum likelihood. ln(Price) represents the natural log of the asking price. Intercept1 refers to the intercept for cases gathered using a maximum price response format; Intercept2 is the corresponding intercept for cases gathered using a Gabor-Granger method (see Ehrenhart and Mills 1990). L_1 represents the log-likelihood for the quadratic model; L_0 , the model without the quadratic term. $df = 1$, $p < .05$.

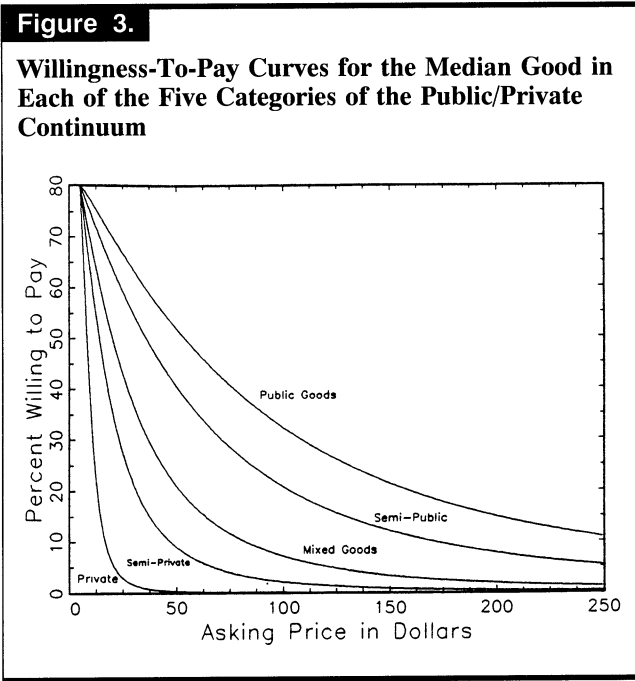
^a $-2\ln\left(\frac{L_1}{L_0}\right) = 231.9$.

^b $-2\ln\left(\frac{L_1}{L_0}\right) = 20.8$.

^c $-2\ln\left(\frac{L_1}{L_0}\right) = 6.3$.

estingly, the rate of acceleration turns out to be quite similar for each of the goods. If anything, the estimates suggest that the rate of increase in elasticity is faster for goods that are private in character (nonsignificant, $p > .05$). The conclusions to be drawn from this digression are threefold. First, once the rate of increase in elasticity is taken into account, anomalies such as the one mentioned disappear. If willingness to pay to shelter the homeless is assumed to follow a trajectory similar to other high-priced goods, the predicted level of support for a thousand-dollar tax would be a more plausible 7%. Second, the notion that higher prices elicit more price-elastic responses accounts for two of the most troublesome outliers in Figure 2, deficit reduction and cleaning up the environment (both relatively price-elastic but classified as pure public goods). Had the prices offered for these goods varied between \$10 and \$50, rather than between \$100 and \$500, the elasticity estimates would probably have fallen within the range of $-.30$ to $-.60$. Finally, while the elasticity estimates in Figure 2 are to some extent conditional on the range of asking prices presented to respondents, the contrast between public and private goods persists when the rate of acceleration is taken into account.

Figure 3 illustrates the differences among the five



categories of public and private goods. In order to facilitate comparison, I have assumed that 80% of the public is willing to pay \$5 for each type of good. Each line depicts a trajectory of willingness to pay, assuming the median elasticity for private (-3.07), semiprivate (-1.40), mixed (-1.25), semipublic ($-.59$), and public goods ($-.39$). In order to take into account the acceleration in elasticity, I have assumed a quadratic effect of $-.20$ for each type of good.¹⁹ Notice that by the time the asking price reaches \$50, the five lines have diverged considerably: fewer than 1% of the public are willing to pay for the private good, whereas a majority are willing to pay for the public good. When price reaches \$250, willingness to pay for the hypothetical private good is all but nonexistent; whereas almost 15% are still willing to pay for the public good. In short, when price increases by an order of magnitude, the result is a decline in the demand for both public and private goods; but the rate of decline is much more precipitous for the latter.

IS THE PRICE-QUALITY RELATIONSHIP A CONFOUNDING FACTOR?

So far, I have considered just one kind of price effect: the negative influence price exerts on demand through the operation of budget constraints. There is, however, a countervailing price effect, which stems from the fact that people sometimes infer a relationship between price and quality (Lichtenstein and Burton 1989). Consumers, for example, may suppose expensive wristwatches to be higher in quality; voters may infer that a \$50 tax will rescue more homeless people than a \$5 tax. Because this type of inference

tends to reduce the price elasticity of willingness to pay, one must guard against the possibility that the public goods in my sample are more prone to price-quality imputations than the private goods.

Experimental evidence drawn from the contingent valuation literature lends little support to the idea that the perceived link between price and quality is especially strong where public goods are concerned. Brookshire and Coursey (1987) asked one set of respondents how much they would be willing to pay to finance a precisely delineated plan to plant 25 additional trees in a neighboring park. Another set of respondents were asked about the same plan, only with the understanding that the more money raised, the more trees planted. Thus, in the latter case higher expenditures seemed to translate into a higher quality public good, whereas in the former case respondents were offered a "fixed bundle" of public goods. Yet my reanalysis of these data indicates that the price elasticity is not significantly different across the two conditions ($p > .05$). Moreover, willingness to pay for a fixed bundle of trees is *less* responsive to price than most other public goods listed in Figure 2.²⁰

Another strike against the price-quality hypothesis is that the effects it ascribes to quality inferences are implausibly large. Consider, for example, what the distribution of willingness to pay to shelter the homeless would have looked like if public goods were in fact as price-elastic as private goods. In 1988, approximately 84% of the California public supported a \$5 tax to shelter the homeless; 74% favored a \$50 tax. If the elasticity were -1.5 (weak by the standards of private goods), then only 14% of the public should have supported a \$50 tax. Clearly, the difference between 74% support and 14% support cannot be ascribed to the greater effectiveness of a program funded by a \$50 tax; for (as I noted in discussing Kahneman's [1986] experiment concerning Ontario water pollution) willingness to pay is relatively insensitive to the scope of a proposed program (see also Brookshire and Coursey 1987; Kahneman and Knetch n.d.).

The final word on the influence of price-quality inferences awaits further experimentation. For the moment, I think it unlikely that imputations of quality account for the sizable differences between public and private goods; for if the scope or character of a public program were crucial, then one would expect to see a greater contrast between the elasticities associated with large programs funded by general tax increases (where an increase in price may well correspond to increased provision of a public good) and those that rely on voluntary contributions (where one's own expenditure has no real impact on the dimensions of a public good). I shall demonstrate that this contrast is all but absent.

ATTITUDES VERSUS BEHAVIOR

As I have noted, a certain amount of skepticism surrounds the use of surveys to measure willingness

to pay. For this reason, I now take up the question of how the price elasticity of willingness to pay changes when money actually changes hands. A preliminary answer is that the difference is not great. Bohm's (1972) data on willingness to pay to see a comedy special, for instance, show no significant difference ($p > .05$) between the elasticities of verbal expressions and actual payments. Nor are lottery tickets (for which people actually paid cash; Knetch and Sinden 1984) distinctive in terms of price elasticity (see Figure 2). In general, experiments comparing actual payments and verbal expressions of willingness to pay for private and semiprivate goods have drawn the somewhat surprising conclusion that the two have very similar distributions (Dickie, Fisher, and Gerking 1987; Heberlein and Bishop 1986).

Much the same argument may be made for public goods. Data on United Way contributions by employees of three large corporations in the greater New Haven area were obtained.²¹ The United Way is an umbrella organization that funds a variety of charitable organizations and programs. It is a pure public good, since payment is collective, consumption is nonexcludable, and few if any contributors benefit directly from its services. Moreover, because payment takes the form of contributions rather than taxes, those who are willing to pay do not have coercive power over others. This is significant in light of the concern that price may be regarded as an indicator of quality. Here, paying more does not mean that the United Way budget will expand proportionally. The United Way services are essentially constant across different prices to the contributor.

Price Elasticity of Contributions

What can the distribution of United Way contributions tell us about the relationship between cost and willingness to pay? The three firms surveyed vary considerably in the strength of their United Way campaigns. In Firm A, 77% of all employees contributed at least \$10 to the United Way in 1989. The corresponding figures for Firm B and C were 58% and 24%, respectively. Despite these differences, the price elasticities of United Way contributions turn out to be similar across firms (see Table 3). When we pool the three firms together, we find that the elasticity of contributions is roughly $-.3$ when the "asking price" is \$15, -1.4 when the price is \$100, and -2.3 when the price is \$500.²² There is, in other words, a close match between the results obtained from the United Way data and the earlier conclusions based on verbally expressed willingness to pay for pure public goods.

Admittedly, this brief examination of charitable contributions to the United Way cannot be construed as a representative sample of contributing behavior, particularly given the diversity of religious, political, and cultural institutions that raise money. These findings, however, are consistent with studies of donations to the Humane Society (Fraser, Hite, and Sauer 1988), the American Cancer Society (Cialdini

TABLE 3
The Price Elasticity of United Way Contributions

FIRMS	ESTIMATE	STANDARD ERROR
Firm A ^a		
ln(Price)	1.128	.171
ln(Price) ²	-.279	.023
Intercept	.097	.294
Firm B ^b		
ln(Price)	1.232	.501
ln(Price) ²	-.288	.070
Intercept	-.980	.809
Firm C ^c		
ln(Price)	1.354	.430
ln(Price) ²	-.278	.060
Intercept	-2.617	.682
All Firms ^d		
ln(Price)	1.215	.151
ln(Price) ²	-.285	.020
Firm A	-.126	.257
Firm B	-.952	.268
Firm C	-2.212	.256

Note: Estimates were obtained by maximum likelihood. ln(Price) represents the natural log of the contribution. ln(Price)² is the square of this variable. Other variables are the intercepts for each of the different corporations. Note that due to the large number of cases, the elasticities of the three firms differ by a statistically significant degree ($p < .05$), although substantively, the trajectories are quite similar.

^an = 1,615; log-likelihood = -2,162.1.

^bn = 342; log-likelihood = -406.1.

^cn = 700; log-likelihood = -584.6.

^dn = 2,657; log-likelihood = -3,161.1.

and Schroeder 1976), and political candidates in Ohio (Snyder 1991). These findings are also consistent with preliminary results from my own investigation of contributions to religious organizations, community programs, cultural institutions, and political campaigns. The only discrepant case I have encountered is the pattern of contributions to a local natural history museum, which displayed an elasticity similar to a semiprivate good. But here the money was raised through a membership drive, in which prospective donors were offered a package of benefits (free admission, a newsletter, etc.) in return for their contributions. Apparently, by marketing the consumption-related benefits associated with the museum, the fund-raising campaign increased the price-elasticity of willingness to pay; for its other campaigns, which did not solicit museum memberships, received more widely varying donations. Although the conclusions I draw from this limited sample of contributing behavior are necessarily tentative, the pattern of results is consistent with findings based on survey data.

DISCUSSION

One of the most hallowed principles in microeconomics is the idea that “a rise in price reduces quantity demanded, be it a rise in the market price of eggs, a rise in the ‘shadow’ price of children, or a rise in the

office waiting time for physicians” (Becker 1976, 6–7). The findings presented here do not dispute this claim, for even pure public goods turn out to be price-elastic. But the evidence does suggest the corollary that goods that are evaluated solely in terms of personal consumption are particularly sensitive to price. Microeconomic reasoning is not inapplicable to mass political preferences; but neither is it especially powerful. Unlike the consumer, whose willingness to pay is quickly extinguished by price increases, the voter tends to be much less sensitive to considerations of personal cost.

Consider, for example, the limited influence of cost on public opinion toward redistributive social welfare policies. As I have noted, whether the price is \$5 or \$50, a sizable majority of Californians support a program designed to shelter the homeless. Analogous results obtain when respondents’ social characteristics serve as proxy measures of price. The unemployed have more to gain from a government policy of full employment than those for whom unemployment is an unlikely prospect; moreover, the unemployed have less to lose, since the tax burden would fall more heavily on people with jobs. Yet, cross-sectional surveys of opinion show that the views of the employed and unemployed are not markedly different (Schlozman and Verba 1979); and panel studies indicate that those who experience unemployment or reduced hours during a recession do not become more supportive of policies designed to alleviate unemployment (Sears et al. 1980). Similarly, the medically indigent would benefit from a system of national health insurance at little cost to themselves; their costs would be borne by others. But despite the fact that the indigent and nonindigent would expect to pay different prices for national health insurance (to say nothing of differential benefits), the former are only mildly more supportive of the policy (Green 1988; Sears et al. 1980). In short, the costs of social welfare policies may differ from one social group to the next; but price is seldom a strong correlate of policy support.

If anything, data on the public’s willingness to pay provide more evidence of self-interest than many previous studies of mass political attitudes. Considerations of cost, for example, determine whether support for expanding government funding for the arts runs below 45% or upwards of 65%. Not so for opinions towards affirmative action, social security, aid to education, or women’s rights (see Citrin and Green 1990; Sears and Funk 1990), which show little covariation with personal costs or benefits. Two factors may account for the apparent contrast. Unlike previous research on the role of self-interest in public opinion, I have analyzed survey questions that state the price of policy support in an explicit fashion. Respondents did not have to figure out for themselves whether their jobs would be threatened by a state budget cut (Sears and Citrin 1985), whether their children would be affected by a desegregation ruling (McConahay 1982), or whether their family might experience a tragic loss at the hands of war

(Lau, Brown, and Sears 1978). Moreover, the fact that price was explicitly mentioned in the survey question meant that respondents were primed to think about considerations of cost—something that survey respondents do not ordinarily do when evaluating policy questions (Green 1988; Lau and Sears 1981; Sears and Lau 1983).²³

Yet even when costs are made salient and stated in an explicit fashion, the price elasticity of public goods lags far behind the elasticity of commercial goods. What accounts for the contrast between political and economic goods? One explanation might be that people lack a clear sense of how much public goods should cost or, similarly, how much public good can be purchased for a given price (Cox 1986; Sears and Citrin 1985). Uncertainty about the appropriate price of a political good increases the variability in willingness to pay, thereby weakening the price elasticity. The implication is that if citizens had more experience as purchasing agents for public goods, the price elasticity of willingness to pay would increase. One might add that this hypothesis would also predict that economic goods with which the public is unfamiliar will tend to have lower price elasticities. Perhaps this is why a 1959 question concerning pay-per-view cable television produced the weakest price elasticity of the 11 private consumption goods.

Experimental evidence on the role of information shows that intensive exposure to going prices for consumption goods over an extended period of time produces more price-elastic preferences (Diamond and Campbell 1989). Comparable experiments have not been undertaken using nonmarket goods. Interestingly, however, the experiments that have been performed indicate that imparting information about public goods seldom alters the distribution of willingness to pay (Cummings, Brookshire, and Schulze 1986), a conclusion that also emerges from the data presented here. Michigan respondents, for example, were told the per capita cost of law enforcement before being asked their willingness to pay for more; yet the elasticity was just $-.59$. Information about per capita expenditures on the arts prefaced a series of willingness-to-pay questions; yet the elasticities hovered around $-.52$. And although Brookshire and Coursey (1987) took pains to inform respondents about the costs and benefits of planting trees in a nearby park, the elasticity was just $-.22$. While this line of explanation is intuitively appealing, the influence of price-related information on the elasticity of public goods has so far eluded detection.

An alternative argument is that asking price is simply one of several considerations that come to mind when people make decisions (Quandt 1956). Price may, for example, compete with feelings of sympathy or ethical commitments for the attention of the decisionmaker (Etzioni 1988; Sen 1977). Deciding whether to purchase cable television brings to bear relatively few considerations that go beyond price and consumption utility. By contrast, deciding whether to support a tax increase to shelter the

homeless involves considerations such as sympathy for the destitute, the appropriate role of government, and perhaps certain racial attitudes as well. As a result, the cognitive weight assigned to price is reduced,²⁴ while variance stemming from diversity in political predispositions is injected into the distribution of willingness to pay, thereby weakening price elasticity.

The contrast between political and economic goods, according to this argument, hinges on the nature of what is to be decided. Conceivably, certain economic decisions, such as whether to purchase grapes during a farm workers strike, could involve normative considerations that distract attention away from price. By the same token, some political decisions may vary in terms of the potency and number of nonprice considerations that they raise. Over a wide variety of goods, however, this hypothesis suggests that price tends to receive less attention in the ballot booth than in the shopping mall.

A telling indication of how the absence of an ideological or moral dimension to a monetary choice affects the nature of willingness to pay may be found in Lynn's (1990) study of a restaurant that allowed its customers to choose the prices they paid for dinner entrées. At the conclusion of the meal, each customer was presented with a bill that listed four prices: a minimum price and prices 16%, 28%, and 38% higher than the minimum price. While Lynn makes much of the fact that almost half of the customers paid more than the minimum price they were offered, the results may be interpreted somewhat differently. In contrast to the relatively cost-insensitive pattern of contributions to the United Way, donations to the restaurant in Lynn's study displayed an elasticity of -21.8 ($SE = 1.8$), since just 2% of the customers voluntarily doled out the maximum asking price. Evidently, Adam Smith was right when he noted that economic enterprise could not survive on benevolence alone; for in absence of significant ethical or ideological considerations to call attention away from considerations of cost and utility, the tendency to economize asserts itself.

One further explanation for the apparent contrast between public and private goods has to do with the availability of substitutes. The market economy, one could argue, provides consumers with an array of different products to accommodate a given taste. Substitutes have the effect of winnowing the upper end of the willingness-to-pay distribution; for if the price of a television subscription becomes too high, people may satisfy their thirst for entertainment by watching movies or reading. Less winnowing occurs where public goods are concerned, one might argue, because nonmarket goods are less readily substitutable. What alternatives are available, for example, to those who wish to clean up air pollution in the Grand Canyon but discover that the price of doing so exceeds their willingness to pay?

At present, the role played by substitution effects remains an open empirical question. The literature on willingness to pay offers little guidance here; and my

data are rather ambiguous. Looking back at Figure 2, private goods would appear to be more readily substitutable. On the one hand, consumption goods such as refrigerators or new communications products (for which there are few substitutes) have sharp elasticities, while public goods such as subways or the arts (for which there are several potential substitutes) have weak elasticities. In none of the cases, however, were respondents encouraged to consider alternative means by which they might accomplish their public or private objectives.

The three explanations—price awareness, price salience, and availability of substitutes—are complementary. The next step is to assess the extent to which each factor explains the distinctiveness of public demand for nonmarket goods. If the price salience interpretation is correct, it should follow that the distribution of willingness to pay changes depending on whether respondents are primed to consider the instrumental or symbolic attributes of a particular good. If price awareness is crucial, then providing respondents with information about going prices should make preferences more elastic. And if substitution effects are important, priming respondents to consider a particular good against a backdrop of possible alternatives should enhance elasticity. The relative importance of information, symbolism, and substitutes is not only a matter of theoretical interest; it has important practical implications for those who wish to shape public opinion by enhancing or weakening the elasticity of public demand.

POLITICAL IMPLICATIONS OF THE PUBLIC'S WILLINGNESS TO PAY FOR PUBLIC GOODS

The results presented here may be regarded as something of a departure from previous findings concerning public attitudes toward taxes and spending. Since the advent of survey research during the 1930s, scholars have taken note of the "something for nothing" paradox: the fact that the public's deep-seated hostility toward taxes and "big government" coincides with its desire to see increased government spending on many (if not most) public services (Key 1961; Sears and Citrin 1985; Studenski 1939). The data analyzed here suggest that when forced to confront the trade-off between public goods and taxes, the public *is* in many instances willing to pay for increased spending in specific policy areas. Indeed, many of the surveys seem to indicate that the reservoir of willingness to pay for public goods at times runs quite deep.²⁵

The survey context, however, tends to be quite different from the political context. Virtually all of the surveys I have encountered try to "sell" the idea of a tax increase to the respondent. Even the less tendentious questions avoid all mention of considerations that might undermine public support (see Appendix B). Actual campaigns, on the other hand, tend to be

two-sided affairs; and the potency of negative symbols such as bureaucratic waste, big government, and undeserving beneficiaries is what often determines the fate of tax-related ballot measures.²⁶ The connection between survey responses and actual support for tax increases becomes more tenuous as one turns from ballot measures to legislative actions. In the survey context, respondents are asked whether they are willing to pay more to fund a particular public good. Very often, the interviewer makes the explicit stipulation that the funds generated will be used solely for the public good in question. While tax measures that feature this kind of one-to-one correspondence between revenues and expenditures arise from time to time in the form of social security taxes or war-related surcharges, many legislative acts, such as the 1990 federal tax increase, raise revenues for a host of public goods threatened by budgetary shortfalls. Under these circumstances, the level of public willingness to pay is contingent on how the public perceives the good that is to be funded through increased taxes. The public might begrudgingly accept a tax increase in return for "deficit reduction"; but tax increases designed to maintain "government services" are unlikely to have widespread appeal. Unlike law enforcement, health care, or environmental protection, nonspecific references to goods provided by government seldom prevail in trade-offs with "higher taxes" (Sears and Citrin 1985).

Finally, it should be noted that political considerations make it risky for public officials to cash in on the public's willingness to pay for public goods. Naturally, tax increases make no friends among citizens who profess unwillingness to pay the amount that is to be exacted from them. But even taxes that seem to fall below the threshold people are willing to pay may provoke electoral reprisal, since willingness to pay need not imply eagerness to pay. This, in combination with the fact that the public often loses track of the connection between revenues and services, means that public officials risk being remembered primarily as the politician who raised taxes. Small wonder that even when elected officials appear to have a clear survey-based mandate to raise taxes for the purpose of improving education, reducing water pollution, or fighting homelessness, their political instincts make them reluctant to do so.

As a practical matter, then, the percentage of the public willing to pay a given price for a collective good is a politically illusory datum. But the depth, or absolute level, of public support has not been my central concern. (Here, I depart markedly from previous research involving the valuation of public and private goods, which focuses almost exclusively on a population's mean willingness to pay.) Instead, the focus has been the *elasticity* of the public's valuation of collective goods, which is arguably more important in shaping the interplay between public opinion and policymaking. The fact that public opinion changes slowly in response to changing costs affords public officials considerable latitude in implementing policies, particularly when the policies are supported by

strong political attitudes. Enormously expensive undertakings, such as Operation Desert Storm, can be pursued on the assumption that if a majority of the public will swallow a \$50 tax hike, a sizable proportion is probably willing to go along with a tax increase of \$100.

But if inelastic demand frees the hands of policy-makers in certain respects, it ties them in others. In particular, it is difficult for public officials to garner public support for a proposed program by reducing the costs it imposes. According to my estimates, slashing a proposed \$100 tax in half tends to boost willingness to pay for a public good by only 5–10%.²⁷ Unless the supporters of an unpopular public good are willing to scale back their ambitions markedly, they will gravitate toward alternative strategies, such as redefining a good so as to appeal to the ideological or symbolic orientations of the electorate (Edelman 1964).

In conclusion, it may be said that the price elasticity of mass preferences and the nature of public discourse reinforce one another. The weak elasticity of willingness to pay for public goods reflects the extent to which questions of policy draw attention to symbolic or ideological issues. At the same time, the weak elasticity of public goods creates a system of incentives that shunts political discourse away from issues of cost or efficient alternatives, toward symbolic or ideological appeals. A similar reciprocal process seems to operate in the economic realm. The price elasticity of private goods may reflect the relative absence of considerations apart from personal utility; conversely, the potency of price may help make price-based appeals ubiquitous in the marketplace. Thus, not only are economic and political decisions different in character, but the fact that these decisions take place in different environments helps to sustain the schism between the consumer and the consumer's less price-conscious alter ego, the citizen.

APPENDIX A: LIKELIHOOD FUNCTIONS FOR WILLINGNESS-TO-PAY DATA

Maximum likelihood estimation requires one to specify the likelihood function for the observations. For the willingness-to-pay data analyzed here, this likelihood function may take one of two forms, depending on how the price questions are presented. The first likelihood function applies to surveys in which a single price is offered to each of several different subsamples (e.g., the homeless question posed to California respondents in 1989 in which half of the sample was asked whether they would pay \$10, half was asked whether they would pay \$50). Let w be a random variable representing the maximum amount each person is willing to pay to shelter the homeless. Let $\{p_1, p_2, \dots, p_k\}$ represent an ordered, nonnegative series of prices to be offered. In this case, $p_1 = \ln(\$10)$ and $p_2 = \ln(\$50)$. Finally, let $I_{\$10}^{\text{no}}$ represent the

number of people observed who refuse to pay \$10; $I_{\$10}^{\text{yes}}$ is the number willing to pay \$10. A similar notation, $I_{\$50}^{\text{no}}$ and $I_{\$50}^{\text{yes}}$, applies to the responses of the other half-sample to the asking price of \$50.

The likelihood function for the data for an arbitrary probability distribution would be

$$L = \Pr[w < p_1]^{I_{\$10}^{\text{no}}} \cdot \Pr[p_1 \leq w]^{I_{\$10}^{\text{yes}}} \cdot \Pr[w < p_2]^{I_{\$50}^{\text{no}}} \cdot \Pr[p_2 \leq w]^{I_{\$50}^{\text{yes}}}.$$

Hence, the log-likelihood would be

$$\ln L = I_{\$10}^{\text{no}} \ln \Pr[w < p_1] + I_{\$10}^{\text{yes}} \ln \Pr[p_1 \leq w] + I_{\$50}^{\text{no}} \ln \Pr[w < p_2] + I_{\$50}^{\text{yes}} \ln \Pr[p_2 \leq w].$$

If one assumes (as I do throughout) that willingness to pay is distributed log-logistically, the likelihood function for the data is

$$\ln L = I_{\$10}^{\text{no}} \ln \left[\frac{e^{-a-bp_1}}{1 + e^{-a-bp_1}} \right] + I_{\$10}^{\text{yes}} \ln \left[\frac{1}{1 + e^{-a-bp_1}} \right] + I_{\$50}^{\text{no}} \ln \left[\frac{e^{-a-bp_2}}{1 + e^{-a-bp_2}} \right] + I_{\$50}^{\text{yes}} \ln \left[\frac{1}{1 + e^{-a-bp_2}} \right]. \quad (\text{A.1})$$

This functional form extends easily to surveys that divide respondents into k different price subgroups. This likelihood function, incidently, is identical to the one used by statistical packages such as SPSS-X when they run "logit." The values of a and b that maximize this likelihood function are maximum likelihood estimates of the intercept and price elasticity, respectively.

The other likelihood function applies to cases in which a series of prices are offered to a single sample. (See the 1973 Harris questions concerning cultural facilities; the sample was offered an initial price of \$50, and those who refused were asked whether they would pay \$25.) Let $\{I_1, I_2, \dots, I_{k+1}\}$ represent the number of respondents who fall in the various intervals between and outside the k price thresholds, so that I_1 people refuse to pay p_1 , I_2 refuse to pay p_2 but agree to pay p_1 , etc. Now the log-likelihood function becomes

$$\ln L = I_1 \ln \Pr[w < p_1] + I_2 \ln \Pr[p_1 < w < p_2] + I_3 \ln \Pr[p_2 \leq w].$$

Assuming w_i to be distributed log-logistically:

$$\ln L = I_1 \ln \left[\frac{e^{-a-bp_1}}{1 + e^{-a-bp_1}} \right] + I_2 \ln \left[\frac{e^{-a-bp_2}}{1 + e^{-a-bp_2}} \right] - \frac{e^{-a-bp_1}}{1 + e^{-a-bp_1}} + I_3 \ln \left[\frac{1}{1 + e^{-a-bp_2}} \right]. \quad (\text{A.2})$$

As before, maximum likelihood estimates are generated by selecting values of a and b that maximize this likelihood function. Again, this functional form extends easily to the general case in which k prices are offered to a sample. In the text, I refer to the second

maximum likelihood estimator as “constrained logit,” so as to distinguish it from the kinds of logit routines that presuppose equation A.1. Note that if the unconstrained likelihood function is used to estimate the price elasticity when constrained logit function is the appropriate likelihood for the data, the estimates are consistent but are inefficient for $k > 2$.

When the individual w are obtained from open-ended questions, one could maximize a likelihood function based on the probability density function for the log-logistic distribution. However, data from such survey measures typically contain zeros and probability spikes around “round” numbers (e.g., \$5 or \$10). For estimation purposes, continuous data were aggregated into intervals and estimated in a manner consistent with equation A.2.

APPENDIX B: NOTES ON QUESTION WORDING

- A *Nylon Stockings* 1963. See Gabor 1985. $N = 722$.
- a *Refrigerators (early 1950s)*. See Adam 1958. $N = 2143$. Prices listed in figure are in thousands of francs.
- B *Toilet Soap* 1963. See Gabor 1985. $N = 1000$ (approximately).
- b *New Communication Product* 1988. The exact nature of the product cannot be disclosed. Proprietary survey data $N = 511$. Respondents were asked how likely they were to make a purchase of this product at \$70. Those who did not respond that they would “definitely” buy were offered a price of \$40. These data were combined with results from another question, which asked about R’s willingness to purchase this good on a monthly basis. Prices here were assigned on a random basis (\$3, \$5, and \$12).
- C *Daily Newspaper* 1973. “Would you continue to get a DAILY newspaper if the price went to 15 cents? Would you continue to get a DAILY newspaper if the price went to 20 cents?” American Institute of Public Opinion 4–7 May 1973 (AIPO 870-k). National adult sample, analysis restricted to $n = 907$ receiving a daily newspaper; personal interview.
- c *Hardback Books* 1983. “Suppose there was a book you wanted to have which was *not* going to be coming out in paperback. If the price was \$15.95/\$17.95/\$19.95 how likely is it that you would buy the book—very likely, somewhat likely, not too likely, not at all likely?” Gallup 29 April–7 May 1983 (See Gallup Organization 1985). National adult sample, $N = 1,471$; personal interview.
- D *Housing* 1949. “Which of the groups on this card come closest to the amount you would be willing to pay for a new house (apartment or duplex)?” Prices listed in the figure have been divided by 100. Roper Commercial Poll no. 34, 1949. Louisville adult sample, analysis restricted to $N = 135$ looking for a place to live; personal interview.
- d *Lottery Tickets*. See Knetch and Sinden 1984. $N = 64$.
- E *Health Insurance* 1974. “How much would you be willing to pay a year for health insurance if it covered all of your and your’s needs?” Harris Study no. 7484, March 1974. National adult sample restricted to $n = 234$ who currently pay for health insurance themselves; personal interview. Prices in the figure have been divided by 10.
- e *BBC Channel 1* 1990. See Ehrenberg and Mills 1990. $N = 213$. Gabor/Granger and maximum price formats were used for purposes of statistical analysis because the one-price surveys were separated in time by several months.
- F *Baseball Pay-per-View Television* 1959. “If you could watch Dodger and Giant games on pay TV—that is, where you had to pay a certain amount to watch the game—about how many games a season do you think you would watch if they cost 25 cents each. What if they cost 50 cents. If they cost one dollar.” Prices listed in the figure are in cents. Field 5902, 9–14 March 1959. California adult sample, analysis restricted to $N = 342$ baseball fans; personal interview.
- f *Swedish Comedy Show* 1971. See Bohm 1972, experiments 1 and 5. $N = 62$.
- *Fishing Day* (mid-1980s). See Cameron 1988, 363–64. $N = 1,033$. I did not present the raw data for this analysis. The method of statistical analysis (constrained logit), however, is the same as mine.
- G *Safety Caps* 1982. “How much more, if any, would you be willing to pay for an over-the-counter drug that now costs \$2.00 if you could purchase it in the future in tamper-proof packaging: 20 cents more or higher, 15 cents more, 5 cents more, or no extra money?” Merit 1–4 November 1982. National adult sample, $N = 1,201$; telephone interview.
- g *Clean Up Pollution* 1974–75. See Eastman, Randall, and Hoffer, 1974–75, Table 1. $N = 526$. The lowest price range, from 1 cent to one dollar, is treated as 25 cents to one dollar for calculation purposes.
- H *Iraq Embargo* 1990. “President Bush’s economic sanctions include a ban on Iraqi oil, which could wind up raising the cost of gasoline to \$2 a gallon. How much more are you willing to pay for a gallon of gas than you paid last week in order to make the ban work? nothing, 25 cents, 50, 75, or \$1 or more.” Gordon S. Black Corporation 8 August 1990. National adult sample, $N = 561$; telephone interview.
- h *Fish Hatcheries* (mid-1980s). See Cameron and Huppert 1989. Weighted $N = 318$.
- I *World War II Effort* 1943. “In order to help pay for the war, should the Federal Government put a national sales tax of 10/5/3 cents on

- everything you buy, in addition to the taxes now in effect?" American Institute of Public Opinion 27 January 1943 (288k/t). National adult sample, N = 1,472; personal interview.
- i *Iowa Gasoline Tax To Improve Roads* 1954. "Some people say we should step up the improvement of our Iowa highways. There is enough money to continue farm-to-market road building, but not enough money to continue the stepped-up improvement of Iowa's primary and main highways. An increase of two cents tax per gallon of gasoline would provide an extra 18 million dollars, enough to carry on the stepped-up rate of improvement of Iowa's main highways. Would you favor or oppose increasing the state gasoline tax 2 cents per gallon to do this? Would you be agreeable to an increase of 1 cent instead of 2 cents per gallon?" Iowa Poll no. 136, September 1954. Iowa adult sample, N = 758; personal interview.
- J *Gasoline Tax To Reduce Oil Consumption* 1974. "I'm going to read you some suggestions that people have made about possible steps we could take. For each please tell me whether you think it is something that you personally would be willing to do, or not? . . . Pay 25 cents a gallon more for gasoline, with a gas tax refund on your income tax, if it would cut back our consumption of gasoline and therefore reduce the amount of money we as a nation spend on oil. . . . Pay 10 cents a gallon more for gasoline, with a gas tax refund on your income tax, if it would cut back our consumption of gasoline and therefore reduce the amount of money we as a nation spend on oil." Harris, December 1974. National adult sample, N = 1,337; personal interview.
- j *Civil Defense Alarm* 1963. "Actually, the Office of Civil Defense is now developing such a new instrument to alert the population if the United States were to be attacked by an enemy. This is how the device might look. Every American home that has electricity can receive warning through this instrument. When the device is plugged into an outlet, it can be set off by a special signal that goes through the regular community power system. When this happens, the instrument makes a loud buzzing sound that will alert people to turn on their radio for emergency information. The device would be triggered by electricity in a matter of seconds after warning is received. Everything considered, how likely is it that you would get an instrument like this for your home? How about if these instruments were for sale? How likely would you be to buy one of these instruments if the cost were \$5/\$10/\$15/\$25?" Note that the sequential price format (see Appendix A) was used for purposes of presentation in Figure 2; N = 672. For the random price format (see Appendix A), N = 1,366. National Opinion Research Center, December 1963 (NORC-SRS-330 Amalgam Survey). National adult sample, N = 1,366; personal interview.
- K *Cigarette Tax To Ease Budget Crisis* 1987. "Currently California's tax on cigarettes is 10 [cents] per pack. It has been proposed that this tax be increased to 20/25/30/35 per pack. If the state needed additional money and taxes had to be raised, would you favor or oppose increasing the cigarette tax to 20/25/30/35 per pack?" Field 8702, 3–10 April 1987. California adult sample, analysis restricted to N = 246 smokers; telephone interview.
- k *Drinking Water* 1982. "Consumers and taxpayers end up paying the cost of cleaning up water pollution through higher prices on products and higher taxes. I'd like to know how much you might be willing to pay to clean up water pollution. In order to make sure that your drinking water and the streams, lakes and rivers in your area are clean and safe, would you be willing to pay 100 dollars a year more in taxes and higher prices, or not? Well, about how much more per year in taxes and higher prices would you be willing to pay to make sure your drinking water and the lakes and rivers in your area are clean and safe?" Louis Harris and Associates, June–December 1982. National adult sample, N = 2266; telephone interview.
- L *Commercial-free Radio* 1945. "Would it be worth it to you to pay a tax of \$5 a year to get radio programs without any advertising in them? [If yes,] Would it be worth a tax of \$10 a year? [If yes,] Would it be worth a tax of \$25 a year?" NORC, October 1945 (no. 238). National adult sample, N = 2696; personal interview.
- l *Muskoka Fishing (mid-1980s)*. See Kahneman 1986. N = 167.
- M *Haliburton Fishing (mid-1980s)*. See Kahneman 1986. N = 164.
- m *Ontario Fishing (mid-1980s)*. See Kahneman 1986. N = 162.
- N *Environment* 1970. "To really improve the environment, would you be willing to accept an increase of \$200 per year in your family's total expenses, or not? [If no,] Well, would you be willing to accept an increase of \$100 per year in your family's total expenses to improve the environment, or not?" Note that since in contrast to k and N, the payment vehicle is ambiguous, I code this as a semipublic good. Harris Study no. 1990, January 1970. National adult sample, n = 1,686; personal interview.
- n *Clean Water* 1984 (*Low Prices*). "Earlier I asked you about Proposition 25, the clean water bond law, which provides funds for water pollution control, water conservation, and water reclamation projects. I would now like you to think about the costs of the program to the state and to you as a taxpayer, should it pass. What if Prop. 25 would cost your household an

additional four dollars each year for the next twenty years. If this were the cost of the program to you, would you vote for or against it? What if Prop. 25 would cost your household an additional \$1/2/3 each year for the next twenty years. If this were the cost of the program to you, would you vote for or against it?" Field Poll 8406, 8–12 October 1984. California adult sample, N = 103; telephone interview.

- O *Clean Water 1984 (High Prices)*. "What if Prop. 25 would cost your household an additional \$5/7.50/10/15/25/50 each year for the next twenty years. If this were the cost of the program to you, would you vote for or against it?" Field Poll 8406, 8–12 October 1984. California adult sample, N = 791; telephone interview.

- o *Crime 1972*. "Each person in Michigan pays about \$36 per year in taxes for police, courts, and prisons. How much more would you be willing to pay in state and local taxes to be used only for law enforcement and justice?" Response categories were "up to" \$1, \$5, \$10, or nothing. It is unclear whether the prices should be treated as upper or lower boundaries. So as to err on the conservative side, we have treated these as upper boundaries: placement in the \$5 category is assumed to reveal a willingness to pay of between \$1 and \$5, and \$10 is assumed to reveal a willingness to pay of greater than \$5 (since there were no higher response options). Treating these values as lower boundaries yields an elasticity of $-.56$. Michigan Attitudes toward Crime Study, September 1972. Michigan adult sample, N = 716; personal interview.

- P *Crime 1974*. "Each person in Michigan pays about \$45 per year in taxes for police, courts, and prisons. How much more would you be willing to pay in state and local taxes to be used only for law enforcement and justice? Response categories were as in o. Michigan Attitudes toward Crime Study, January 1974. Michigan adult sample, N = 797; personal interview.

- p *Arts 1973*. "Would you be willing to pay an additional \$50 a year in your taxes if the money were used to maintain and operate cultural facilities such as theatre, music and art exhibitions? [If *no* or not sure,] How about a tax rise of \$25 to pay for such facilities, would you be willing to pay that much, or not? [If *no* or not sure,] Would you be willing to pay an additional \$5 in taxes to make such activities more available?" Harris, January 1973 (see Farrell 1975). National adult sample over 16 years of age, N = 2,785; personal interview.

- Q *Cultural Activities 1975*. "Would you be willing to pay \$25 more in taxes per year if you knew that the money would be used to support arts and cultural activities and facilities, or would

you not be willing to do that? How about a rise of \$15—would you be willing to pay \$15 more in taxes per year if you knew that the money would be used to support arts and cultural activities and facilities, or would you not be willing to do that? And what about a rise of \$5—would you be willing to pay \$5 more in taxes per year if you knew that the money would be used to support arts and cultural activities and facilities, or would you not be willing to do that?" Harris, June 1975 (A-H0027). National adult sample, N = 1,462; personal interview.

- q *Arts 1984*. "The federal government now pays over \$700 per capita for defense, \$130 for education, and no more than 70 cents for the arts. Would you be willing to pay . . . \$25/\$15/\$10/\$5 more in taxes per year . . . for the arts, or would you not be willing to do that?" Harris 5–25 March 1984. National adult sample, N = 1,504; telephone interview.

- R *Arts 1987*. "The federal government now pays over \$900 per capita for defense, \$140 for education, and no more than 75 cents for the arts. Would you be willing to pay . . . \$25/\$15/\$10/\$5 more in taxes per year . . . for the arts, or would you not be willing to do this?" Harris 13 March–6 April 1987 (no. 2436). National adult sample, N = 1,501; telephone interview.

- r *South Carolina Environment 1971*. "Would you be willing to see an annual increase of \$100 in your taxes if you could be assured that this would prevent future air and water pollution in the state, or not? [If *no*,] Would you be willing to pay \$50 more in taxes to prevent air and water pollution? [If *no*,] How about \$25—would you be willing to pay that much to get effective pollution control?" Harris no. 2130, August 1971. South Carolina sample, n = 803; personal interview.

- S *Subway 1988*. "There has been much talk lately of building a subway in Los Angeles to reduce the traffic congestion and air pollution in that city. Suppose there were a bond issue on the statewide ballot to raise funds for a Los Angeles city subway project and that the cost to your household were an additional \$5/\$10/\$25/\$50 per year. If you were voting today, would you vote for or against such a proposal?" Field 8801, February 1988. California adult sample, N = 976; telephone interview.

- s *Trees (mid-1980s)*. See Brookshire and Coursey 1987. N = 48.

- T *Environmental Cleanup 1990*. "Would you be willing to pay \$500 more in taxes to clean up the environment if you knew the money was going to be used for environmental cleanup purposes only? Would you be willing to pay \$200 more to clean up the environment if you knew the money was going to be used for environmental cleanup purposes only?" Yankelovich, Clancy, Shulman Poll, 27 No-

- vember 1990. National Adult sample, N = 1,000; telephone interview.
- t *Deficit Reduction* 1990. "In order to reduce the federal budget deficit, would you be willing or not willing to pay \$100 more in taxes? Would you be willing or not willing to pay \$500 a year more in taxes?" CBS News 7 October 1990. National adult sample, N = 775; telephone interview.
- U *Endangered Species* 1989. "How much would you be willing to have your taxes raised each year in order to save endangered wildlife like the condor or the Northern Spotted Owl—or wouldn't you be willing to have your taxes raised at all for that purpose?" Los Angeles Times 17–21 November 1989. National adult sample, weighted N = 2,155; telephone interview.
- u *Homelessness* 1988. "California has many homeless and destitute people. Next November there may be a ballot initiative aimed at providing food and shelter for homeless people. What if this proposition were to cost your household an additional \$5/\$10/\$25/\$50 in taxes each year? If you were voting, would you vote for or against this initiative?" Field 8801, February 1988. California adult sample, N = 985; telephone interview.
- V *Homelessness* 1989. "California has many homeless and destitute people. Suppose there were a ballot initiative aimed at providing food and shelter for homeless people. What if this proposition were to cost your household an additional \$10/\$50 in taxes each year? If you were voting, would you vote for or against this initiative?" Field 8903, July 1989. California adult sample, N = 853; telephone interview.
- v *Clean Air* 1965. "If it would cost each family an extra \$100 a year in taxes to have air pollution greatly reduced, would you be willing to accept this expense? How much would you be willing to pay?" Opinion Research Corporation 4 May–1 June 1965. National adult sample, N = 1,064 (half sample); personal interview.
- W *Clean Water* 1965. "If it would cost each family an extra \$100 a year in taxes to have water pollution greatly reduced, would you be willing to accept this expense? How much would you be willing to pay?" Opinion Research Corporation 4 May–1 June 1965. National adult sample, N = 1,064 (half sample); personal interview.

Five survey questions not included in the analysis are a 1976 General Electric Survey (Study no. 76-04) question about willingness to pay for electric cars, a 1989 Gordon Black survey on willingness to pay more to fight illegal drugs, a pair of 1990 *Los Angeles Times* (study no. 212) questions about willingness to pay for national health insurance and retirement home care, and a 1989 *Los Angeles Times* San Fernando Valley Survey (study no. 189) question concerning charitable

contributions to build an "arts park." In each case, the use of filter questions made the data problematic.

When available, weighted survey data were used. Responses of *don't know* or *not sure* were excluded from computation when questions asked respondents to name their highest price. Otherwise, *don't knows* were treated as *not willing* unless ambiguity existed about whether people whose recorded response was *don't know* or *not sure* were in fact asked the willingness-to-pay question. In some cases, *don't know* responses were lumped together with other missing data codes.

The data used in this study, as well as the GAUSS-386 programs used to derive maximum likelihood estimates, are available on request.

Notes

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1. Technical definitions of *willingness to pay* may be found in Brookshire and Coursey 1987 and Mitchell and Carson 1989. These authors use the terms *willingness to pay* and *maximum willingness to pay* interchangeably.

2. Asking price is by no means the sole determinant of willingness to pay. Varying budget constraints and access to substitutes may produce variation in willingness to pay. In addition, people may have different conceptions of what a particular good should cost and who should pay. Generally speaking, the greater the variability in determinants of willingness to pay other than price, the weaker the price elasticity.

3. The logistic is just one of many distributions that might be used to describe the dispersion of willingness to pay. Experimentation with the normal and Weibull distributions, however, produced such similar results that I leave aside the question of which distribution best describes the data. The only other study that employs a comparable statistical approach found the logistic to have somewhat greater predictive accuracy than the normal (Cameron 1988).

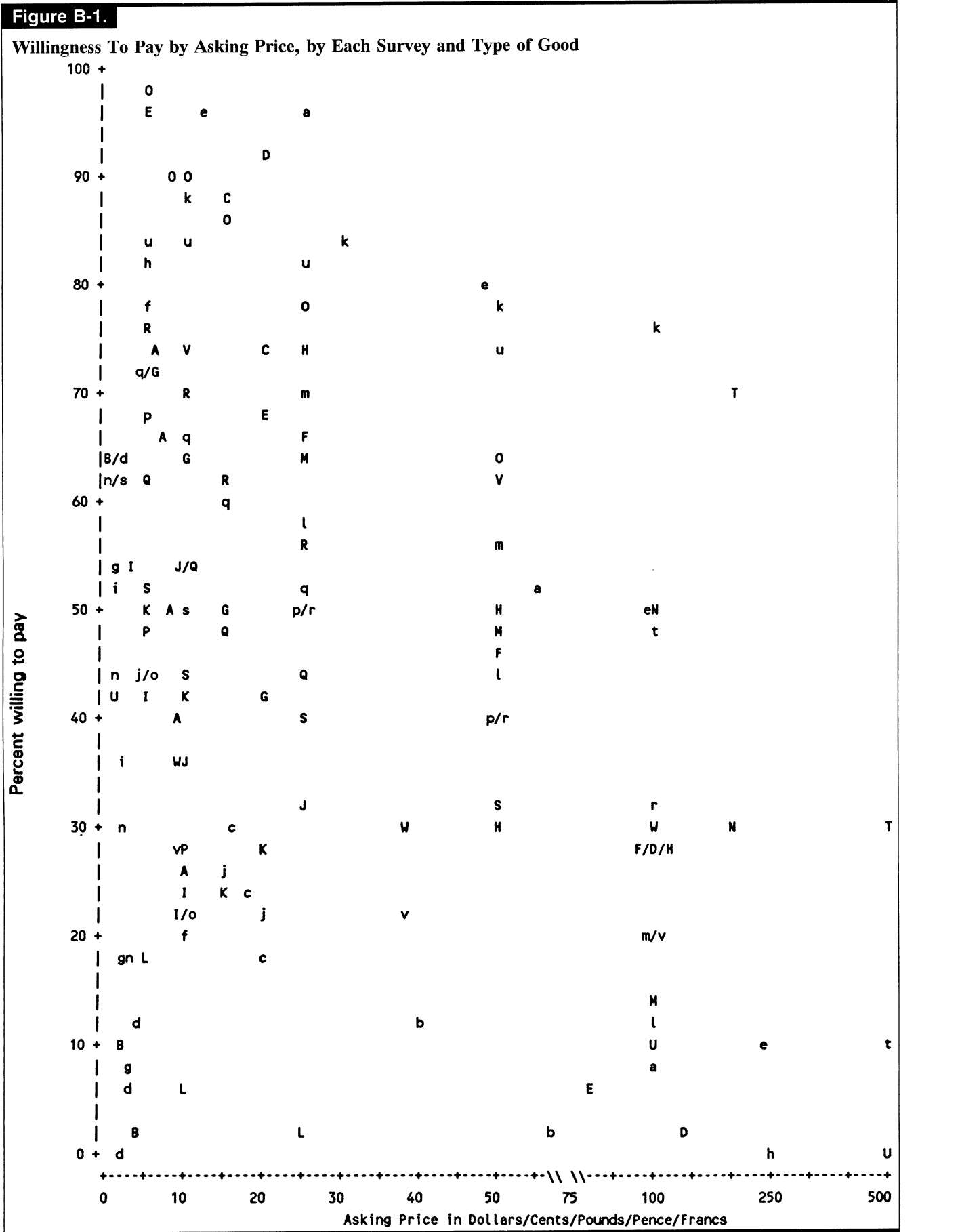
4. This procedure assumes that people who are willing to pay \$10 are also willing to pay \$5. This assumption seems reasonable, although one must be careful to choose plausible prices. Adam (1958) and Gabor (1985) have shown that when the asking price is too low, people become suspicious about the quality of the product.

5. Consider, for example, the case in which people are asked whether they would pay one or two dollars for a gold brick. Presumably, 100% would say *yes* to both, yielding no information about price elasticity.

6. Sampling variability, of course, may account for an observed *B* of zero, especially if the range of prices is narrow. It would not be surprising, for example, to derive a *B* of zero from a small sample if the first price were \$10 and the second \$9.95.

7. This kind of closed-form solution is possible only in the special case in which two prices are presented to respondents. In the general case, estimates are obtained by iterative maximization of a likelihood function. Interested readers should consult Appendix B.

8. Certain alternative sources of data are less informative about willingness to pay than one might suppose. Experiments or quasi-experiments that track price changes and sales



of a given product allow one to estimate the price elasticity of aggregated demand, but not the price elasticity of willingness to pay. There are two reasons for this. First, the number of units sold does not necessarily correspond to the number of people who have made a purchase; some people may buy several units at one time (Cramer 1971). Second, those who purchase nothing go uncounted. Thus, one has no way of knowing how the proportion who are willing to pay changes with fluctuations in price. Data on local tax referenda are also unsuitable. While it might at first seem feasible to compare the level of voter support for different local tax increases, this research design has an important defect: the size of the proposed tax increase is likely to be endogenous, since those who desire a tax hike may tailor its size to the level of anticipated support. Further complications arise from local differences in turnout rates, income, and objectives of the tax proposal. The present research sheds light on the dynamics of public support for such tax increases, but voting data themselves are problematic.

9. As shown in Appendix B, a few of the questions I use ask respondents how *likely* they would be to make a purchase at a stated price. The proportion responding *definitely* or *very likely* was used as the proportion willing to pay.

10. The first is a 1988 Gallup poll that asked a series of 13 willingness-to-pay questions (see n. 24). The second is my finding that the elasticity of willingness to pay for bilingual education among Californians was a scant $-.12$ (Green 1988). The prices offered, however, differed from the prices offered earlier in the survey regarding homelessness and the Los Angeles subway. Respondents who had previously heard prices of \$50 responded significantly more favorably toward a subsequent price of \$25 than those who had previously heard \$10. I dropped this case to avoid biasing the results in favor of my hypothesis concerning public vs. private goods.

11. Of the General Electric polls conducted between 1966 and 1981, 16 contain questions about willingness to pay for various public goods. However, the questions were asked only of respondents who said they would like to "see something done" in their region about each of the public goods. Thus, these data are unsuitable due to truncation bias. Elasticities calculated on these data, incidentally, display the same pattern of over-time stability one observes elsewhere.

12. These results are consistent with data presented by Ehrenberg and Mills (1990, 27), which suggest that a series of prices tends to elicit more price-sensitive willingness to pay. Calculations based on their data concerning subscription television suggest that responses to a single price are about 80% as elastic as responses to a series of prices.

13. The elasticities for the two intermediate groups, "moderately frequent cultural attenders" and "infrequent cultural attenders" are $-.52$ and $-.58$, respectively.

14. For classification purposes, semiexcludable goods (i.e., goods owned collectively but consumed on a restricted basis, e.g., national parks that charge an admission fee) will be treated as public goods.

15. Complicating matters somewhat are taxes that take the form of surcharges on private goods. Consider the question of whether to raise gasoline taxes in order to reduce U.S. dependence on foreign oil. Here the question of willingness to pay involves both a public objective (limiting dependence), as well as private consumption (the gasoline one buys for personal use). Respondents may interpret this question as either one concerning willingness to pay more for gasoline or one involving willingness to pay more for energy independence.

16. In principle, these four dichotomous classification criteria generate a 16-cell typology. But as Appendix B suggests, the cases tend to cluster together, which rules out a more fine-grained examination of the role of each of the public/private criteria taken separately. I am currently collecting experimental data in an effort to understand better the distinctiveness of public goods.

17. Even more price-elastic than the private goods I included in the analysis are foodstuffs that have comparable substitutes. A February 1971 Social Science Research Council survey (Gabor 1985) found willingness to pay for butter and

beans to have elasticities of approximately -10 and -5 , respectively. Similarly large elasticities are to be found among Adam's (1958) consumption goods with close substitutes, such as cigarette lighters.

18. Following Cameron and Huppert (1989), I experimented with a Box-Cox transformation of price, but opted for the quadratic specification due to its superior fit to the data. In the quadratic model, the elasticity evaluated at any particular price is equal to the coefficient for $\ln(\text{price})$ plus two times the coefficient for $\ln(\text{price})^2$ times $\ln(\text{price})$. For example, Table 2 indicates that the elasticity of willingness to pay to preserve wildlife is $-.40$ when the price is \$10.

19. The slopes depicted in Figure 3 seem to grow weaker as price increases; but in terms of log-odds, they are in fact increasing. Note that once one includes a quadratic term it becomes necessary to decide at what price the median slope applies. For the purposes of illustration in Figure 3, this price is \$10.

20. Indeed, Figure 2 gives little indication that goods offered in a fixed bundle are significantly more price elastic. Among purely private goods, the cases where quality cannot plausibly vary with price are baseball television, lottery tickets, newspapers, and a communication product; two of these four are the least price-elastic goods in this class. In the middle of the private-public continuum, only one good is offered in the form of a fixed bundle, civil defense alarms, an item that falls in the midrange of elasticities in its class.

21. Requests for data were mailed to eight firms. Three firms, each employing over two hundred people, responded. Firms B and C distribute the standard United Way solicitation cards that ask employees to make either a one-time contribution or choose one of several levels of payroll deduction (employees could also volunteer their own level of payroll contribution). Firm A distributes its own cards: hourly and weekly employees receive cards similar to the standard United Way forms; management and officers receive cards that request larger donations. The data I analyze are actual contributions (as opposed to pledges) made through the firm, whether through cash, check, or payroll deduction.

22. See n. 19. Had I omitted the quadratic term and examined only those prices at or below \$50 (relegating all prices over \$50 to the *\$50 and over* category), the price elasticity of United Way contributions across the three firms would have been $-.45$ (SE = $.02$).

23. Both factors—the transparency of self-interest and the saliency of considerations of personal benefits—seem to account for the fact that tax initiatives, smoking restrictions, and rent controls elicit an unusually self-interested public response.

24. Normative considerations may be particularly influential when people are primed to think about the desirability of a good; hence, the unusually weak price elasticities that turn up when respondents are asked their willingness to pay immediately after stating their eagerness to see government spend more. A Gallup survey conducted in 1988, for example, asked respondents whether they would like to see more federal spending on public education. Those who answered *yes* were assigned at random to one of two tax prices: one hundred dollars or two hundred dollars. Despite the rather large sums involved, 59% of the former group and 54% of the latter were willing to pay, for an elasticity of just $-.29$.

25. Survey data on willingness to pay to reduce the deficit, for example, suggests that the median citizen is willing to pay \$94 more in federal taxes. Since the distribution of willingness to pay is skewed, however, average willingness to pay is approximately \$1,000, even assuming a rate of acceleration of $-.2$.

26. Willingness-to-pay surveys have a respectable track record at forecasting referendum results (Mitchell and Carson 1989). But the ballot measures that have been studied (e.g., California's Proposition 25) have been environmental bond issues that faced no organized opposition.

27. Analogous arguments have been made concerning the efficacy of cost reduction in the face of public opposition in cases where the costs are nonmonetary. McConahay (1982), for example, has shown that white opposition to court-ordered school desegregation has little to do with the degree

of inconvenience associated with daily bus rides; he contends that tinkering with bus schedules and the location of bus stops is an ineffective means of currying public favor.

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