

FREE RIDING, CONTRIBUTION BEHAVIOR, AND PUBLIC GOODS:
THE CASE OF THE VIRGINIA NONGAME WILDLIFE TAX CHECKOFF

by

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Dissertation submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

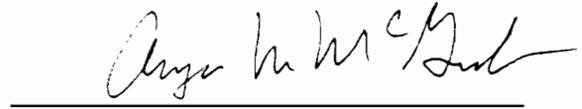
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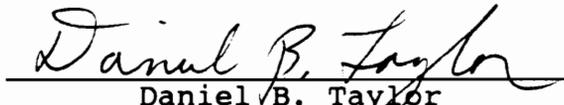

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(ABSTRACT)

The study examines the free rider effect and other voluntary contribution behavior in an actual public goods funding situation. Because the traditional neoclassical economic model of consumption behavior does not adequately explain behavior with respect to voluntary contribution to the funding of public goods, a model is developed that expands upon the traditional model and which incorporates several aspects of behavior. These aspects include strategic behavior such as strong and weak free riding, non-voting, and protest voting, as well as utility received from contributing.

Most studies of voluntary contribution behavior involve the use of hypothetical or contingent markets and use the traditional neoclassical model. Therefore, a study of contribution behavior that incorporates an expanded neoclassical model including factors such as contribution utility would be desirable in order to examine actual contribution behavior. To this end, a model is developed which explains the behavior of contributors and noncontributors to a tax checkoff program. The case study is the Virginia nongame wildlife tax checkoff for taxable year 1987. A survey was developed and administered to a random sample of Virginia taxpayers who were eligible to contribute to the program.

The survey results do not support the strong free rider hypothesis, although many people apparently contributed less than their total willingness to pay for nongame wildlife management or preservation. Non-voting behavior was not a significant factor, in contrast to protest voting, which was a significant reason for noncontribution. Many contributors indicated that they were receiving utility from giving to a perceived good cause rather than from nongame wildlife per se. Finally, other factors appeared to be important to the contribution decision, including the institutional setting in Virginia and assurance about the use of funds.

I get by with a little help from my friends

-John Lennon and Paul Mc Cartney

The world cannot subsist for a single moment without
yajna [altruistically-motivated work]

-Mohandas K. Gandhi

"Business!" cried the Ghost, wringing its hands again.
"Mankind was my business. The common welfare was my
business; charity, mercy, forbearance, and benevolence
were, all, my business. The dealings of my trade were
but a drop of water in the comprehensive ocean of my
business!"

-The Ghost of Jacob Marley, in Charles Dickens'
A Christmas Carol

ACKNOWLEDGEMENTS

First and foremost, I wish to acknowledge the contributions, both professional and personal, of my committee chairperson, Dr. Sandra S. Batie. Dr. Batie was instrumental in the conception of the study, and provided many useful insights along the way. More important, perhaps, was her extreme patience with me through three topic developments, two unfunded proposals, my struggles with the PhD preliminary examination process, as well as many distractions that were presented to me in the course of my PhD program.

For many other suggestions and particularly for help in the development of the survey, I would like to thank Dr. Leonard Shabman, Dr. Daniel Taylor, and Dr. Thomas Dunlap. Dr. Anya McGuirk contributed to the interpretation and statistical analysis of the survey data. Many sincere thanks are in order for the help and friendship of Ms. Ann Meyers, Virginia Department of Taxation. Ms. Meyers went above and beyond the call of duty to help with the survey. Likewise, I would like to thank those individuals in the Virginia Department of Taxation who provided assistance in developing the mailing list and in mailing the surveys.

For friendship and encouragement, I wish to thank Skip and Mollie Clary, Martha Segall, Charlene Browne (Virginia Tech Department of Landscape Architecture), and the "clan" at the Ton80 Club and the London Underground Pub. Finally, the place of honor goes to my parents, "Fergy" and Avis Ferguson, who have helped me in more ways than I can acknowledge here, and who have shown supreme patience in my long voyage through university study.

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CHAPTER 1. Introduction

1.1 A Problem With Economic Theory

The neoclassical economic theory of consumption is based, in part, on the concept of man as **homo economicus**. The central assumption about the behavior of this "animal" is self-interested behavior. This assumption lies behind the model of consumer behavior that in turn is used to describe the activity of markets, particularly under perfect competition. The neoclassical model allows some other types of behavior, such as giving gifts to others, as long as the giver essentially has a self-interest motive for giving.

However, the neoclassical model of behavior does not allow for classes of behavior that occur frequently in the "real world", such as altruism. Daly and Cobb (1989) state the problem this way:

What is excluded from **homo economicus** are concerns for other people's satisfactions or sufferings that do not express themselves as one's market activity. For example, **homo economicus** takes no pleasure when a neighbor receives a gift from

someone else, or a promotion, or when a philanthropist endows a park for underprivileged children. This adds to the utility function of the philanthropist, but not to other members of the community. Similarly, **homo economicus** is not envious of the neighbor's new car or pained in defeat in competition for an honor. **Homo economicus** knows neither benevolence nor malevolence in any of these instances, only indifference [p. 86].

While the neoclassical model of consumption may accurately describe behavior with respect to the purchase of many common goods, it fails to describe other consumption behavior such as charity. Specifically, the assumption of self-interested behavior implies that an individual, faced with an opportunity to voluntarily donate to the provision of a good that will be shared by all in the community, will "free ride". That is, the individual will allow others to contribute and will consume the good or service provided as a result of others' contributions. Obviously, if everyone in society were to act in this manner, no funds would be collected at all, implying a level of provision of zero. Such a result suggests that people have no "sense of community". Daly and Cobb (1989) have this to say with respect to free riding:

...economists view individual identity as independent of community relations, and they expect free riding to be the rule rather than the exception. Nevertheless, they do assume a degree of social cohesion and consensus sufficient to enact laws to diminish the opportunity to take a free ride [p. 54].

An example of such laws is the institution of compulsory taxation.

Neoclassical economic theory, in explaining the existence of public goods or the occurrence of behavior such as contribution to charity, introduces the notion of the externality. An externality exists when the benefits or costs of production or consumption accrue to others than the individual producer or consumer and when no compensation is made. A contribution is an externality when there are altruistic motivations for making the contribution: the welfare of others becomes important to the individual. Briefly, public goods are externalities because there are significant transactions costs associated with their production. The existence of such transactions costs means that: 1) individuals cannot feasibly be excluded from consuming a public good once it is produced, and 2) one person's consumption of a public good does not generally decrease another person's consumption. Also, the total amount of a public good available for consumption is, in a collective provision situation, the sum of individuals' contributions. Therefore, one person's decision about contributing affects the total level of supply.

In reference to externalities, Daly and Cobb (1989) state:

Externalities are ad hoc corrections introduced as needed to save appearances...Externalities do represent aspects of concrete experiences, but in such a way as to minimize restructuring of the basic theory. As long as externalities involve minor details, this is perhaps a reasonable procedure. But when vital issues...have to be classified as externalities, it is time to restructure basic concepts and start with a different set of abstractions that can embrace what was previously external [p. 37].

The authors are suggesting that neoclassical theory needs to be expanded to internalize much of what is now considered external. One aspect of this expansion would involve the inclusion of the possibility of altruistic behavior and of utility based on actions taken for "moral" reasons. Such inclusions might, for example, explain why individuals do not free ride, or why they contribute to charities. One reason why altruism has been excluded from economic analysis is the complications altruism introduces to mathematical analysis. The analysis becomes more complicated because the utility functions of individuals, which are usually assumed to be independent, become interdependent under the assumption of altruistic behavior. Given the pervasive role of mathematical analysis in modern economics, it is understandable why altruism, in applications of economic theory, has largely been ignored.

The free rider effect is an important and widespread concept in modern economic theory. Neoclassical economic theory predicts that free-riding behavior will occur when an

individual is faced with a purely voluntary action, such as contributing to the funding and provision of a pure public good.

A "pure" public good differs from a private good in that it is not usually traded in a market and thus does not have a price associated with it. The reason for this situation lies in the nature of public goods benefits and consumption. A unit of a pure public good is available to all of society once it is produced since it is not usually feasible to exclude people from consuming a public good. Such non-divisibility of benefits and non-excludability in consumption leads, in the neoclassical theory of markets and in practice, to public funding of the good through taxes. Taxation assures that people, who are assumed to be rational profit-maximizers, can not refuse to fund the provision of a good exhibiting public goods characteristics, yet partake in the public good's benefits. That is, mandatory taxation eliminates free riding and "solves" the problem of the public goods externality. In reality, however, there are many reasons why a person might voluntarily contribute to the provision of a public good. Likewise, there may be many factors controlling the level of an individual's contribution.

1.2 Empirical Studies of the Free Rider Effect

Since the exposition of the economic concept of public goods in the 1950's, many economists, sociologists, psychologists, and political scientists have examined voluntary behavior with respect to the provision of public goods. Frank (1988) estimates that there are approximately 1000 such studies in the literature. These studies have tended to fall into three categories. The first type of study speculates on the theoretical basis, economic or behavioral, of contribution to the public provision of public goods. Other studies are empirical in nature, and generally involve experiments on one or more aspects of the behavior of individuals with respect to public goods contributions. Finally, a few studies have attempted to explain observed contributions in terms of one or more models of contribution behavior.

A number of empirical studies exist which study behavior with respect to the voluntary funding of public goods provision. The studies are usually motivated either by interest in confirming or providing evidence for the validity of a model of behavior, often free-riding behavior, or by the existence of a large voluntarily-funded sector of the U.S. economy. In this respect, Ireland (1970) states the following in regards to economic thinking about how

individuals and institutions act to collectively provide goods:

Although these [economic] theories do possess considerable explanatory and predictive value, there appears to be a serious hiatus between the economist's theoretical apparatus and the diversity of the allocative and exchange institutions which have been devised by individuals. If economics is a science which provides a framework in which the various activities of individuals may be categorized and yet integrated, then economic theorists should consider the diversity of institutional mechanisms through which individuals strive to achieve their ends [p. 74].

Runge's (1984) assessment of empirical studies of free-riding behavior is as follows:

A number of disciplines have examined problems of free rider behavior on an experimental basis. Economics, political science, sociology, and psychology have all contributed to this growing literature....Procedures vary, but they generally involve a structured attempt to replicate the conditions of the prisoners' dilemma. Some studies are only one-shot, while others iterate the prisoners' dilemma over time, allowing analysis of learning behavior. All such studies share a structure of payoffs in which subjects receive higher individual payoffs to free ride than to contribute, and in which all are jointly better off if they contribute than if they free ride [p. 172].

In other words, most studies of free-riding behavior involve experiments in human behavior that are structured around a very specific contribution environment, such as the

prisoners' dilemma.¹ As Runge notes, the problem of the free rider and the nature of voluntary contribution behavior is important to many different disciplines.²

Throsby and Withers (1986) and Kim and Walker (1984) provide summaries of empirical studies of the free-rider effect, and conclude that there is evidence both for and against its existence. However, none of these studies provides evidence to support the "strong" free rider hypothesis, that is, that there is zero contribution on the part of study subjects. Rather, the studies each support varying "strengths" of weak free riding behavior, that is,

1. Briefly, the prisoners' dilemma describes a situation where two prisoners, who cannot communicate with one another, can either confess to a crime or remain silent. Each knows that if one confesses and the other remains silent, the confessor will not be sentenced, while the one that remains silent will receive a large sentence. If both confess, an intermediate sentence will result; if both remain silent, a short sentence for both will result. The predicted outcome is that both will confess, since whatever the other person does, it is in each prisoner's self-interest to confess. However, if both remain silent, a lighter sentence for both would result. This sub-optimal result of the two longer sentences will be obtained in a two-person situation due to distrust between the two individuals. Even if communication were possible, there is no guarantee that the other person would actually remain silent, since it would still be in each person's self-interest to confess. On the other hand, cooperation would have led to the optimal solution of the shorter sentences. This result implies rejection of the group optimum and use of personal gain as the basis for similar decisions.

2. Dawes (1980) and Edney (1980) summarize the results of studies in the psychology literature.

where an individual contributes, but at a level less than their assessment of the benefits of contributing.

A number of researchers have conducted laboratory studies of voluntary contribution behavior. Most of these studies do not confirm the existence of strong free-riding behavior. For example, Bohm (1972) found practically no evidence for free-riding behavior. A study by Sweeney (1973) found evidence for weak free-riding behavior, but did not confirm the strong free-rider hypothesis. Similar results were obtained by Isaac, Walker, and Thomas (1984) and Kim and Walker (1984). Possibly the most complete series of studies based on hypothetical markets were conducted by Marwell and Ames (1979, 1980, 1981). Their results do not support the strong free-rider hypothesis. In most instances, the groups of respondents "weakly" free rode to some extent. Interestingly, the group to come closest to strong free-rider behavior was a group of economics graduate students.

1.3 Problems With Empirical Studies

There are numerous difficulties with the experimental studies of free-riding behavior. Most studies to date involve experiments conducted using few subjects and

hypothetical situations (or markets). Throsby and Withers (1986) note that:

...experimental work is often inconclusive, since subjects are usually chosen non-randomly (e.g. students), only small groups are used (for cost reasons), and excludable commodities are employed, i.e. impure public goods pertaining to the experimental group only and from which others are excludable. It thus cannot easily suggest what free-rider behavior might be in large groups for pure public goods [p. 314].

The authors also note the importance and advantages of survey-based approaches to the study of actual public goods provision situations: "These [survey-based approaches] have the advantage complementary to much experimental work of dealing with large numbers and pure public goods" [p.314]. They also note the disadvantage of survey-based studies which employ hypothetical markets or goods: "The off-setting disadvantage is the hypothetical nature of liability to pay for benefits stated" [p. 314]. The authors are referring to studies employing the contingent valuation technique, which estimates individuals' willingness to pay for goods, based on a hypothetical or contingent market. In summary, the authors suggest that survey-based studies employing pure public goods and actual markets would be desirable. Most of the survey-based studies to date have employed hypothetical markets or goods. These studies, of which there are many, usually employ the contingent valuation technique, and

attempt to estimate individuals' willingness to pay for non-market goods, which are goods that are not usually bought and sold in a market.

Bolnick (1975) also expresses a concern for the applicability of studies based on hypothetical behavior.

It must be noted that many of the experiments... are not strictly applicable to the problem of voluntarism, in that they test behavior with regard to symbolic acts rather than referent acts, i.e. expressed attitudes rather than behavior. Just because individual A says, in an experimental situation, that he agrees with individual B, one cannot conclude that, in a behavioral context, he would in fact act in a manner consistent with this statement. The relationship between such symbolic acts (statements) and their referent acts (corresponding behavior) depends on a complex blend of social, psychological, and situational factors...[p. 201].

1.4 Problem Statement

Since most studies of contribution behavior and the free rider problem have been based on theoretical or experimental markets, an analysis of a real-world, voluntary contribution situation would be of interest. Such a study could illuminate the usefulness of the concept of the free rider in an actual situation, as well as provide a test of hypotheses about voluntary contribution behavior. Fortunately, an actual voluntary contribution situation

exists, in the form of state tax checkoff programs, which allow taxpayers to voluntarily contribute to a specific public program at the time of filing their tax form.

Current economic theory would benefit from expansion to include an explanation of observed behavior that implies the existence of motivations other than, or in addition to, simple self-interest as determinants of certain consumption decisions. A study of actual contribution behavior with respect to the funding of a public good may help to explain charitable giving and other "non-rational" behavior. Furthermore, conclusions from such a study could influence the use and interpretation of studies employing the contingent valuation method. Such a study would need to: 1) develop a model of voluntary contribution behavior that explains consumption behavior, specifically in regards to voluntary contributions to the provision of public goods, including free-riding behavior, and 2) "test" the model, preferably in a "real-world" situation, such as an actual charity, or other voluntary giving situation.

The factors influencing contribution and free-riding behavior are of interest to public managers as well as economists, particularly managers who administer "public good" programs that are funded through voluntary contributions. Managers of public agencies are increasingly

faced with budget constraints as costs and the demand for public services rise at the same time that the public resists increased taxation. Taxation is a major means of funding goods and services provided by the public sector, although user fees may be applied in certain situations. Voluntary funding will not usually totally fund public sector goods and services since there is no way to compel people, in contrast to taxation, to contribute. Likewise, managers of charity programs are concerned with voluntary contribution behavior. These individuals would benefit from the knowledge of the factors that are most important to the decision whether to contribute. Marketing efforts can be based on such information. More generally, it would be useful to examine contribution and free-riding behavior more closely, given the perceived need to fund public goods and services, perhaps with less reliance on taxes.

1.5 Objectives

The objectives of this study are:

1. To provide empirical evidence as to the existence of free riders in a real-world contribution situation.
2. To develop a comprehensive model explaining voluntary contributions to the provision of public goods. The model will consist of a taxonomy of

contributors, based on the primary determinants of the contribution decision.

3. To draw conclusions about the usefulness of free riding and related voluntary contribution behavior as theoretical concepts in economic theory.

The final objective relates specifically to the test case, and is discussed in more detail in Chapter 3:

4. To draw conclusions about the usefulness of the voluntary tax checkoff as a mechanism for funding the provision of public goods.

1.6 Summary of Data and Methods

A model of voluntary contribution behavior was constructed that incorporated many of the results of past studies, both theoretical and empirical. A decision tree was constructed that incorporated a series of decisions and which resulted in several categories of contributors and noncontributors (including free riders). The categories were based on the primary factor influencing the contribution decision. The model emphasizes contribution to the funding of a public good. A survey was used to gather data on actual, voluntary contributions for an actual public good, the Virginia nongame wildlife management programs, and which placed contributors and noncontributors in the categories incorporated in the decision tree. The

existence of the various categories of contribution behavior (including the existence of free riders) was determined by the response rates for questions which were designed to elicit a response specific to each category. Testable hypotheses were formed that discriminate between certain categories on the basis of other respondent characteristics. Qualitative choice (LOGIT) models, were used to determine the role of certain proxies for information, utility, budget constraints, and demographic variables in determining survey respondents' choices of certain categories of the proposed model.

The test case was the Virginia nongame wildlife tax checkoff program for taxable year 1987. The use of this particular program is appropriate, since nongame wildlife is a public good. In Virginia, nongame wildlife programs are funded by taxpayers who voluntarily designate (on their state income tax return) that all or part of their refund should go to nongame programs. The survey was sent to a random sample of Virginia taxpayers who were eligible to contribute to this program.

CHAPTER 2. Conceptual Framework

2.1 Introduction

There are two approaches to studying the funding of public goods. The first approach is based on the behavior of the individual and relates to the nature of the utility function and demand revelation, that is the expression of individual utility or behavior. Such behavior manifests itself in the choices made by individuals. The second approach is that of studying group behavior. In this case, group behavior is defined as group participation in the provision of public goods, via voting or contributing. However, group behavior is ultimately based on individual behavior and, so, an understanding of individual behavior is needed in order to properly interpret the results of group actions.

This chapter presents a discussion of public goods provision at the level both of the group and of the individual. Since this study is ultimately concerned with the group funding of public goods and the free-rider

phenomenon, both individual and group behavior are important. The free-rider effect is examined from a theoretical and practical standpoint. The former includes an examination of public goods supply, demand, and funding, using both neoclassical economic and game theory approaches. The practical standpoint includes a discussion of institutions that exist to overcome the free-rider effect, as well as charity institutions, which exist in contradiction to the prediction by neoclassical theory that free-riding behavior will occur in voluntary funding situations.

In the final section, a model of individual behavior with respect to voluntary contribution to the funding or provision of a public good is developed. The model is presented as a basis for the study of actual situations where individuals are making decisions, in a voluntary setting, about contributing to the provision of a public good.

2.2 Public Goods: Demand, Supply, and Funding

In neoclassical economic theory, the existence of public goods, also referred to as social goods, is an example of an externality. Public goods may represent an

example of an externality in both supply and consumption. The supply externality results from the existence of transactions costs associated with producing or supplying a public good. Dahlman (1978) suggests that transaction costs may be classified into three main groups: 1) search and information costs, 2) bargaining and decision costs, and 3) policing and enforcement costs. Using this approach, the existence of public goods may be attributable to the large policing and enforcement costs of enforcing property rights (exclusion), since it is not feasible to exclude individuals from consuming a public good. Randall (1983) uses the term "nonexclusive" to describe such goods. Also, the information costs of allocating the costs and benefits of a public good to individuals are large. This problem underlies the argument for public funding via taxation. Further costs are associated with discovering individuals' demand schedules and coordinating such information in order to provide the optimal level of supply. Different goods might be expected to exhibit varying levels of these transactions costs. A good exhibiting high levels of each could be termed a "pure" public good. Common examples include national defense and lighthouses. Finally, price, the rationing and information mechanism that exists in private markets, is absent or highly imperfect in the public goods situation. Therefore, it is hard to make informed

decisions about, for example, tradeoffs between competing uses of lands and between alternative uses of scarce funds for resource management.

The externality in supply, or production, implies that private provision will not occur, unless the producer is a philanthropist, and that some other mechanism is necessary. Public provision, usually funded by taxes, is the mechanism that is usually employed. It should be noted that, while the funds may be collected through some public mechanism, production of goods used by or for the public may be by private individuals or companies. For example, national defense is a public good, but the equipment for its maintenance is usually produced, in the U.S., by private corporations. However, the use of the equipment in the provision of the service of defense is a public good.

The consumption externality arises from the fact that, in a collective funding situation, others' decisions about funding affect the consumption available to the individual, since the total level of provision is usually taken to be the sum of all funds collected. In addition, the consumption of a pure public good by one person does not reduce the amount available for another to consume, implying a marginal cost of consumption of zero, unless there is congestion. In other words, the good is available to

everyone, and everyone, theoretically, determines the amount available for consumption. Again in Randall's (1983) terms, such goods are "nonrival" with respect to consumption.

Finally, there is another class of public goods which includes goods that do not meet the above criteria, and could be provided by the private sector. Such goods are referred to as 'merit goods'. Merit goods are publicly funded and/or provided even though private provision would be feasible. For example, a society may believe that it is morally or traditionally right that a good or service be publically provided. This belief exists despite the ability to exclude users at "reasonable" policing and enforcement costs. Examples in the U.S. include public education and highways.

2.2.1 Public Goods Demand and Supply

In brief, the neoclassical definition of the optimal quantity of goods produced and consumed in private and public goods markets is as follows. In a private goods market with perfect competition, the optimum level of supply and demand is determined by the equation:

$$MRS_{xy} = MRT_{xy} \quad (2.1)$$

where:

MRS_{xy} = the marginal rate of substitution
between good x and good y for each
individual

MRT_{xy} = the marginal rate of transformation
between good x and y for each
producer

For a public good, the situation is different, due to the nature of consumption of a public good discussed earlier. The equilibrium level of supply and demand is:

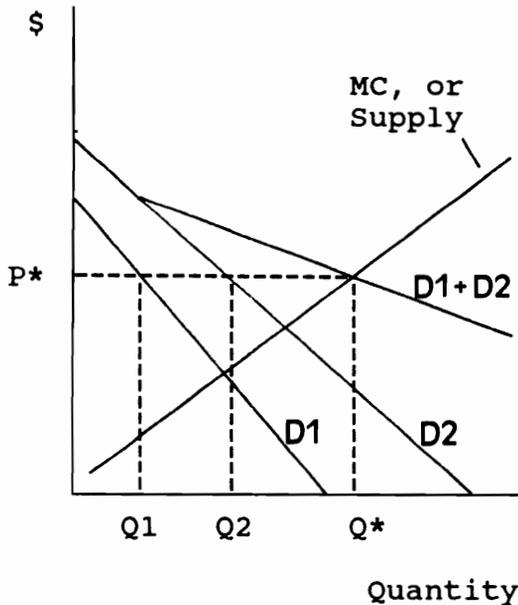
$$\sum MRS_{xy} = MRT_{xy} \quad (2.2)$$

where MRS_{xy} and MRT_{xy} are defined as above,

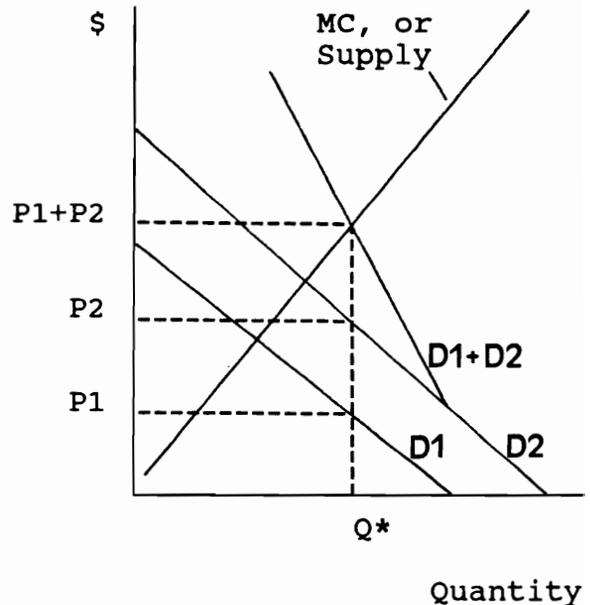
MRS_{xy} is summed over all individuals.

These two results are illustrated in Figure 2.1, for a two-person case, with respect to one private (A) and one public (B) good. Each graph shows the demand schedules for the same two individuals, and the aggregate demand based on these two individual demands. The main difference between the graphic representation of the two classes of goods results from the situation just described. The aggregate demand for the private good, $(D1 + D2)$ in graph A, is the horizontal summation of the two individual demand curves, $D1$ and $D2$. The aggregate demand for the public good, $(D1 + D2)$ in graph B, is the **vertical** addition of the two individual

A. Private Good



B. Public Good



Where:

P_n = price or marginal benefits of the good.

D_n = demand for the good

The efficiency condition for a private good requires that the marginal benefits for each individual equal the marginal cost of provision. For a public good, it is the **sum** of the individual benefits equated to the marginal cost of provision. In this model, the initial distribution of income is taken as given.

Figure 2.1 Optimal Levels of Demand and Supply for a Private and a Public Good.

demand curves, D_1 and D_2 . Despite identical individual demand curves, and identical marginal costs of provision, or supply, the resulting optimal level of provision, the quantity described by the intersection of the aggregated demand and the supply curve, can be different. The graphs demonstrate an important distinction between the two types of goods. For the private good, the individuals are assumed to be "price takers", that is, the individual does not affect the price of the good. Therefore, the benefits received by each individual are P^* times the amount of the good that each chooses to consume (Q_1 and Q_2). For the public good, the individuals are not "price takers." Rather, they receive benefits from the good based on the total amount of the good produced, Q^* . Each derives a marginal benefit from consuming the public good (P_1 and P_2). Public goods that are funded through voluntary contributions may be provided at a less than optimal level, if one or more individuals chooses not to contribute. The result is the so-called "free-rider" rider effect, which derives in part from the nature of public goods supply and demand just discussed.

2.2.2 The Free Rider

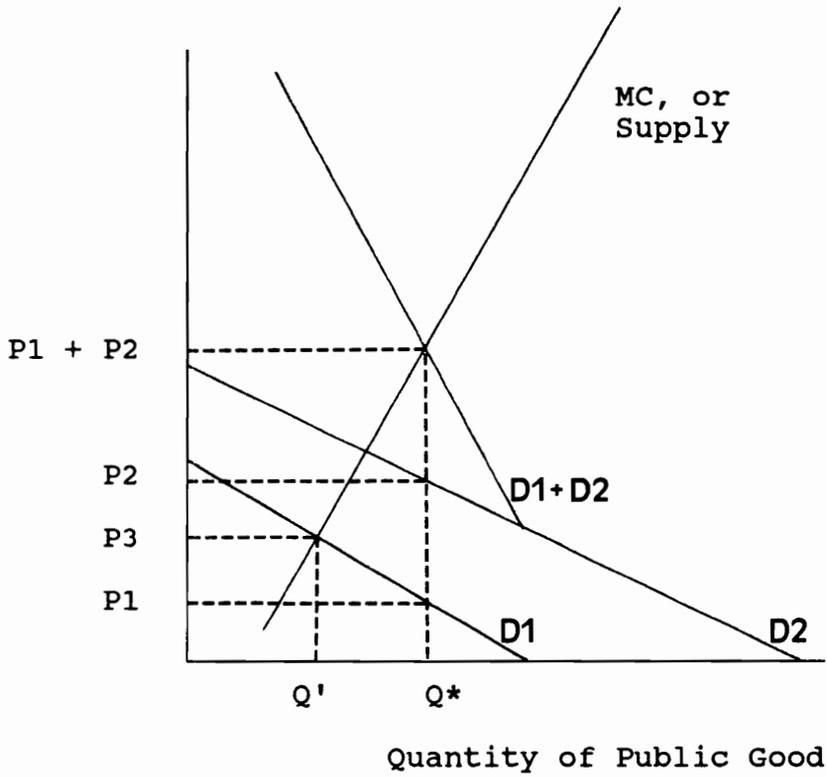
The assumption of self-interested behavior by individuals leads to the conclusion that public goods will be provided at a sub-optimal level by the private sector. This phenomenon is referred to as the free-rider effect or the free-rider problem. The concept of "free-riding" has existed in economic literature for many years. Margolis (1955, p. 347) mentions the possibility of such behavior in a comment on Samuelson's (1954) seminal article on the theory of public expenditure. The logic of this phenomenon is usually presented as follows: Rational, self-interested persons would not voluntarily contribute to the provision of a public good, since it would be possible to consume the benefits of the provision of the good without paying for its provision. The person would take a "free ride" on the others in society or in the group that consumes the good. Thus, insufficient funds will be collected to enable the good or service to be provided by the private sector.

The "self-interest" model of behavior of individuals is the fundamental assumption of modern neoclassical economic theory, the model of man as **homo economicus**. This model underlies much of neoclassical economic theory, and it predicts free riding behavior in voluntary contribution or voting settings. In a study by Marwell and Ames (1981), five of six economists stated that economic theory would

predict free-riding behavior on the part of individuals faced with the voluntary funding of a public good. Indeed, the concepts that the term free riding embody have been put forward by numerous authors as the main reason for the existence of strong central governments in free societies. For instance, in his pioneering and influential book, "The Logic of Collective Action," Olson (1965) states:

Almost any government is economically beneficial to its citizens, in that the law and order it provides is a prerequisite of all civilized economic activity. But despite the force of patriotism, the appeal of the national ideology, the bond of a common culture, and the indispensibility of the system of law and order, no major state in modern history has been able to support itself through voluntary dues or contributions [p.13].

Free riding, in neoclassical economic terms, is similar to Nash-Cournot behavior, where one person does not consider the actions of another, or others, in making a contribution to the provision of a public good (Cornes and Sandler, 1986). This behavior is purely self-interested, since it is the sum of **individual** actions that results in the provision of the good for all to consume. If individuals choose not to contribute, the result is a sub-optimal level of provision from societies' standpoint. The free-rider effect is illustrated in Figure 2.2. The marginal benefits to persons 1 and 2 of the good in question are represented by P_1 and P_2 respectively, for quantity Q^* . If both contribute,



Where:

P_n = price or marginal benefits of public good, based on optimal level of provision

D_n = demand for public good

MC = marginal cost of supplying the public good

Figure 2.2. Demand and Supply of a Public Good, Illustrating the Free Rider Effect.

then the level of provision is Q^* , which implies an overall benefit to society, here, person 1 and 2, of $(P_1 + P_2)$, and an equilibrium where the marginal benefits equal the marginal costs of supplying Q^* . If person 2 decides not to contribute and to free ride, then the level of provision is Q' , where person 1's demand equals the marginal cost of provision. This new optimum implies a lower level of benefits to society (P_3). The lower level of benefits to society exists since Q' is based only on the demand schedule for person 1.

In actuality, free-riding behavior implies the consideration of the actions of others in that a person who free rides expects to consume the good in question without paying for it; the assumption is that others will pay for the good. The expectations or assumptions about others' actions depends, to a large extent, upon the size of the group involved in contributing to the provision of the good. The feasibility of communication is an important determinant of the actions of the individual and is related to group size. In a small-number situation where communication and negotiation between individuals is feasible, an optimal level of provision, in the neoclassical sense discussed earlier, could theoretically be reached, since 1) people could exchange information about the value of the good, similar to the price mechanism for private goods, and 2)

people could ensure that others will actually contribute, through social pressure and/or enforcement. This solution is like that predicted by the Coase solution to externalities,¹ where, in the absence of transactions costs and income effects, bargaining between the interested parties results in an optimal level of provision of a good, or "bad". However, in a large-group situation, with no significant communication between individuals possible, the Nash-Cournot type of behavior is possible, given the assumption of self-interested behavior.

Comparing the private and public goods markets, Cornes and Sandler (1986) state, in reference to dissembling²:

[In the private goods market]...as the number of individuals in the economy becomes larger, **the scope for individual dissembling is reduced**, and in the limit each acts as a price-taker;....The public goods world is rather different, and, if anything, **the scope for individual dissembling increases** with the size of the community [emphasis in the original] [p. 102].

A number of theories which propose solutions to the under-provision, that is, provision at a less than optimal level, of public goods have been advanced. All of these

1. See: Coase, R.H. 1960. The problem of social cost. J. Law and Econ. 3: 1-44.

2. Dissembling occurs when a person withholds his or her contribution or contributes less than their assessment of the value to them of the good.

solutions have some unrealistic assumptions with respect to practical applicability. For example, the Lindahl solution to sub-optimality of provision of a public good (Cornes and Sandler, 1986), where individuals contribute based on others' share of the total level of provision of a public good, is not feasible in practice since it assumes perfect information about others' contributions. This assumption is analogous to the assumption of perfect knowledge of prices in the competitive market.

There are other approaches to "solving" the free-rider problem, such as the Clarke tax and the Tiedman-Tullock solution. These approaches use a central planner, who gathers information on each and every individual's preferences. The amount that each individual is then "taxed" is equal to the marginal cost of providing the good, minus the sum of the reported marginal benefits, or preferences, of all other individual consumers of the good, excluding the one being taxed (see Boadway and Wildasin, 1984). Each of these solutions has its drawbacks. Probably the main difficulty is that individuals must report their demand for differing quantities of the good to the provider of the good, who then aggregates the individual demands into a total demand for the good. The same argument that applies to free riding behavior could apply to this situation: that is, people may act strategically and not reveal their actual

demand schedules. Furthermore, as Boadway and Wildasin (1984) suggest, people may not want to take the time or make the effort to report their demand schedules, particularly since they may quite correctly think that the impact of their own demand on the total outcome would be very small. Also, the administrative costs of such a program would be very large.

The Gibbard-Sattethwaite Impossibility Theorem demonstrates that there is no social decision mechanism that will ensure that people will reveal their actual demand, that an optimal quantity of the public good will be produced, or that revenues will always be sufficient to pay for producing the optimal quantity. More specifically, the theorem states that any social decision function that satisfies these requirements will be dictatorial in nature (Feldman, 1980).

Another approach to explaining the existence of free-riding behavior and sub-optimal provision of public goods is provided by game theory. The foundation of many theories of behavior is the classical prisoners' dilemma (Buchanan, 1968), which was described in Chapter 1. Unfortunately, the classical prisoners' dilemma is not a good model for most public goods provision situations for two reasons. First, the prisoners' dilemma is presented as an all or nothing

situation: a person either confesses or remains silent. In order for a contribution to public goods to be analagous, the dilemma would have to be an all or nothing situation for the contributor: either all is contributed or nothing. An analogous situation with respect to the outcome is that either all or none of the public good is provided, as the prisoners' dilemma does not allow contribution at a level lower than the individuals' assessment of benefits. Second, the prisoners' dilemma describes a small-group situation. A large-group situation can produce consideraby different results, although it need not. In a large group, communication between individuals is infeasible, which makes it similar to the classic prisoners' dilemma. However, as Buchanan (1968) states, the decision problem is different in that:

He accepts the totality of others' actions as a parameter for his own decisions, as a part of the environment, a part of nature, so to speak, and he does not consider this subject to variation as a result of his own behavior, either directly or indirectly [p. 85].

In conclusion, economic theory and game theory suggests that free-riding will likely occur in a voluntary setting, but that the actual actions depend on the individual. Further, there is no mechanism for funding public goods provision that can ensure an optimal level of provision in circumstances of less than perfect information.

2.2.3 Strong Versus Weak Free Riding

Several authors have noted the difference between non-contribution and contributing an amount less than the individual's assessment of the marginal benefits of contributing. Brubaker (1975) refers to the former as "strong" free riding and the latter as "weak" free riding. Brubaker discusses the implications of these two types of behavior: "The 'strong' version of the free-rider hypothesis...may be distinguished from a 'weak' version frequently encountered in the literature. The former asserts that the collective good will not be provided because of the inadequately expressed individual demands"[p.150]. Indeed, Frank (1988) states quite correctly that "for those who accept the strong free-rider hypothesis, the notion of a 'voluntary public good' is an oxymoron" [p. 222].

The weaker version states merely that the allocation of resources to its production will be less than Pareto optimal. Brubaker (1975) states that:

...given all the cogent reasons for expecting some revelation of demand for a collective good, one can be confident that the strong versions of the free-rider hypothesis are not likely to receive support from observation. The weak version will be more difficult to refute. Furthermore, there may be a bit of free-rider as well as golden-ruler in each individual [p. 154].

He continues: "In its weakest form, however, the free-rider hypothesis approaches triviality" [p. 156], since it could include any level of contribution, from an amount marginally different from the individual's marginal benefit assessment to an amount marginally different from zero.

Also, the observation of non-contribution to the provision of a public good may not indicate that the person is a free rider. The person may in fact place a zero value on the good in question. Also, a person's willingness to pay may be constrained by his or her budget, that is, by ability to pay, such that contribution is zero. Second, a person may in fact be a non-voter, who does not intentionally free ride, but believes that his or her contribution will not make a difference with respect to the outcome. This result, given a strict interpretation of the assumptions of neoclassical economics, would be expected to occur with any election or similar situation involving voting where large numbers of people are participating--non-voting behavior is "rational." Non-voting is another kind of strategic behavior, independent of free-riding behavior.

2.2.4 Institutional Responses to the Free Rider "Problem"

The primary institutional response by government to the free-rider problem associated with the provision of desired

public goods is taxation. Taxation does eliminate some of the transactions costs associated with gathering information and reaching agreements among individuals. However, the government does not possess information about each individual's preferences. Therefore, mandatory taxation creates both weak free-riders, those who pay less than their marginal benefits would indicate that they would be willing to, and what have been called "unwilling" (Schmid, 1978) or "forced" riders (Brubaker, 1975), those who pay more than their marginal benefits. Brubaker states in this regard:

Operation of fiscal mechanisms can result in two analogous types of error, "conviction" of the innocent forced rider or "acquittal" of the guilty free rider. The forced rider can be "convicted" incorrectly, and without a trial, of failure to express his demand for the collective good. He is "fined" the difference between his true valuation of the good and his stipulated tax payment. There is no court that can possibly try his case, since no one, not even he himself, may have determined his true demand. If he refuses to pay, he can be deprived of his personal liberty. The forced rider's responses might include costly and uncertain attempts to avoid taxes, to evade them, or to reform fiscal institutions, none of which are normally regarded as prime choices for leisure activities. It generally has been thought that a set of institutions relying on uncoerced contributions would avoid the detrimental effects of forced riding only by suffering the free rider. By electing to employ a fine meshed instrument society catches its would-be free riders but only at the expense of victimizing its innocent forced riders. Curiously given the historic emphasis on the presumption of innocence it has been discarded where rules of the game regarding expression of demand for collective goods is concerned [p. 157].

Also, taxation does not produce the kinds of benefits as may voluntary donations. Briefly, people who voluntarily contribute may receive "moral" benefits related to the satisfaction of having contributed to a "cause". Such benefits are referred to by Morrison (1979) as "reform utility", and by Ireland (1970) as "act utility".

Finally, there are broader issues, such as the greater freedom that exists under a voluntary choice system versus the potentially greater efficiency that could be possible under coercive or non-voluntary systems, such as taxation. If people do not, in fact, free ride, and if "weak" free riding is nonexistent or insignificant, then a coercive system may not have the advantage of greater efficiency in the attainment of "optimal", in the neoclassical sense, levels of provision of public goods.

2.2.5 Charity

A major source of funding for public goods, and other goods and services, is through donations to charity. Under the self-interest model of behavior, with its assumption of strong free riding, charity giving is not expected, since it is not "rational." Yet, Frank (1988) reports that, in 1981, religious organizations raised around \$10 billion, health organizations and hospitals, around \$7 billion, and civic

orchestras, around \$150 million. He also cites a study which reported (presumably for the same year) that greater than 85 percent of U.S. households made private donations, averaging around \$200 in 1971 dollars. The Chronicle of Higher Education (June 13, 1990) reported that voluntary donations to charities by individuals totaled \$96.4 billion in 1989.

The question with respect to charities, given the above discussion is: why do people contribute, when such contribution seems to imply interdependent utility functions and, from the viewpoint of neoclassical economics, is not "rational"? There are a number of possible explanations, which are not mutually exclusive and not necessarily inconsistent with the idea of rationality. Indeed, it may be that more than one model of rationality is needed. The neoclassical economic model may well apply to the purchase of a loaf of bread; another model may be needed to describe the contribution to a charity. Johnson (1970) states:

Individuals, in a large community, who are money-cost minimizers will refuse to contribute towards the provision of a social want...because they cannot be excluded from the benefits. Individuals may, however, voluntarily contribute if they obtain satisfaction from giving, or if they are confronted with social, religious, or psychic pressures....The traditional version of the free-rider problem, also, cannot explain the reasons impelling individuals to contribute \$17 billion to charity in 1968, or to voluntarily join unions

where not required for maintenance of employment, or to vote in political elections [p. 80].

Johnson (1970) states the same question as a problem of economic theory: others' welfare is important to at least some individuals, implying self-interest and independent utility functions are not an accurate model of human economic behavior in all cases:

Positive economic models can be constructed on motivational postulates other than **homo economicus** as easily as on the assumption of economic man. One need not develop a "moral science" to explore individual decision-making and institutions which are so evident in the world but so neglected by economists; one needs only to incorporate other motivational postulates into the analysis. If this point is not recognized, does it not seem contradictory for a social science to place so much emphasis on individual rationality in analytical models and then to have to explain a considerable portion of private and collective decision-making on grounds of individual irrationality? [p.81]

In conclusion, a model of individual contribution behavior that is consistent with observed behavior would need to incorporate factors other than those based on self-interested behavior or the neoclassical theory of economic rationality. Frank (1988) suggests a "friendly amendment to the self-interest model", one that does not discard the motive of self-interest, but which operates with it, or in addition to it in certain situations. Some of these other behavioral factors, which are discussed in detail in the following sections and which fall outside the mainstream of

neoclassical economic theory, that have been identified as explanations for charitable donations include:

Altruism: where one or more other person's utility enters into an individual's utility assessment or function.

Psychic Utility: utility derived from contributing or from involvement in a cause.

Incentives: monetary or goods incentives provided to contribute.

Social Pressure: pressure put on an individual by peers or an employer.

Vehicle/Assurance: belief in the legitimacy of: 1) the organization receiving the contribution and/or providing the good, and 2) the means of collecting the funds, referred to as the "vehicle"; assurance of provision and/or what use is made of the contribution.

The first three factors relate to the benefits received by the individual, either from consuming the good in question or from contributing. Social pressure includes any non-monetary incentives to contribute, or not contribute, in the form of peer pressure. For example, contribution might affect the status of the contributor, or could be a condition of employment. The final factor relates to the individual's perceived probability of: 1) the contribution being put to good use, which could include the perception of the legitimacy and/or effectiveness of the provider of the good, and/or 2) the perceived probability that the good actually will be provided in the "correct" quantity and quality.

In summary, neoclassical economic theory may accurately explain consumption behavior in many situations or much of consumption behavior in specific instances. However, the neoclassical model of behavior makes some naive or limited assumptions which may lead us to make incorrect conclusions about behavior, and which are not supported by much observed behavior, such as contributions to charity, exhibited by individuals. More correctly perhaps, it is naive of neoclassical economic theory to make assumptions about a very limited range of human behavior, and to apply these assumptions to nearly all human economic behavior.

The factors just mentioned imply that an expanded definition of **homo economicus** may be required if economic theory is to accurately describe a range of normal human behavior. The problem with the assumption of self-interested behavior, as well as the conclusions drawn as a result of the use of economic models based on this assumption is summarized by Daly and Cobb (1989) in the notion of the "fallacy of misplaced correctness." This concept suggests that a high degree of abstraction in thinking about something results in erroneous conclusions when an actual situation is examined. The authors contend that this fallacy has been committed by the profession of economics, with respect to human consumption behavior. For example, in discussing altruism, Daly and Cobb state:

The chief nature of **homo economicus** that appears in this picture [neoclassical economic theory] is extreme individualism. What happens to others does not affect **homo economicus** unless he or she has caused it through a gift. Even external relations to others, such as relative standing in the community, make no difference. In addition, only scarce commodities, those that are exchanged in the market, are of interest. The gifts of nature are of no importance, nor is the morale of the community of which **homo economicus** is a part. When economists draw conclusions about the real world from this model, there can be no question but that the fallacy of misplaced correctness has been committed [p.87].

The authors also note that "the frequency of appeal to externalities is a good index of the overall problem of misplaced correctness in economic theory" [p. 37]. In order to fully understand the economic behavior of individuals, in particular, behavior with respect to voluntary contribution to the provision of public goods, an expansion of the neoclassical model of behavior is necessary. The following section develops such a model.

2.3 A Model of Voluntary Contribution to the Provision of a Public Good

With the above discussion in mind, this section presents a model describing the voluntary contribution of money for the provision of a public good. The model incorporates the possibility of free riding. It is

important to note that we are not discussing the value or appropriateness of public versus private provision of public goods or of voluntary versus mandatory funding mechanisms in society. Rather, the model models the contribution process, and the empirical study assesses the results of a case study where a voluntary contribution process was used.

Several authors have proposed models explaining contribution behavior or, more specifically, free-riding behavior. While many studies include several important factors, none of which this author is aware explain all the relevant factors. This study does not claim to include every possible factor either. The model presented here does, however, include the factors that economic theorists and empirical studies have identified as being important, organized in a way that facilitates empirical study.

The aspects of a model of contribution to the provision of a public good may be classified into four general areas, which are not mutually exclusive:

1. Behavioral factors, including free-riding and non-voting behavior, the influence of group size on contribution behavior, the assurance of others' contributing, and the probability of provision of the good.

2. Economic Rationality, which incorporates the neoclassical model of behavior, including the influence of individual utility, both for the public good in question and the process of contributing, budget constraints, and opportunity costs of contributing.
3. Information, including the influence of information on the utility or benefits of the public good and as a transaction cost of contributing.
4. Institutional factors, including the possibility of protest voting by individuals, and the assurance of provision by the provider of the public good.

The following sections discuss each of these four sets of factors in depth. The chapter concludes with some cautions about applying theoretical models of behavior, such as the one developed here, to real-world situations. While this discussion may improve upon the neoclassical model of behavior, the application of any abstract model of behavior to an actual behavioral situation may be difficult, both because people may not behave as anticipated, and because each situation is different, and may include factors which are not included in the model.

2.3.1 Behavioral Factors

There are numerous behavioral factors that are important to an individual's contribution decision. Aside from those explained by traditional economic theory (which are discussed in the next section), the most important can be classified as relating either to group size or the assurance effect.

Group size

As group size increases, the number of possible lines of communication with others increases. At the same time, the perceived probability of affecting the outcome, the level of provision, decreases. For example, in a very small group versus a larger group, 4 individuals versus 80, Marwell and Ames (1981) found group size to be important to an individual's decision to contribute. Specifically, individuals in small-group situations contributed more than did the same respondents in a large-group situation. Chamberlin (1978) also noted that contributions decreased with increasing group size. In a recent series of studies based on hypothetical markets, Isaac and Walker (1988a, 1988b) found evidence that increasing group size increased the likelihood of free-riding behavior. This effect occurred when the increase in group size was accompanied by

decreasing marginal benefits to the individual of the good in question. This decrease in marginal benefits, whether real or perceived, may occur in general as group size increases. Also, as group size increases, the practicability of a mechanism for coordinating individual demands for a public good becomes increasingly difficult. Thus, increasing group size implies an increasing cost to collecting information, both for the individual and for public goods providers, who are trying to discover the preferences of individuals. For the individual in a large group, it is difficult to predict with certainty others' actions, that is, how much they will contribute. This situation is equivalent to increasing the uncertainty of the expected outcome.

Another large-group phenomenon is that of the non-voter. Non-voting behavior, in the context of this study, could occur where the individual's perceived probability of his or her contribution affecting supply of the public good approaches zero or is negative. This situation is similar to an election where an individual's perceived probability of affecting the outcome is zero, because his or her one vote is seen to be very small in relation to the total number cast. Buchanan (1967) summarizes the effect of the non-voter in the following way:

This effect stems, not from the indivisibility of the benefits from public goods and services, but from the nature of the decision process when collective outcomes are settled by less-than-unanimity rules. The single person, as he participates in collective choice, will recognize that his own preferences, as expressed by his vote [or monetary contribution: "voting with dollars"] ...will not be decisive.... He will be faced with the probability that his own vote simply "does not matter." The probability becomes larger as the size of the electorate increases, given any established voting rule. This probability may lead the individual to abstain from participating in the choosing process [p. 121].

Non-voting could also result from the individual's receiving information about the outcome of the event in question. An example is voters on the west coast of the U.S., who may choose not to vote in a national election after the media networks have declared a winner based on east coast vote returns.

Identification with a small group (in the terms of psychology, a **reference group**) can conceivably overcome the large-number effect. Bolnick (1975), discussing this phenomenon states:

Through direct social pressures existing in the small groups which function within the large group, and through pressures derived from identification with significant reference groups and reference individuals ("influentials" or "opinion leaders") within the large group, channels of influence can be maintained even as group size increases. Behavioral models based solely on assumptions of economic rationality and economic motivation are apt to fail to explain behavior within these social contexts [p. 215].

Reference group theory may explain why groups such as the United Way aim their contribution drives at small groups. As group size increases, direct social pressures would be expected to decrease.

A way to overcome the large numbers effect from the institutional standpoint is through the provision of some coordinating mechanism such as Brubaker (1975) suggests:

collective-good intermediation...[where] some individuals specialize in facilitating the necessary negotiations. Their function is to communicate information about the character of collective-goods supply to potential purchasers and information about collective-goods demand to potential sellers in order to find bases for mutually satisfactory exchange [p.148].

An example from the charity sector is the United Way, which deliberately organizes on the local or organizational level. Coordination of donations and provision of information is usually by someone familiar to the potential donor. Keating, Pitts, and Appel (1981) found that the social pressures provided by small groups significantly influenced individuals' contributions to the United Way.

The Assurance Effect

The assurance effect relates both to an individual's perception of the probability of contribution by others and

to the probability of provision by the provider of the good to which the person is contributing. The perception of actual and/or probable actions by others may relate to the fairness of the process of collecting funds and providing the good as well as the probability that others will "do their fair share." The "probability of provision" is defined as the likelihood that a contribution will result in the production of the good, either for the individual's or others' consumption. Obviously, in the absence of a "money-back guarantee," the probability of a person contributing decreases as the perceived probability of non-provision increases.

Isaac, Schmidtz, and Walker (1989) examined the assurance "problem" in a hypothetical market and found that assurance of provision of the good in question is an important factor influencing the contribution decision, particularly in multiple, or multi-period, contribution decisions. They also note that the addition of a money-back guarantee significantly increased the chance of a group reaching an optimum and stable solution, or level of provision.

Schmid (1988) suggests that the perception of fairness may be tied to income:

I would hypothesize that whether people think the game is fair has something to do with such things as the free rider problem...income distribution may affect willing participation and this has measurable economic consequences [p. 236].

Buchanan (1967) states that, in order to overcome the free-rider problem:

...institutions must present alternatives to the individual which embody definitive commitments on the part of others as well as himself, which make outcomes measurable in terms of his own utility dependent in some degree upon his own choice, and, finally, which reduce to some reasonable limits his own influence over the net "terms of trade" [p.115].

The existence and success of a large sector based on charitable contributions implies that, in some cases, people have the assurance of supply and fair-play on the part of organizations and, possibly, of other people. A possible explanation for the existence of a charity sector is provided by Runge (1984):

The prisoners' dilemma leads to the conclusion that public goods will never be supplied without outside enforcement. However, the coordination game described by the assurance problem suggests that there are incentives to develop and maintain institutions characterized by rules which make voluntary contributions to public goods a utility-maximizing strategy. The essence of the assurance problem is that institutions which promote fairmindedness can provide the assurance which makes contribution to the public good more attractive than a free ride [p. 155].

2.3.2 Economic Rationality

The neoclassical definition of economic rationality with respect to consumption decisions has a place in the determination of the contribution decision. The concept of maximization of utility subject to some budget constraint is the concept used in this discussion. This concept needs to be expanded, however, to include some non-traditional concepts of utility. This section discusses the utility derived from contributing, the budget constraints on the level of contribution, and the opportunity costs of contributing.

Utility or Benefits of Contribution

In the simplest form, the benefit or utility derived by an individual from contribution to the provision of a public good is related to the current or expected benefits that the person receives from consuming that good. An individual could obtain such benefits from the direct consumption of the good in question, independent of the benefits derived from contributing to the funding of that good. This concept is identical to the neoclassical definition of utility derived from consumption. However, as Ireland (1970) notes: "Both the desire for public goods in terms of direct personal motives and broader public motives are normal

demands for a public good" [p. 22]. These public motives can take two forms. The first form is described by the Kantian idea of the moral law versus the private maxim (Buchanan, 1965). The essence of this form is that people may receive psychic utility from contributing to a cause or to some good or service that, to them, is morally right. This kind of utility is described by many authors in different ways. It is the basis of Morrison's (1979) "reform utility" and Ireland's (1970) "act utility." The term that is used to describe this concept in this paper is "contribution utility."

Not all goods would be expected to generate contribution utility. For example, contribution to the provision of public roads may not generate such utility, while contribution to the preservation of an endangered species of animal or for housing for the homeless probably would. Also, contribution utility could contain an aspect of righting a wrong or preventing a wrong. Such motives for contributing may be rooted in custom, tradition, ethics, or morals. In essence, this concept is not much different from the usual idea of utility. However, the presence of contribution utility would represent an addition to an individual's assessment of the utility gained from contributing to the provision of a public good. Exclusion of contribution utility would result in an incorrect

interpretation of the efficiency conditions for consuming a public good that is funded through voluntary donations, since the total level of utility would be underestimated. It is possible that contribution utility would be a larger component of the total benefits received from contributing than would direct, or use, utility. Finally, it is important to note that contribution utility differs from utility derived from consuming a good in that it is impossible to free ride and still receive the benefits that derive from contribution utility.

Ireland (1970) adds one other kind of utility, which is a subset of contribution utility, based on political motivation. People might wish to affect the future supply of some good or service for reasons other than consumption, for example, philanthropic or ideological reasons.

Another concept that could modify the usual idea of utility is that of altruism. Altruism implies taking one or more other persons utility (or welfare) into account when making a consumption decision. Altruism is referred to by Arrow (1975) as an "unrequited transfer." Altruism implies that an individual could receive benefits from actions taken by others, but that do not affect the individual directly. An example would be the donation of money by a

philanthropist to a cause favored by the individual, but which does not yield direct benefits to the individual.

An alternative explanation of the benefits received from contribution to a public good is provided by Mitchell (1979): "In a situation where individuals have a high **disutility for public bads** that they are unable to escape, where they have imperfect information, and where the cost of contributing to a lobby is low, the act of contributing is consonant with a rational strategy of seeking to minimize the maximum regret" [emphasis added] [p. 121]. Mitchell's point is particularly important with respect to the case study employed in this paper. He suggests that a person might be contributing to the provision of a public good, but might in addition (or instead) be contributing to the avoidance of a public bad:

Public goods are entities such as clean water and air, which have a positive value for individuals and which, once created, are potentially available to everyone in a society. Public bads are entities such as polluted air and water, which have a negative value for individuals and which, once created, are potentially available to everyone in society. These are, of course, the opposite of each other. The avoidance of a bad is a good and vice versa. Likewise, a high utility for clean air implies a high disutility for polluted air. Nevertheless, someone considering an appeal from a lobby that is striving to work for cleaner air may be motivated to contribute by a desire for this amenity or a fear that if he or she does not contribute, the level of pollutants will get worse or stay the same...the latter may be a more powerful motivating force than the former [p. 99].

A summary of Mitchell's discussion of the potential benefits and costs of contributing is provided in Table 2.1. Note that his classification includes some of the social costs and benefits that were discussed earlier, such as social status. This author's additions are in brackets. In Table 2.1, the benefits of contributing are, roughly, the reverse of the costs of not contributing. The difference is that the benefits of contributing are derived from the increase in public goods benefits, as well as any private benefits such as contribution utility or "self-esteem". He also notes the importance of the assurance effect, which he describes as the "perceived effectiveness of collective action to achieve the public good." The three categories under the costs of not contributing include the continuance or increase in some public bad, presumably a decrease in the quantity or quality of a public good, as well as the receipt of "private bads". The categories relating to social status and sociability are probably not relevant in a large-group situation with little or no communication possible between contributors. However, the receipt of self-esteem, as well as guilt, could be a factor in any contribution decision.

The observation of contribution by an individual, then, may involve more than a simple assessment of utility derived from the consumption (or potential consumption) of a public

Table 2.1. Benefits and Costs of Contributing--Mitchell's
(1979) Classification [p. 100].

1. Costs of Contribution [benefits of not contributing]
 - A. Money
 - B. Time
 - C. Loss of social status and reputation

2. Benefits of Contribution
 - A. Possible increase in a public good
 1. Utility of the public good for the individual
 2. Amount of the public good the individual expects to receive personally
 3. Perceived effectiveness of collective action to achieve the public good [assurance effect]
 - B. Receipt of private goods
 1. Goods and services
 2. Sociability
 3. Social status
 4. Self-esteem

3. Costs of Not Contributing
 - A. Possible continuance of or increase in a public bad
 1. Disutility of the public bad for the individual
 2. Amount of the public bad the individual has received or expects to receive personally
 3. Perceived effectiveness of individual contributions in preventing the bad.
 - B. Receipt of private bads
 1. Loss of goods and services
 2. Reduced social status
 3. Guilt

Note: This author's additions are in brackets.

good. Schmid (1978) provides us with a caution in regards to theories about peoples' evaluations of utility:

It is difficult to imagine a prediction precise enough to identify the utility of my \$10 contribution to a million dollar project. The perfect-knowledge assumption of neoclassical economic theory misses a lot of real-world situations of interdependence [p. 155].

The implication of this discussion is that the exact nature of the benefits of contributing to the provision of a public good may be difficult to determine, and may vary, for any one good, among individual contributors. The determination of the benefits of contributing are particularly complex in situations where a contributor may receive contribution as well as good utility, or where a person may be contributing to avoid a bad (or to avoid a reduction in a good).

The concept of contribution utility and avoidance of a bad are not foreign to neoclassical economic theory. However, the utility gained through altruistic actions, that is, the value to the individual of others' gains in utility, generally is foreign. The concept of contribution utility should include such altruistically-derived utility. Finally, it is difficult it not impossible to free ride on contribution utility in any form. The existence of this type of utility may help to explain the large quantity of

donations to charity noted earlier, and complicates the measurement of willingness to pay for non-market goods.

Budget Constraint to Contribution

An individual's budget is obviously an important factor in the contribution decision, and it defines ability to pay.³ Regardless of a person's behavioral inclinations, the budget could act as a constraint to contribution. It is important to note that an individual's preference for contribution to the provision of a public good relative to other goods, is not dependent on a person's budget, or level of income. Rather, preferences are based on the utility that individuals derive from consuming goods, including the "consumption" of contributions. Utility derived from contributing can be compared to the utility derived from consuming other goods in an indifference curve, which expresses the amount of consumption of different quantities of both sets of goods that will yield a constant level of utility. The amount of total utility that an individual may

3. There have been several attempts to arrive at an empirical estimate of the relationship between income and charitable giving. Collard, 1978 (pp. 93-98) reports the results of several such studies. For example, a U.S. study reported an elasticity of level of charitable contribution with respect to income of around 0.8. That is, a one percent rise in income would result in a 0.8 percent rise in charitable giving.

receive or consume is subject to that individual's budget or income level. When the level of income changes, the utility derived from each good also changes. For example, a person's income might increase, resulting in an increase in consumption of all goods including contributions.

It may be more appropriate to think of the amount that an individual desires to contribute to all voluntary causes as being a fixed amount which is a function of his or her income. In this case, the amount that a person contributes to any one public good would be determined by the utility derived from contributing to that public good versus other charities, as well as the amount already contributed to other public goods or charities. The relevant comparison in this case would be the individual's preferences between different potential recipients of the individual's contributions, subject to a total contribution constraint that is in turn a function of the individual's total income. In other words, contributions are weakly separable from all other goods. The contribution decision for the individual then becomes a comparison of alternative uses for the proportion of his or her income that is devoted to charity.

The total amount of income that can be devoted to charity, whether the money is contributed to one or more charities or public goods, is determined by two main

factors. The first is the individual's preferences between contribution and other goods, as just discussed. The second factor is the amount of money needed to maintain the individual at a subsistence level, which would vary for each individual. Given these two factors, it is possible to characterize an individual's contribution decision with respect to the budget constraint in one of three ways: 1) the individual is essentially unconstrained by budget, implying that the individual's contribution is not constrained by his or her need for a subsistence income, 2) a person is constrained by budget, but contributes some amount, or 3) the person is constrained such that no contribution is made. Individuals in the first category have an income well beyond the subsistence level, such that they feel unconstrained by the need to consume other goods to maintain themselves at a subsistence level. The second category would include individuals who are above the subsistence level, and who may not be able to contribute an amount equal to their assessment of the benefits of contributing. The third category consists of individuals who are at or below the subsistence level, and thus cannot contribute any amount at all. A more detailed discussion of this concept, including a graphical analysis, is presented in Appendix A.

Costs of Contributing

Aside from the amount of money given and the time cost of contributing, the major cost of contributing is the opportunity cost of the use of the money for the contribution. The opportunity cost of contributing may be expressed in terms of priorities between the public good in question and other (possibly similar) public goods and/or private goods. Other public goods might include other "causes" worth contributing to; other private goods could include any goods or services that might be purchased with the money spent on the contribution. A change in the amount spent on various alternative goods may reflect a change in the individual's preferences between the goods, a change in income, and/or a change in the prices of goods.

Another important factor in determining the level of contribution is other contributions made that could affect the individual's assessment of a particular situation. For example, a person may have contributed money or volunteered time to the provision of the same good, or to a similar good, which could decrease the level of contribution, or could lead to noncontribution. The decrease would occur if the individual feels that, in a sense, a contribution has already been made, or that a portion of his or her total income has already been allocated to that particular good. Samples, et. al. (1986) discuss this situation in terms of a

household production function where an individual minimizes the cost of achieving an output vector that includes the public good in question in their study of endangered species preservation. The time and money discussed above are inputs to this production process. After choosing an optimal combination of inputs, the individual in the Samples, et al. study then maximizes utility, subject to a budget constraint.

An additional cost of contributing is the transaction cost of searching for and acquiring information about the public good, the vehicle used to collect the money, and/or the provider of the public good. If such costs are significant, a zero contribution might result. Alternatively, the individual might contribute based on limited information or on a basis other than that which would require more information. Such a contribution would be the result of receiving contribution utility rather than utility from the good. Obviously, the provider of the good, who may also be the designer of the vehicle for collecting contributions, plays an important role in the potential transaction cost of contributing in the amount of information provided to the potential contributors.

It is important, therefore, to know the opportunity costs of contributing, as well as the benefits of

contributing. Opportunity costs could include the use of funds that could be applied to contributing to a public good or other goods, including voluntary contributions to other public goods providers or charity groups. Further, gathering information, in order to make an informed decision, has costs associated with it. Therefore, a lack of information could increase the costs of contributing, even to the point where no contribution is made.

2.3.3 Quantity and Quality of Information

The amount and kind of information that an individual possesses at the time of the contribution decision is extremely important. Information is needed not only about the good, but about the contribution vehicle, and the provider of the good. Information is important in several ways, some of which relate to factors discussed previously. In the most basic sense, a person must be aware of the existence of the vehicle for making the contribution and/or the good itself. Second, information is a determinant of utility or value: knowledge about a public good or service can increase or decrease utility. Collecting information also poses a transaction cost of contributing, as was just discussed. Finally, information plays a role in the

formation of expectations and in assurance about provision and others' contributions.

Empirical studies of the role of information in contribution decisions have been conducted mainly with respect to bids made on the value of goods in contingent markets. Bergstrom, Stoll, and Randall (1989) and Samples, et. al. (1986) noted a significant impact of information on the level of such bids. Stephenson (1988) found, however, that such information did not affect the contribution decision.

Information and Assurance

Institutions involved in the provision of public goods play a role in providing information and in coordinating preferences. In regards to institutional roles in providing information and assurance, Runge (1984) states:

Assurance is a matter of degree. The ability to predict the behavior of others is subject to varying limits of confidence....[P]olitical and economic institutions can increase this mutual predictability, reducing uncertainty and stabilizing expectations by coordinating individual choice....[I]nstitutions order expectations by providing information, which allows more accurate prediction of individual actions [p. 162].

Having information on others' actions, for example, updates on the progress of a vote or of contributions, could lead to impression of others "giving their fair share". This updating would allow people to revise their expectations of the outcome as well. Finally, Buchanan (1967) notes the interaction of non-voting behavior and information: a person may not gather information if he or she believes that the outcome will not be affected by a vote or contribution. The lack of information makes a vote or contribution even less likely.

Information as a Constraint to Contribution

As in the case of budget constraints, it is possible to think of an individual's contribution as being constrained by information. If a person is totally unaware of the vehicle or good in question, contribution is zero. Theoretically, a person might have little information about the good, and would contribute primarily on the basis of his or her receiving contribution utility. An individual might have a decreased level of benefits or willingness to pay, compared to his or her "full information" level, if that individual feels that he or she has insufficient information about the good or the provider of the good.

With respect to the institutional role in this learning process, Runge (1984) states that:

The manner in which institutions perform such an informational function in a dynamic context may be expressed in terms of a Bayesian learning process. The particular ordering of expectations resulting from institutions is an adaptive learning response to the environment of the group. Over time and across cultures, individual contributions to public goods may be expected to change [p. 170].

The receipt of information could act on the individual in two ways. First, the individual's utility function or level of utility received could change. Experience may also reduce the transaction cost of information in the decision whether to contribute. Second, an individual's information about the provision of the good in question by the provider could change the expectation or assurance of provision. This concept is consistent with the learning or Bayesian process of updating utility and expectations over time based on the receipt of information.

Thus, there are three categories of contributors, based on the amount of information possessed at the time of the decision:

1. Contribution essentially unconstrained by lack of information. The individual possess essentially "full" information.
2. Contribution made, but constrained by lack of information. Contribution is less than would be made under "full information".

3. Contribution constrained by lack of information such that no contribution is made.

2.3.4 Institutional Factors

It is the responsibility of institutions to coordinate the actions of individuals, such as contributing to the funding of public goods, as well as to provide public goods. In a voluntary setting, this role is particularly important. Frohlich and Oppenheimer (1970) state:

...the extent of the free-rider problem, in groups of any size, will depend on the existence of a coordinating mechanism. Without such a mechanism there is no *a priori* reason to believe that goods will be collectively supplied to groups of any size [p.119].

A coordinating mechanism would have to include a payment vehicle, a means of providing information, and possibly a means of solving the assurance problem. The term "institutions" could refer either to the vehicle for collecting money or the provider or producer of the public good.

An additional reason for an individual to withhold their contribution or vote could relate directly to that individual's perceptions about the vehicle, the provider, or the public good in question. An individual may have reasons for protesting against the institutions involved in the

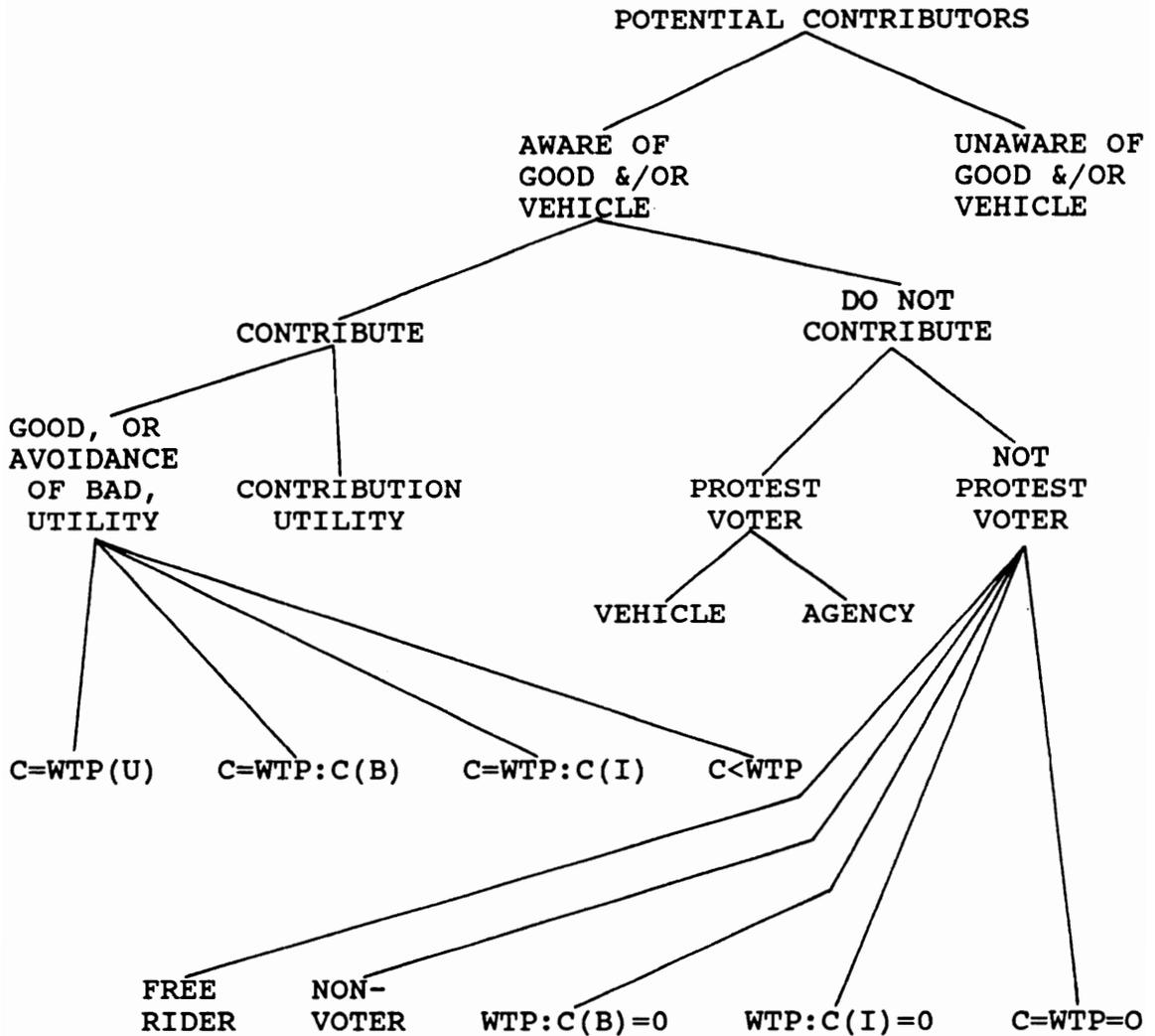
provision of a public good. These noncontributors are essentially protest voters, who protest by not contributing, or by not voting. A protest voter might, for example, value the good being provided, but have a negative attitude towards the method of payment collection or the agency that provides or manages the good. In the case of government agencies, the protest voter might have political motivations for not contributing. Finally, a protest voter could be a person who believes that he or she will be harmed in some way by contributing, or by the provision of the good in question. Such persons might feel that they should be compensated for having to consume the good that is being provided, so their noncontribution could be viewed as a protest against the lack of such compensation.

2.4 On Lexicographic Ordering

The categories discussed above interact simultaneously to produce a contribution decision. However, it is possible, in some cases, to order some of the various factors in terms of when they may affect the contribution decision. For example, if a person is totally unaware of the contribution vehicle or the good in question, the other factors are obviously inoperative. Likewise, if an

individual opposes the provider of the public good, or the vehicle in question, then the assessment implied by economic rationality may never take place. With these ideas in mind, a decision tree is offered as a representation of the contribution decision process (Figure 2.3). The process described in this case models the voluntary contribution to the provision of a public good, where the number of potential contributors is large.

Following through the decision tree in Figure 2.3, the first level of the decision tree distinguishes whether the individual is aware of the good or the funding mechanism. If the person is not aware, then the person is obviously a noncontributor. If the person is aware, then the process becomes a conscious decision of whether to contribute. Among aware noncontributors, the decision to protest vote may be the first choice that is made, since this decision takes precedence over any other factors, such as the utility the person may receive from the good in question. Protest voters are either protesting the agency in question, or the vehicle for collecting the funds, or both. Noncontributors who are not protest voters will fall into one of five categories: 1) strong free riders, who choose not to contribute despite a positive benefit assessment, 2) nonvoters, who do not believe that they are affecting the outcome of the provision of the good, 3) persons constrained



Where:

C = Contribution
 WTP = Willingness to pay, or marginal benefits for the public good in question
 WTP(U) = WTP "essentially unconstrained"
 WTP:C(B) = WTP constrained primarily by budget
 WTP:C(I) = WTP constrained primarily by information
 C<WTP = "Weak" free rider

Figure 2.3. Schematic Representation of Theory of Contribution to the Provision of a Public Good.

by budget such that their contribution is zero, or 4) persons constrained by a lack of information such that their contribution is zero, or 5) persons who have a zero, or negative willingness to pay.

Contributors will either receive primarily contribution utility or good utility. Good utility could also be conceived of as being the utility derived from the avoidance of a "bad". It is likely that a person receiving primarily one of the two categories of utility, good or contribution utility, could be receiving some of the other category of utility. For example, a contributor receiving primarily contribution utility could receive good utility as well. For those contributors who are receiving primarily good utility, some assessment of willingness to pay has occurred, although this assessment may not be a conscious, considered process. Four categories of contributors receiving primarily good utility are possible: 1) contributors who are essentially unconstrained by budget and information, 2) contributors who are primarily constrained by budget, 3) contributors who are primarily constrained by information, and 4) weak free riders, who give an amount less than their assessment of willingness to pay, or marginal benefits of contributing, subject to ability to pay. Categories 2 and 3 are not necessarily mutually exclusive. For example, a person who feels that they are

primarily constrained by a lack of information could also consider budget constraints to be an important factor in their contribution decision.

For contributors receiving mainly contribution utility, an assessment of willingness to pay is possible, but would be quite different from an assessment of good utility. Further, such a person could not be a "weak" free rider, due to the nature of contribution utility. While it is possible that contributors receiving primarily contribution utility could be essentially unconstrained, or constrained by budget or information, these categories are not explored in this study, and thus are not included in the decision tree.

The four categories of factors influencing the decision to contribute, namely behavioral, economic rationality, information, and institutional factors, are not necessarily mutually exclusive. For example, the interactions of the categories may differ depending upon the good in question. A good example of these differences is given by Collard (1978; additions by this author are in brackets):

The voluntary donation of blood works because donors see blood donation as part of essential life support, consider blood donation as a relatively low cost activity and trust that a sufficient number of other donors will come forward to meet requirements. But one would not expect to build hospitals on the scale required, or motorways, on the basis of voluntary contributions. The relevant gift relationship then

becomes that implied in altruistic voting behavior [p. 148].

The above quote may be interpreted in terms of the decision tree just discussed. The fact that donors view donation as a part of essential life support is evidence of high utility for that contribution and, possibly, altruism. Blood donation is viewed as a low-cost activity, implying low opportunity costs of contribution. The trust that others will come forward to meet requirements is an indication that people have a high degree of assurance, both about others' actions and about the probability of provision. It is unlikely that contribution to the provision of a highway would generate similar effects.

In summary, all of the above factors may interact simultaneously to produce a contribution decision, though there may be a lexicographic ordering of some factors for some individuals and/or some situations. The nature of the good in question may determine, to a large extent, the relative importance of some factors, such as the existence and amount of contribution utility.

2.5 On the Empirical Validity of Models

The discussion just presented must be interpreted in the context of what a person is actually thinking about when he or she makes a contribution. The model may be an over-formalization of the actual process of decision making in many cases. In other words, the model may not accurately explain what occurs when a person is faced with an actual decision. Sowell (1980) states:

The real problem is that the knowledge needed is a knowledge of subjective patterns of trade-off that are nowhere articulated, **even to the individual himself**. I might think that if faced with the prospect of bankruptcy I would rather sell my automobile than my furniture....but unless and until such a moment comes, I will never even know my own tradeoff, much less anybody else's [emphasis added] [p. 218].

Schmid (1978) also makes a useful point in this regard:

If the group is large, the individual will find it costly to know how many people would give how much. But, more fundamentally, how can a person estimate how much others are going to give and then decide on how much he will give, when the people he is trying to estimate are asking the same question? He is trying to estimate a whole series of interdependent decisions. This is not just a matter of high information cost, but simply impossible information [p. 155].

Schmid continues:

It is probably a mistake to overintellectualize the decision-making process. Just because we can imagine some set of calculations consistent with observed behavior does not mean people actually think that way. Perhaps a bit of empathy would be more useful. When I contribute to the local public television station, I have no estimate of the probable contributions of others, of total cost (I note that the stations are careful to tell you this), or even of the number of people that watch public television in my area. I am not aware of any evidence that other viewers make these estimates. I am aware, after writing this book, that I have the opportunity of being a free rider. But I do not reflect on it long. I make a contribution because I agree with the purposes of public television and enjoy its programs, and it just seems like the right thing to do. I have learned a certain behavior. Scholarly people make contributions to scholarly and artistic enterprises in their communities, and it would pain me not to live up to my self-image as a scholar, even if no one in town knows I made the donation. I can imagine people making the decision on a variety of bases, and perhaps even some detailed calculations of advantage, but I would not care to make any interpretations of the sum of willingness to pay from observed voluntary contributions to goods with high exclusion costs and large numbers [p. 155].

The implication of these warnings is this: the model presented here, may accurately describe the factors or determinants of a person's contribution decision, but cannot be regarded as a reliable guide, with empirical application, to explaining a person's actions when presented with a decision. Given the complexity of factors just discussed, it can be seen that choices made in the past may not prove a good guide to actions taken in an unknown future. Also, the model does not imply that people do not behave "rationally", in the neoclassical economic sense of the term. People may

appear to behave irrationally when viewed in light of the conventional interpretations of neoclassical theory; it may be that there are simply other factors or aspects that are important to people than "economic rationality", or that predominate in a specific instance of decision making. Rather, the model is presented as an improvement upon past studies which, for the most part, have enumerated only a few of the factors that might influence a person's decision to make a voluntary contribution to the provision of a public good. This warning is included to caution the reader in interpreting the results of this study. For example, while the results may indicate that the model provides a good description of contribution behavior, what is **actually** going on in peoples' minds when the decision is made may be more complex, or more difficult to ascertain. The results of a study based on this model can, however, indicate the relative importance to individuals of various factors included in the model when they were deciding whether to contribute.

**CHAPTER 3. Institutional Framework and Problem Setting:
The Virginia Nongame Wildlife Tax Checkoff**

3.1 Introduction: Nongame Wildlife Tax Checkoffs

State tax checkoffs, that either partially or totally fund state public goods programs, provide a mechanism for making voluntary monetary contributions to state programs. In such programs, taxpayers usually reduce the amount of their refund or, in some programs, increase the amount of their mailed-in tax payment. The funds collected are generally "earmarked", that is, designated for some specific purpose or program.¹ An example is the campaign contribution checkoff used by some state governments.

Tax checkoffs may be an example of an institution that arises in response to a desire by people for a "fair" approach to funding of public goods. Runge (1984) states that:

1. A discussion of the merits and drawbacks of the "earmarking" of tax funds is beyond the scope of this paper. The author suggests that interested readers consult Buchanan (1967, chapter 6) for a discussion of the economics of "earmarked" taxes.

...self-interested motives in an interdependent choice problem may lead to development of institutions which promote fairmindedness, leading in turn to utility-maximizing contributions to public goods.... [U]nder such circumstances free riding is an option, but hardly an imperative. There may be numerous incentives internal to any group to contribute voluntarily to collective or public goods [p. 157].

The tax checkoff may provide a framework for voluntary contribution that facilitates just such an atmosphere of fairmindedness. People might expect that others will contribute for any number of reasons, not the least important of which is that the checkoff is conducted under the auspices of the government.

In a sense, the tax checkoff is an incentive-compatible funding mechanism, since there is no incentive to misstate preferences or demand. Likewise, the checkoff meets the test of Pareto optimality, since no one is made worse off by the "change", in this case, contribution, unless they so choose. In the absence of free-riding behavior and with "perfect" information, the tax checkoff mechanism is capable of producing funds at an "optimal" level, where contributions are equal to individuals' willingness to pay for the good in question. However, information cannot generally be expected to approach perfection. Also, the voluntary nature of the tax checkoff means that weak or strong free riding is possible. There is also the issue of what the providing agent does with the funds once they are

received. For example, the funds may be used in a manner that is inconsistent with individuals' initial expectations.

Starting in the late 1970's, a new type of tax checkoff came into use in 34 of the 43 states which have state income taxes as of 1988. It is aimed at funding nongame and/or endangered wildlife programs.² Nongame wildlife includes any wild species of animal that is not hunted, fished, or trapped. As such, they are said to be used "nonconsumptively". Nonconsumptive use of wildlife includes such activities as viewing, feeding, and photography. Such nonconsumptive use may be engaged in as a primary activity, or as a joint activity with other outdoor recreation, including hiking and hunting. Obviously, game species can be "used" nonconsumptively as well: viewing deer, for example. Nonconsumptive uses, and species, have not traditionally received as much attention nor funding as have consumptive uses and game species, either in terms of management or research. This situation is particularly apparent at the state level, since the states are generally responsible for game activities. This difference is probably due in part to the difficulty in placing a value on nonconsumptive activities, as well as a lack of information about public preferences with respect to

2. State tax checkoffs were in use before the late 1970's, but were not widely applied other than for contributions to political parties or campaigns.

nongame wildlife management and preservation. Another reason for the lack of emphasis on nongame wildlife may be that the public does not usually organize to express preferences for nongame species as they do for game species. Recently, however, managers and researchers are paying increasing attention to nongame wildlife species and their habitat. This change is largely due to the recognition of the importance of nonconsumptive uses of wildlife as an outdoor recreation activity, the identification of endangered species of wildlife, and changing preferences to favor the preservation of "natural" habitats and all species.

Millions of people in the U.S. engage in nongame-related activities and consume a considerable amount of goods related to viewing, feeding, and photography. Prescott-Allen and Prescott-Allen (1986) reported that 1980 expenditures on wild birds alone, including feeding, photography, books, and dues to user groups was in excess of \$618 million. In that year, approximately 80 million people in the U.S. engaged in nongame wildlife consumption activities at home, and approximately 29 million away from home. The authors report the results of a major national survey in 1980, where individuals reported various nongame wildlife-related activities that they engaged during that year. Some of these results are reported in Table 3.1.

Table 3.1. Nongame Wildlife Activities of U.S. Citizens. Percent of respondents indicating that they engaged in each activity. From Prescott-Allen and Prescott-Allen, 1986 [p. 382].

<u>At Home</u>		<u>Away From Home</u>	
<u>Percent</u>	<u>Activity</u>	<u>Percent</u>	<u>Activity</u>
37	Feeding wild birds	99	Observing wildlife
33	Observing wildlife	34	Feeding wildlife
12	Feeding wildlife other than birds	20	Photographing wildlife
8	Visiting parks and natural areas (<1 mile from home)		
7	Photographing wildlife		

About 47 percent of respondents indicated that they engaged in nongame wildlife related activities at home. At least one third of these respondents indicated that they had either fed birds or observed wildlife at home. About 17 percent of those surveyed indicated that they had engaged in nongame wildlife-related activities away from home (greater than one mile from home). The figures are comparable or larger for activities away from home. In conclusion, nongame wildlife appears to be important to many individuals.

Nongame wildlife activities fit the definition of a public good well, with the exception of controlled access areas where user fees are charged. It is generally infeasible to exclude people from viewing wildlife and, once provided, nongame wildlife is available for all who so desire to "consume". Also, such consumption does not reduce the consumption of others, although, in some areas, congestion may be an issue. In Randall's (1983) classification, nongame wildlife is non-exclusive and non-rival. While there may be some exceptions, and no categorization is perfect in all cases, nongame wildlife fits this classification well.

The existence and indirect use value components of nongame wildlife value are, perhaps, even more "public" than

normal use value. Existence value is the value gained by the knowledge that something exists, for example, whales, whether direct use such as viewing or hunting occurs.

Nongame wildlife has a strong existence value component. Existence value has two main components. The first component relates to the value received directly by the individual. The second component of existence value is derived from altruistic motives, and may be classified as philanthropic, knowing the good exists for others to consume now, or bequest, knowing the good exists for future generations to consume. In the case of nongame wildlife, indirect use value includes such activities as watching wildlife television programs and reading wildlife magazines.

Option value is another important component of nongame wildlife value. Option value is the value a person attaches to the option to consume a good at some future date; it is a kind of risk premium for those who feel that they will demand a good in the future, but feel that there is risk associated with its supply. In the case of an endangered species, the option value placed on that species may be very high.

There is an additional component of wildlife value that stems from the fact that animals are not perceived in the same way as traditional consumption goods. In the terms

discussed in chapter 2, it is possible that "altruism for animals" exists. The current animal rights movement and the activities of Greenpeace and other organizations are indications that this aspect of wildlife value exists for some people.

There is also an aspect of nongame wildlife that makes it quite different from, say, manufactured goods: whether funds are available for management or not, there will still be nongame wildlife in existence. This situation means that the "production function" for nongame wildlife, with donations as one input, is poorly understood. Thus the link between a person's donation and the "product" produced or consumed is tenuous. Therefore, it may be difficult for both providers of nongame wildlife management and those who contribute to its funding to assess the costs of "production," and thus to justify a specific level of funding.

In conclusion, nongame wildlife is "consumed" by millions of U.S. citizens, and is becoming increasingly important, both in terms of actual amount of "use," as well as in recognition of its existence and value. Nongame wildlife, and the values it generates, may be viewed as a public good. Further, there are aspects of wildlife value that could generate monetary contributions to its

management, aside from use value. Finally, there are difficulties in estimating the costs of wildlife provision that could cause problems for potential contributors to nongame wildlife programs, who might wish to assess the needs of the wildlife agencies being funded.

3.1.1 History of Nongame Wildlife Tax Checkoff Programs

A number of mechanisms have been used to fund state nongame wildlife programs, including a variety of taxes and user fees, the sale of promotional items and personalized license plates, and the use of income from concessions in public areas (Whitehead, 1983). Proposals were also made for funding nongame wildlife programs at the federal level through the use of semipostal stamps, which are regular postage stamps for which an individual pays a surcharge which is "earmarked" for a particular program, or an increase in gasoline taxes (GAO, 1988a, 1988b). However, the most popular mechanism used to date has been the state tax checkoff. Colorado instituted the first nongame wildlife tax checkoff program in 1978 for the taxable year of 1977. First year contributions totaled about \$350,000; contributions the next year totaled around \$500,000. Oregon started a program in 1980, followed by Kansas, Kentucky, Minnesota, and Utah in 1981, and Idaho, Louisiana, New

Jersey, New Mexico, South Carolina, Virginia, and West Virginia in 1982. In 1988, 34 states had wildlife-related tax checkoff programs, out of 43 states that have a state income tax.

The reason for instituting the checkoffs is not certain, but may relate to a number of factors. Referring to the first checkoff program (Colorado), Harpman (1984) states that the program was "...justified on the basis of normative arguments rather than any formal estimation of potential revenue" [p. 6]. These arguments may relate to the perceived underfunding of nongame programs; presumably, those putting forth the argument believed that the checkoff would generate more revenue than the legislature would normally provide. Later nongame wildlife checkoff programs may have been a response both to the success and acceptability to politicians and the public of earlier programs in other states and to the lack of federal funds for nongame wildlife. In 1980 Congress passed the Fish and Wildlife Conservation Act, authorizing up to \$5 million per year in matching funds to states for nongame wildlife programs--the first national act of this kind. This act has been reauthorized, but has not been funded to date (1990).

The spread of checkoff programs may be due in part to a kind of "bureaucratic inertia", where an idea takes hold and

is adopted by numerous organizations without fully examining the idea, or considering alternatives. As March (1982) states:

...[D]ecision-making can be seen as reflecting rules that spread through a group of organizations like fads or measles. Decision makers copy each other. Contagion is, in fact, much easier to observe than either learning or selection [p. 35].

Other reasons for instituting tax checkoff programs could include deficit reduction efforts and cutbacks in federal grants to states.

The results of studies of nongame wildlife tax checkoffs show two general trends. First, there is a low level of public awareness of the checkoffs. Cary (1985), Manfredo and Haight (1986) and Moss and Fraser (1984) reported levels of awareness among noncontributors in Wisconsin of 38 percent, in Oregon of 62 percent, and in Virginia of 22 percent respectively. Applegate (1984) and Brown, et al. (1986) reported levels of awareness among the general population of 32 percent (New Jersey), and 38 percent and 28 percent (upstate New York and downstate New York) percent respectively. Second, a low percentage, from around 1 to 14 percent, of those eligible to contribute actually contribute, although the average level of contribution is fairly uniform, at around four to five dollars (Table 3.2). The low level of participation, even

in relation to the level of awareness, is an indication that free-riding or similar behavior may be occurring. For example, a Kansas survey showed that less than 2 percent of respondents reported contributing to the nongame wildlife checkoff, while 90.3 percent indicated that it is important to protect wildlife (Vickerman, 1989). Summarizing a number of such studies, Vickerman states that "virtually every survey of public preferences for various funding options reveals two things. First, the public is highly supportive of government efforts to conserve wildlife, and second, nearly everyone expects someone else to pay."

3.2 The Virginia Nongame Wildlife Tax Checkoff Program

The Virginia nongame tax checkoff program was instituted beginning in taxable year 1981 (S. 551, Ch. 204). Until taxable year 1988, it was the only checkoff that allowed the taxpayer to choose the level of contribution. For several years, there has been another Virginia checkoff allowing \$2 to go to the Democratic or Republican Party. Only those taxpayers receiving refunds are eligible to contribute to the checkoffs. For the nongame tax checkoff, the line appears in the "Authorized Deductions from Overpayment" section of the tax form, and reads "Virginia

Wildlife Program Contribution." The tax form is reproduced in Appendix C. The tax booklet provides a brief description of nongame wildlife by quoting from the law that was enacted, as well as providing a phone number for further information and an address for sending in contributions. The description reads: "'Nongame Wildlife' includes protected, endangered and threatened wildlife, aquatic wildlife, specialized habitat wildlife (both terrestrial and aquatic), mollusks, crustaceans, and other invertebrates under the jurisdiction of the Commission [now Department] of Game and Inland Fisheries." A minor incentive to contribute is provided in that the contribution may be deducted from taxable income on next year's tax form. The Department of Game and Inland Fisheries also sends the contributor a computer-generated thank-you letter. The letter has no impact on the same year's contribution, but could theoretically affect future contributions.

The history of contributions to the Virginia checkoff is provided in Table 3.3. While the amount contributed has risen in both nominal and real terms, the degree of participation has remained relatively constant, at slightly over three percent. According to Virginia state officials, the drop in total and average donations from 1987 to 1988 was due to changes in the overall tax situation, such as the

Table 3.2 Summary of State Nongame Wildlife Tax Checkoff Funds. Adapted from Boggis & Hamilton, 1984 [p. 224].

<u>State</u>	<u>Year checkoff started</u>	<u>Tax Year</u>	<u>Percent of refund recipients contributing</u>	<u>Average contribution (Nominal \$)</u>
Alabama	1982	1982	2.4	3.44
Arizona	1982	1982	5.0	9.95
Colorado	1977	1981	11.9	5.36
Idaho	1981	1981	9.0	4.43
Indiana	1982	1982	2.4	3.79
Iowa	1982	1982	7.0	5.28
Kansas	1980	1981	3.5	6.00
Kentucky	1980	1980	1.3	7.20
Louisiana	1981	1981	NA	NA
Minnesota	1980	1981	13.3	3.23
New Jersey	1981	1981	4.8	4.11
New Mexico	1981	1981	4.6	10.68
New York	1982	1982	6.1	5.58
Oklahoma	1982	1982	4.2	6.34
Oregon	1979	1981	8.1	4.13
Pennsylvania	1982	1982	5.5	4.16
South Carolina	1981	1981	2.5	4.10
Utah	1980	1981	13.9	4.27
Virginia	1981	1981	3.7	5.95
West Virginia	1981	1981	7.8	4.41

Table 3.3 History of Contributions to the Virginia Nongame Wildlife Tax Checkoff Program [Source: Virginia Department of Game and Inland Fisheries].

<u>Year*</u>	<u>Total contributions</u>	<u>Percent eligible contributing</u>	<u>Avg. Contribution</u>	
			<u>Nominal\$</u>	<u>Real 1982\$**</u>
1982	\$373,754	3.65	\$6.03	\$6.03
1983	392,282	3.14	7.43	7.14
1984	447,017	3.31	7.92	7.33
1985	495,450	3.24	8.69	7.79
1986	529,462	3.19	9.29	8.13
1987	642,574	3.15	11.31	9.44
1988 [^]	502,802	N.A.	10.69	8.58
1989	421,921	N.A.	8.89	7.14 ^{^^}

* Taxable year 1981-1988.

** Using total personal consumption price deflators, base year 1982.

[^] Year involved in this study (taxable year 1987)

^{^^} Using 1988 price deflator, base year 1982.

number and amount of refunds, brought about by federal tax reform legislation. The drop from 1988 to 1989 was due, at least in part, to the addition of three other checkoffs to the Virginia tax form. The low participation rate may be evidence of free-riding and/or non-voting behavior, although it could also indicate a low level of awareness of the checkoff. It could also, of course, indicate a high level of zero valuation, negative valuation, or protest voting.

In discussions with managers involved with Virginia nongame programs, concern was raised over the lack of funds for publicity purposes. This problem suggests a possible lack of information about the checkoff on the part of Virginians. A further information problem arises from the fact that, particularly for those who did not read the tax information booklet, the simple line on the tax form provides very little information on the use of the funds. Also, the tax checkoff line on the tax form could easily be overlooked. Finally, those individuals who have a tax professional prepare their tax return may not be informed of the existence of the checkoff. Schmid (1978) discusses the problem of providing information as follows:

For the product or cause to gain wider acceptance, it helps if it can be described simply. In more perjorative terms, it helps to have a slogan. You can get people to respond to a leader who proposes more money for national defense if the enemy can be dramatized in simple terms. Difficult as the

civil rights movement was to organize, its objective can be described more easily than the many complex issues involved in something like consumer protection. It is hard to get an emotional reaction to complex goods; people's attention spans are exhausted before they are willing to reach into their pockets for a contribution or to vote [p. 158].

The issues involved with nongame wildlife are both complex and emotional. The latter is particularly the case with respect to endangered species. It is impossible to tell, given this background, exactly what benefits a person might be thinking about when confronted with the decision to contribute. The interaction of the information given by the tax form with the information possessed by the individual with respect to nongame wildlife issues, however, is crucial to understanding any individual's contribution decision. Table 3.4 shows the results of questions asked by Moss and Fraser (1984) which sought to discover why people did not contribute to the Virginia nongame wildlife tax checkoff. Note that information and/or the assurance problem seemed to be important to 38 percent of the respondents. Also, the "no particular reason" category could include people engaging in a variety of behaviors.

It is worth noting that, with the exception of limited federal funds, all funds for nongame wildlife management and research in Virginia come from the tax checkoff program. The public is not informed of this fact when they are

Table 3.4 Reasons for Not Contributing to the Virginia Nongame Wildlife Tax Checkoff Program, 1983. Includes only those noncontributors who were aware of the checkoff program. From Moss and Fraser, 1984 [p. 82].

<u>Reason for not contributing</u>	<u>Percent</u>
No particular reason	42.5
Didn't know enough about what my money would be used for	38.0
Didn't receive a tax refund	22.1
Contribute to nongame wildlife some other way	17.7
Not interested in nongame wildlife	4.4
Unhappy with the nongame program in Virginia	1.8
Not living in Virginia at the time	0.0

contributing. This situation obviously creates opportunities and dangers for the funding of the nongame program. There are opportunities to raise funds independently of the budget process, but dangers in that other checkoffs may be added and result in a decrease in nongame contributions, or that contributions might decline for some reason.

CHAPTER 4. Methods

4.1 The Survey

The existence of the Virginia nongame wildlife tax checkoff program provides an opportunity to explore the model of voluntary contribution behavior presented in Chapter 2. To this end, a survey was designed to examine the role of the four categories of factors that determine contribution behavior--behavioral factors, economic rationality, information, and institutional factors. In this case, the contribution behavior consists of donating money to the management of nongame wildlife species in the state of Virginia.

Specifically, contributors and noncontributors were surveyed to determine the nature of their contribution behavior, including the occurrence of free-riding behavior. The information gathered was used to determine the number of survey respondents in each category of the model of contribution behavior. Also, information on the specific mechanism of the voluntary tax checkoff was obtained. Other

questions collected information on certain characteristics of respondents, producing a data set which was used for discussions and for "testing" hypotheses about contribution behavior, or on factors that influence or determine the categories of the decision tree presented in Figure 2.3.

The survey was conducted in Virginia, and was based on the Virginia nongame wildlife tax checkoff program for the taxable year 1988. At this time, the only other checkoffs present on the tax form were a two dollar checkoff allowed for the Democratic and Republican parties. Only those taxpayers who received refunds were eligible to contribute to the Virginia tax checkoff programs. Because of this fact, the population sampled was, technically, those Virginia taxpayers who received a refund. Unfortunately, no data existed that allowed a statistical comparison of refund recipients versus those who owed tax money at the time of tax filing. Finally, the cover letter included with the survey mailings requested that the survey be completed by the person in the household who was most involved with filing the tax return.

The sampling procedure followed the "total design method" of Dillman (1978). The total design method is a procedure for administering surveys that aims to maximize the response rate. The method includes procedures for the

wording of survey questions, for the sampling procedure, such as sample size, for the design of the survey and the cover letters included with the survey, and for the mailing procedures. The Dillman technique includes followup postcards and additional questionnaire mailings.

This study followed the total design method procedures with some exceptions. The first is that only one followup mailing of surveys was conducted. This change in the procedure recommended by Dillman was due to budgetary limitations. The second departure from Dillman's method occurred because of the nature of the sampling procedure. In order to limit the sample to those who received tax refunds, the Virginia Department of Taxation (VDOT) conducted the survey mailing, sending surveys only to individuals who received a tax refund in 1988. Further, the surveys were coded such that each questionnaire could be identified as coming from an actual contributor or noncontributor to the checkoff. Because this information is considered confidential, the names and addresses of the sample and respondents were known only to the VDOT. For the same reason, only VDOT could conduct the mailings. Questionnaires were returned directly to the author at Virginia Tech, with no return address.

Because both contributor and noncontributor behavior was being studied, the inclusion of an equal number of each in the sample and statistical analysis was desirable. In their study of nongame wildlife valuation, Bishop, et al. (1987) reported response rates of 89 percent and 73 percent for contributors and noncontributors, respectively. Given the population of Virginia, Dillman's suggestion is to have around 1000 individuals in the sample. Statistical theory suggests that a large sample size would be appropriate, particularly since the statistical methods anticipated for the study (see section 4.4) involve regression analysis using several independent variables. This figure (1000) was adopted as an overall target sample size for the study. Contributors are a very small percentage of the total population (around 5 percent, or less). Given the response rates of the Bishop, et al. study, the anticipated overall response rate for this study was assumed to be approximately 50 percent. Thus, the total number of individuals in the initial mailing was 2000: 900 surveys were sent to contributors and 1100 to noncontributors.

Validation

In order to determine if the sample is representative of the Virginia population, a sample validation procedure

was conducted. This procedure consisted of a statistical comparison, using a chi-squared analysis of categorical data, of the sample with the 1980 census data for Virginia. The factors used to compare the respondents to the population were: residence, age, income, education, and gender. The questions used to elicit this information are discussed under section 4.2.4 below. A detailed discussion of the validation procedure is found in Appendix D. It should be noted that: 1) the sample was comprised of only those individuals who received tax refunds, not all Virginians and 2) the census data available is from 1980, which is nine years previous to the administration of the survey. It is possible that those receiving tax refunds differ from adult Virginians or Virginia taxpayers in general, and that changes may have occurred over the nine years that could affect that validation procedure. Since no means to estimate these differences exists, the validation procedure was viewed as the best that could be done under the circumstances. The results of the sample validation procedure are presented in Chapter 5.

4.2 Survey Questions

In conducting a survey, it would be desirable to include questions pertaining to the entire theory of contribution behavior presented earlier. Unfortunately, such a survey would be lengthy, and would likely result in a low response rate (Dillman, 1978). Multiple surveys would be possible, but budget and time considerations made multiple surveying impossible. Therefore, certain aspects of the model of contribution behavior were not included in the survey. In some cases, reasonable assumptions can be made which would render the inclusion of some aspects of the model unnecessary, particularly when those factors are constants for all of those in the population. In other cases, certain aspects of the theory had to be completely excluded.

The aspects, or theoretical factors, of the model that were assumed to be constant or not relevant include group size, incentives, social pressures, and aspects of the vehicle. Given that the population for this survey consists of Virginia taxpayers who received refunds, the group size is obviously large. Communication between contributors would be extremely difficult and unlikely. The only incentive offered to contribute via the tax checkoff is tax deductability of the contribution on next year's state

taxes. Social pressures are probably not important, since contribution is a private matter. The vehicle is not subject to variation; it is a fixed method for collecting funds and is sponsored by the state government. Therefore, each person is presented with the same contribution situation, as regards the payment vehicle.

Aspects of the model which were excluded, but could be important are assurance, the impact of reference groups, and experience. These aspects were excluded mainly in the interest of keeping the size of the survey manageable. The excluded factors could be included in a future study.

The assurance effect is important with regard to individuals' perceptions both of the probability that others will contribute (that is, that people will be "fair"), and that the good will be produced. However, as noted earlier, there are some problems with "production" here, since some wildlife will exist even if no contributions are made. The role of assurance in the contribution decision was not pursued in this study, although the inclusion of the possibility of protest voting might capture some respondents who are highly concerned with the assurance of provision. Reference groups could be important, particularly for those individuals who are members of wildlife or environmental organizations. The important point is that some individuals

may not act as if they are part of a large group. Again, the role of such behavior cannot be determined in this study. Finally, the impact of experience is not examined. Experience in this case would be the history of contributions by an individual to the Virginia nongame wildlife tax checkoff, and the impact of these past contributions on current contribution behavior. Since the checkoff program has existed in Virginia since 1981, it is possible that learning has occurred over this time that could affect current contribution behavior. This determinant of behavior is not examined in this study.

4.2.1 Bias in Empirical Studies

One of the challenges of conducting an empirical study of contribution behavior is to control for factors that could bias the results. This aspect is particularly important in a study of an actual, large-group situation; it is difficult to control for many factors as may be possible in a controlled experiment involving small groups.

Kim and Walker (1984) list nine so-called "invalidating factors" that could bias the results of a study aimed at estimating the importance of the free rider phenomenon. These factors are:

1. **Public good not "pure":** The good may not be truly a "pure" public good. If the good is not a "pure" public good, then people's perceptions of and behavior with respect to that good would be different than that assumed in the study. For example, people may consider that there are alternative, such as private, means of provision, which could lead to a decision not to contribute. This factor is not important since, as was argued earlier, nongame wildlife is a pure public good.

2. **Discrete public good:** There may not be a range of available levels of provision of a public good. For example, the choice may be "all or nothing" rather than a choice along a continuous range. Again, such a situation would alter people's contribution behavior, particularly with respect to the assurance of provision: an all-or-nothing situation would be considerably more risky, in terms of probability of provision, than a situation where a continuous range of levels of provision are possible. Discreteness is not an issue in this study, since there is a range of possible levels of value that people could have for use, option, and existence value. Also, the provision and funding of nongame wildlife is not an all-or-nothing situation.

3. **Unknown group optimum:** The group utility function is unknown. It is usually not possible to know the individual (and thus aggregate) utility functions for each person. The total amount contributed by all people is usually taken as the total value of the public good. This problem applies to studies which try to determine the optimal level of provision for a group. There is no way to know the "true" group optimum in this study. However, since the study does not attempt to estimate the "optimal" level of provision, this factor is not important.

4. **Misunderstanding and vagueness:** The nature of the good and/or the payment vehicle may not be clear to the respondent. Biased results could occur if people do not understand the survey instrument or the subject being studied. This factor could be important to this study, and is included via questions aimed at eliciting information possessed by contributors and noncontributors.

5. **Uncertainty and disequilibrium:** People's expectations about outcomes (level of consumption) may not converge to an equilibrium level. The level of uncertainty depends on peoples' familiarity with the good in question, that is, their experience, information, and level of assurance. The existence of disequilibrium with respect to the optimum level of provision cannot easily be determined; it must be

assumed that it is not a problem. Again, disequilibrium is important mainly to studies that attempt to arrive at the optimum level of provision for a group of contributors. Since this study does not make this attempt, disequilibrium is not an important factor. Uncertainty is important to the study, and is partially included since the role of information is examined. Experience and assurance are not examined in this study, for reasons discussed earlier.

6. Insufficient economic motivation: The consequences of a person's action may not seem significant, particularly in an experimental setting. Thus, there is a lack of motivation to contribute. This problem particularly relates to experiments conducted using contingent markets. This study examines actual contribution behavior, so this factor should not be important.

7. Small group: In a small-group situation, individual actions may be noticeable, as regards the total, and/or people may be able to take others' actions into account. In a small-group situation, people may believe that they can affect the total level of provision, or may be motivated to affect others' contribution behavior. The tax checkoff is used in a large-group situation, so the small-group problem does not apply to this study.

8. Transitory endowment income: The income used in an experimental or contingent contribution situation may not be regarded as "real" or "permanent" income. Therefore, the behavior of individuals may differ from that which would be expected if the income were "real." For example, an individual might be more willing to contribute "unreal" income. Despite the fact that actual monetary contributions are made to the tax checkoff, this factor is important to this study. It is an issue since the contribution is made from the tax refund. The tax refund is not actually cash in hand at the time the contribution is made, and thus may be viewed as transitory, one-time income. Also, the refund itself may be viewed as a unique, nonpermanent addition to income. Milton Friedman's permanent income hypothesis suggests that such income is treated differently from regular income. An attempt was made to include this aspect of contribution behavior in the survey, by asking respondents to indicate their perception of the tax refund.

9. Lack of anonymity: Experiments with small groups often involve direct contact with the experimenter and/or allow some interaction between contributors. Such interactions would not be appropriate to an experiment that models actual contribution behavior in a large-group situation. To avoid bias in the results of an experiment, people's contribution actions should remain anonymous, the other group members

should not be known, and the interviewer should be kept as anonymous as possible. These precautions also would have the effect of eliminating direct social pressures. Lack of anonymity is not important to this study, since the checkoff is conducted in a large-group situation, where there is little or no communication between contributors, and since a mail survey instrument is employed.

Another kind of bias that could occur in this study is termed "social desirability" bias (Warwick and Lininger, 1975). People may have an impression that valuing wildlife or related goods is socially desirable, and so may bias their responses in a way they perceive as being socially desirable. In order to minimize the occurrence of this kind of bias, the survey instrument provided neutral responses to many questions, as well as the positive and negative responses. The respondent, then, is not forced to choose between a negative or positive valuation of wildlife or similar goods.

4.2.2 The Survey Questions

The survey was designed to generate two types of information. The first relates to the overall model of contribution and consists of the number of individuals responding to questions designed to elicit the aspects of

the model of contribution that best describes that person's behavior. Questions were asked in order to determine the number of respondents that could be classified in each category of the decision tree presented in Chapter 2. As such, the analysis of this data is qualitative in nature, and consists of a confirmation or denial of the existence of the categories in the model of contribution behavior.

The second type of information gathered in the survey was used in statistical tests of hypotheses about the predetermined categories identified by the questions just discussed. Specifically, the decisions made by individuals, which are represented in certain parts of the model of contribution behavior, may be explained in terms of proxies for variables that can be elicited from people in a survey. These proxies measure characteristics of respondents that could explain the choice of or distinction between certain categories in the decision tree. In the following discussion, the wording of most questions is presented. For further information, and for the exact presentation of the questions in the survey, the reader should refer to the copy of the survey in Appendix B.

4.2.3 Identification of Categories of Respondents

All respondents were asked to answer a question as to whether they contributed to the checkoff (question 1). This question was included in order to determine if the respondent was a contributor or noncontributor. The response was compared with the information provided by the Virginia Department of Taxation. Those respondents whose contribution status did not match that reported by the Department of Taxation were not included in the analysis because of uncertainty as to whether they were actual contributors or noncontributors.

Questions for Noncontributors

A set of questions was included to identify categories of the behavioral factors that influence the contribution decision. This set of behavioral factors is related mainly to reasons for not contributing and includes free-riding and non-voting behavior. The responses to the questions designed to elicit behavioral factors were interpreted as accurately representing the individuals' behavior. Thus, the questions were designed to classify noncontributors into the predetermined behavioral categories identified in the model of contribution behavior. These behavioral categories

were covered by Questions 7 and 8, preceded by Question 6, an awareness question.

Question 6 ("Were you aware of the existence of the Virginia nongame wildlife tax checkoff program before receiving this survey?) was included first, to determine if noncontributors were aware of the checkoff program prior to receiving the survey. Question 7 was answered by noncontributors who were **aware of the existence of the checkoff**. Response A was "I do not value nongame wildlife", and it was designed to reveal noncontributors with a zero or negative willingness to pay. Other "aware" noncontributing respondents were asked: "I value nongame wildlife, but:", then were asked to check one of six statements. The first (B) read: "Since the checkoff is voluntary, I do not need to contribute to it." This response was designed to reveal strong free riders. The second response (C) was designed to reveal non-voters and read: "Since I am one person out of many in Virginia, my contribution will not really make a difference". The third (D) and sixth (G) responses were designed to reveal protest voting behavior. Response D was for individuals who were protesting the government or wildlife programs: "I am not satisfied with the performance of the Virginia state government, or with Virginia wildlife programs". Response G was for individuals who were protesting the checkoff itself, that is, the "vehicle" for

collecting the funds: "I do not believe that voluntary contributions to government programs should be collected by tax checkoff programs". The fourth response, (E): "I need my tax refund for other uses", was included to reveal those people who were constrained by budget and/or opportunity costs such that their contribution was zero. The fifth response, (F): "I knew very little about the tax checkoff program, so I did not contribute", was designed to reveal zero contributors due to a lack of information.

Question 8 was to be answered by noncontributors who were not previously aware of the checkoff. A very simple description of the checkoff and nongame wildlife was provided, after which respondents were asked whether they would contribute and why. These respondents are referred to as "hypothetical" contributors and noncontributors. These categories are distinguished from "aware" contributors and noncontributors, that is, respondents who answered "yes" to Question 6. The same seven categories discussed above were included for the hypothetical noncontributors, with one exception. Since information was being provided about the checkoff, a category similar to "F", noncontribution due to insufficient information, above was not included as a choice. It is possible that some respondents would have indicated that information was the main constraint that caused them not to contribute. However, it was felt that

such results should not be compared to the results obtained in question 7, for "aware" noncontributors. It was felt that information provided at the time of the completion of the survey would bias individuals' responses. Samples, et al. (1986) note the influence on survey results of providing information at the time that the survey is completed. Their study found that information provided at the time of the survey significantly altered respondents' bids for the preservation of endangered and other wildlife species.

Question 8 also asked "hypothetical" contributors to indicate their main reason for contributing, as well as their main constraint to contribution, if applicable. The categories are the same as for those described below for "aware" contributors. Again, however, a category based on information constraints to contribution was excluded, for the reason just discussed. Also, it was felt that weak free riding was too abstract a concept to include in a hypothetical setting. Therefore, a response was included: "I would contribute a few dollars because the checkoff seemed like a good cause" which should capture both hypothetical contributors receiving mainly contribution utility and hypothetical weak free riders.

Questions for Contributors

Questions 3, 4, and 5 were designed to determine the category of the model of contribution behavior to which **aware contributors** belong, and related mainly to utility, budget constraints, and information. Questions 2, 3, 4, and 5 were to be answered by aware contributors. Question 2 asks for the amount of the contribution. If the person could not indicate the exact amount, categories were provided. The midpoint of each category was then entered as the amount of contribution. The results of this question were not used in this study other than to compare the average level of contribution with the data from the tax department, as an indication of the validity of the sample.

Question 3 was designed to determine if the **primary** benefits (or utility) from contributing were from nongame wildlife specifically, or from contribution to a cause, the "contribution utility" discussed in Chapter 2. The exact wording of the two responses was: "Which most nearly describes your reasons for contributing to the checkoff fund? (choose one): A. Nongame wildlife is important to me. [or] B. It seems like a good cause." It is possible that an individual may receive both kinds of utility, however, the respondent was forced to choose which kind of utility was dominant. Question 3 was designed to elicit which kind of utility was of greater importance to the respondent.

Question 4 was answered only by those respondents indicating that they received primarily nongame wildlife utility, and was designed to determine the main constraints to contribution, or if the individual was a "weak" free rider. Question 4 read: "Which of the following best describes your contribution (choose only one):". Response A indicates weak free riding: "I contributed a few dollars, and was not thinking of exactly how much Virginia nongame wildlife was worth to me over the last year". Response B indicates that information, less than "full" information, was the main constraint to the contribution: "I contributed a few dollars, and might have contributed more if I had a better idea of what the tax checkoff or nongame wildlife is". Response C indicates that the individual was essentially unconstrained by information, that is, they had "full" information, or budget: "I was thinking of how much Virginia nongame wildlife was worth to me over the last year and gave an amount that approximately reflects that worth". Response D indicates that budget and/or opportunity costs were the main constraint to contribution: "I was thinking of how much Virginia nongame wildlife was worth to me over the last year, but gave less than that amount because of the small size of my refund, or because I had other important uses for my refund".

Question 5 was designed to determine if the respondent considered factors other than the main constraint elicited in question 4 to be important constraints to the decision to contribute. For example, a respondent may have considered budget to be the main constraint to his or her contribution, but may also have considered information to be a constraint. The question read: "Please indicate how you might change your contribution to the tax checkoff if the following situations occurred (Please answer A through C)". Responses A and B were aimed at budget constraints. Response A was designed to discover if the respondent's budget was important and read: "If my refund were larger"; response B was designed to elicit if opportunity costs were important and read: "If I did not need most of my refund for other uses". Response C was aimed at information constraints: "If I had more information about what my contribution will be used for". The respondent was given a choice of increasing, decreasing, or not changing the level of contribution, based on a change in the three constraints. A response of "larger" was interpreted as meaning that the constraint was significant to the respondent.¹

1. In Chapter 5, the data from this question are presented in two ways: 1) if a respondent left any one of the responses blank, the response was considered to be a missing value, and 2) if a response was left blank, it was interpreted as being equivalent to indicating that the constraint was not important.

4.2.4 Survey Information Used in Statistical Models

The categories of the model of contribution behavior that are related to two of the factors important to the contribution decision, economic rationality and information, may be distinguished on the basis of proxies for these two factors. As discussed earlier, the aspects (or categories) of contribution behavior presented in the model of contribution behavior were identified in questions 3, 4, 7, and 8. Additional questions were included that were designed to collect information on budget, utility and information about nongame wildlife for each respondent. These proxies for these three types of information on respondents can be used as independent variables in statistical models designed to explain into which of certain of the predetermined categories in the model of contribution behavior a respondent falls. For the variables which measure the impacts of economic rationality (utility and budget constraints) and information on contribution decisions, specific models of this type can be developed, incorporating statistically "testable" hypotheses about the choice of a particular category of the model of contribution behavior by the respondent.

The statistical models are not intended to predict behavior, but to explain the respondent's behavior that occurred in this case. For example, the independent

variables (utility, budget, information) may explain an individual's response to a certain question(s) in the survey, which is equivalent to belonging to a category in the model of contribution behavior. For example, variables measuring the respondents' budget and level of information may explain what the respondent felt was the major constraint to their contribution. The categories of the model are predetermined, and are identified by responses to questions 3, 4, 7, and 8, as noted above. The hypotheses are presented in an attempt to explain the choice by individuals of several of these predetermined categories, or which category a respondent "fell into", on the basis, or as a function of proxies for economic rationality (budget and utility) and information.

Ideally, the other two determinants of contribution behavior presented in Chapter 2, behavioral and institutional factors, should be included in the statistical models explaining to which categories respondents belong. In this study, however, the behavioral aspects of the contribution decision, such as strong and weak free riding and nonvoting, are assumed to be determined by purely behavioral factors, that is, factors not directly related to behavior that is usually termed "economic", such as utility constrained by budget, or having "full" or less than "full" information. Questions designed to measure such "non-

economic" or psychological factors influencing behavior such as free riding and nonvoting were not included, due to space constraints in the survey. One institutional factor, protest voting, is however included in the statistical "tests" of hypotheses.

Proxies for Variables Used in Statistical Models

In order to examine the role of economic rationality and information in individuals' choices of certain of the predetermined categories of the model of contribution behavior, survey questions were designed to elicit these characteristics from the respondents. Factors pertaining to economic rationality and information were estimated through the use of proxies. The proxies for determining if contributors are rational in terms of economics were divided into two main categories: 1) utility and attitude, and 2) budget. The other proxies are related to the information possessed by the respondent. The reader should refer to Appendix B for the exact presentation of the survey questions designed to elicit these proxies. A key to the possible responses to each question, and the interpretation of the responses, that is, how the data were coded for computer entry, are also found in Appendix B.

I. Economic Rationality

The proxies for economic rationality were measured by eliciting the respondents' utility of and attitude towards the good in question, nongame wildlife, and the budget available to the respondent, which includes both income and the tax refund. The tax refund is important since it is a constraint to the total amount an individual may contribute via the tax checkoff.

A. Utility

1. **Benefits received from nongame wildlife:** two questions (14A and 14B) were used to estimate this variable. The first attempted to elicit use and option value (14A), the second existence value (14B). A five-interval Likert scale was employed, which included a neutral response. A Likert scale measures attitudes, and employs multiple categorical responses indicating strength of agreement or disagreement with or strength of opinion about a statement. The questions forced the respondent to make a tradeoff: the respondent was asked whether he or she agreed that he or she would be willing to pay money for nongame wildlife. If a person did not consider themselves a "user" of nongame wildlife, they were asked to answer only the existence value question. The question on use/option value read: "I am a user of nongame wildlife (viewing, photography, feeding,

etc.). I am paying or would be willing to pay money to ensure that I can continue to "use" nongame wildlife in the future". The question on existence value read: "Whether or not I am a "user" of nongame wildlife (viewer, photographer, feeder, etc.), I enjoy knowing that nongame wildlife exists and would be willing to pay money to ensure that it continues to exist, for now and for future generations". The variable used was the sum of the values for the two questions, and was treated as a continuous (range possible: 2-10).

2. Residence: Residence has been shown to affect the value people place on wildlife and related resources (Kellert, 1982). Also, residence can be used in sample validation. Respondents were asked to indicate whether they live in an urban, suburban, town, or rural area (question 18 --entered into the computer as question 18A). They were also asked to indicate the approximate population of their area, if applicable (question 18--entered into the computer as question 18B). For sample validation purposes, the categories on the questionnaire were chosen to match those for the census.

3. Attitude

a. Attitude towards refund: A respondent's attitude towards the refund reflects whether the refund is seen as

permanent or transitory income. Respondents were asked in question 15 whether they viewed the refund as being: 1) "like any other income", 2) "not like income, to be used for something special", and 3) "too small to be useful". The first response was interpreted as indicating that the refund was viewed as permanent income, the latter two, transitory income. The variable was incorporated as a binary variable, 1 = real income, 0 = transitory income.

b. Attitude towards environmental/nongame wildlife issues: This variable consisted of the summation of the results of four separate questions, each a five-part Likert scale (questions 17A, 17B, 17C, and 17D). Question 17A read: "Air and water quality should be improved, even if it means paying higher taxes or higher prices for goods". Question 17B read: "Widespread use of pesticides in agriculture should be continued, even if there is some risk to wildlife". Question 17C read: "Economic growth and development should continue, even if it means that wildlife habitat is often converted to commercial uses." Question 17D read: "Endangered species should be preserved, even if it means that some major projects, such as dams or roads, are not built". Agreement with Questions 17A and 17D was interpreted as being a more "environmentalist" response; agreement with Question 17B and 17C was interpreted as being a less "environmentalist" response. The questions were

intended to present the respondent with trade-offs, both with respect to nongame wildlife and related environmental issues, such as wildlife habitat preservation. This variable is referred to as the "environmentalist index". The variable was treated as continuous. Since the range of values for each question was one to five, five being the strongest "environmentalist" attitude, the range possible for the aggregate measure was 4-20).

4. Age: Age has been shown to the value placed on environmental and natural resource goods, with younger people having a higher level of value (Hays, 1987). Respondents were asked to choose one of several categories, designed to match census categories, again to facilitate sample validation (Question 20). Since taxpayers made up the sample, only those people eligible to be in the work force were sampled. Therefore, no respondents under the age of 16 should appear in the sample, and no categories for respondents under 16 were included. The mid-point of each category was used as the value for this question, with a possible range of 17-72.

B. Budget

1. Income: Total household income was obtained from respondents, and was expressed as a series of categories,

which match those used in the census, again to facilitate sample validation (question 23). The mid-point of each category was used as the income level. Income per household member was derived by dividing this income by the number of individuals in the household, which was elicited in Question 22. Per capita income was treated as a continuous variable.

2. Refund amount: Respondents were asked to choose one of several categories of refund ranges. Refund categories were developed based on the average level and range of refunds in Virginia. The midpoint of each range was used as the amount of the refund. The variable was treated as continuous.

II. Information

The information proxies attempted to measure respondents' general level of knowledge, as well as their level of information with respect to nongame wildlife and related issues. The level of knowledge was measured by the respondents' level of education, as well as by responses to questions designed to measure the respondents' exposure to news and information in the media, including media programming related specifically to nongame wildlife.

A. Media exposure: Four questions were asked that elicited the amount of exposure that respondents have to the media, including nongame wildlife-related programming (Questions 10, 11, 12, and 13). Each question included five responses designed to elicit how often a respondent engaged in a particular media-related activity. The responses were: A) never, where the value assigned was zero, B) less than once a week, where the value assigned was one, C) once a week, where the value assigned was two, D) more than once a week, where the value assigned was three, and E) every day, where the value assigned was four. Question 10 read: "How often do you read a newspaper?". Question 11 read: "How often do you watch television news programs?". Question 12 read: "How often do you watch public television (PBS) or listen to public radio (NPR)?". Question 13 read: "About how many times a week do you watch nature or wildlife programs on TV? (for example, on public television (PBS) or the DISCOVERY channel)". The four questions were combined into one "information index", which was treated as a continuous variable (range possible: 0-16).

B. Nongame wildlife and related magazines received: The number of nongame wildlife and related magazines received by the respondent was elicited (Question 9). The respondent was asked to check which magazines he or she receives from a list. The magazines included in the question represented

the conservation, environmental, outdoor, and hunting/fishing journals with large circulations. A "write-in" line was provided in addition to a list of commonly-received journals. The total number of such journals received by the respondent is included as a variable in the analysis. The variable was treated as continuous. It is important to note that, while this variable is probably a good measure of information and, probably, attitude, about nongame wildlife, it could also indicate the amount of money and/or time already spent on nongame wildlife. If a person believes that he or she already contributes sufficiently to nongame wildlife, then the individual may choose not to contribute to the checkoff. In this study, the variable is viewed as an indicator of the amount of information possessed by the respondent. In some of the statistical models, this variable is used as an indicator of utility as well, since the number of publications received can be viewed as an indication that the individual values nongame wildlife and related resources.

C. Education: An individual's level of education should be an indicator of his or her level of knowledge or information: a level of higher education hypothesized to imply that a respondent has more information on nongame wildlife. Education was elicited by allowing respondents to choose one of a series of education categories which match

the census, again facilitating sample validation, in Question 19. The variable was treated as continuous, with a possible range of 1-8.

The **gender** variable in Question 21 was included for sample validation purposes only.

4.3 The Statistical Models

The statistical models can be derived from the model of contribution behavior, and are related to the representation of the model in Figure 2.3. Figure 2.3, which was presented earlier, is reproduced in section 4.3.1 so that the statistical models discussed in the following pages may be more easily understood. The numbers at the right margin represent levels in the model, and are referred to in the discussion of the statistical models.

In statistical terms, the null hypothesis for each model is that there is no significant difference between the two (or three) categories of the model of behavior with respect to the independent variables included in the statistical model, or that the coefficients for the explanatory variables are all equal to zero; the alternative hypothesis is that there is a significant difference between

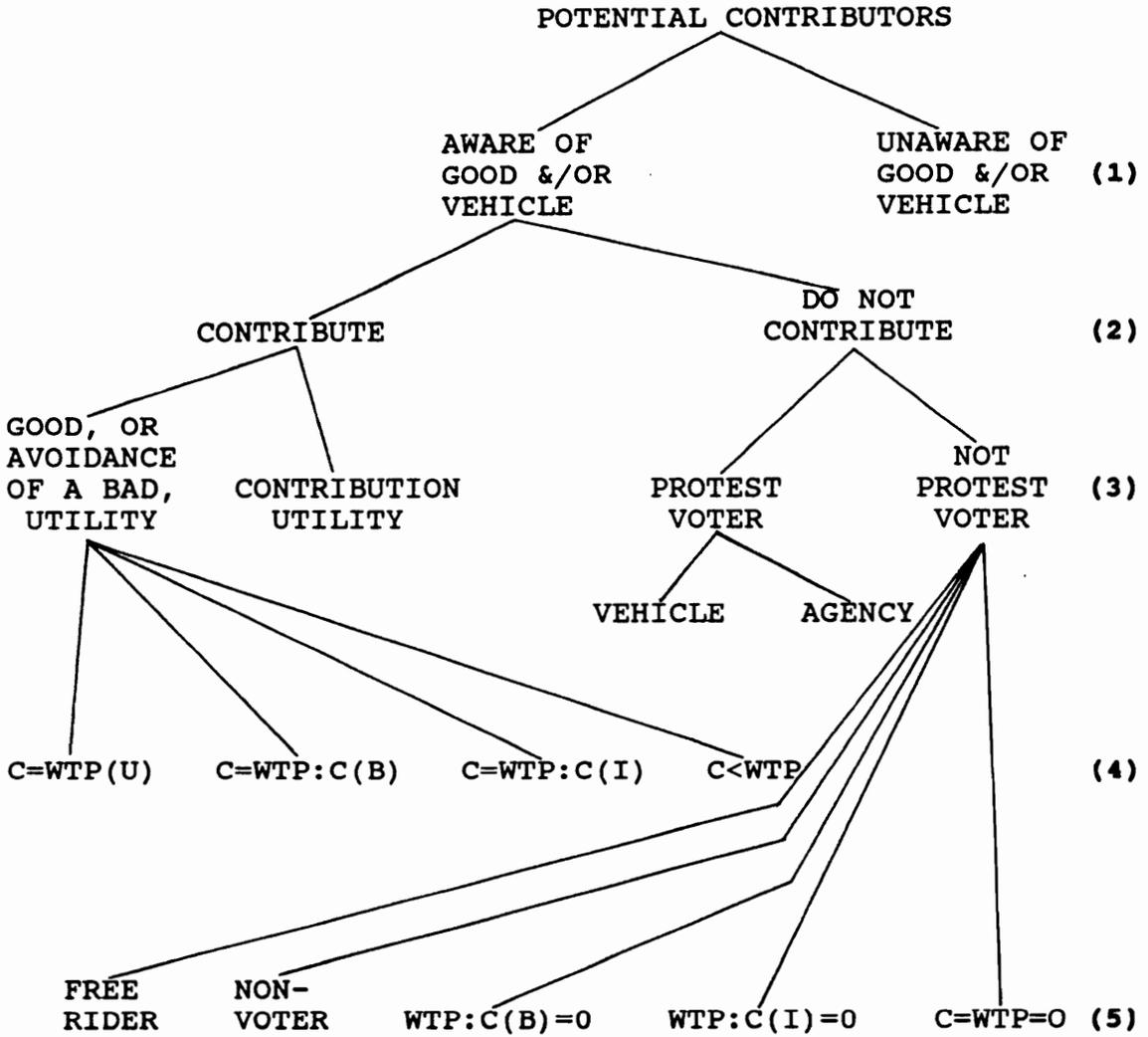
the categories, which is explained by differences in the independent variables, or that the coefficients for the explanatory variables are all significantly different from zero. Another way to view these statistical models is that the independent variables either do or do not perform well, in terms of statistical significance, in correctly predicting the choice of categories in the model of contribution behavior on the part of the individuals in the sample.

The following section presents several statistical models, incorporating hypotheses of contribution behavior. In each case, the statistical model attempts to explain a "decision" as a function of one or more of the three following factors: utility, budget, and information. The possible outcomes of each decision are discrete, and are reflected by two or three categories in the decision tree of contribution behavior (Figure 2.3) in which a respondent may fall. In all but the first statistical model, the categories reflect decisions on the part of survey respondents, who indicated their choice by responding to a particular survey question. As discussed earlier, the independent variables influencing those choices were developed by formulating proxies for utility, budget, and information.

4.3.1 Summary of Hypotheses for Statistical Models

Each statistical model is presented as a dependent variable as a function of one or more independent variables. The dependent variables indicate which of the two, or in the case of models 5 and 6, three categories of the decision tree presented in Figure 2.3 to which the respondent belongs. As discussed above, the independent variables included in the models are the proxies for utility, budget, and information. Rather than listing all of the proxies in each case, in the following discussion they are simply referred to as utility, budget, and information. The statistical significance of the model and of the individual explanatory variable parameter estimates were used as the "test" of the hypotheses examined in each model. The 0.05 percent level of significance was used as the criterion for rejecting, or failing to reject, the hypotheses.²

2. Some statisticians argue that specific levels of significance should not be used to decide whether the parameter estimates for explanatory variables are significant. The reason for this concern is that the usefulness of tests of significance largely depend on how well the data fit the assumptions of the model in each case. In this study, however, the author follows the more common convention of presenting the P-values and an indication of which explanatory variables are significant at the 0.05 level.



Where:

- C = Contribution
- WTP = Willingness to pay, or marginal benefits for the public good in question
- WTP(U) = WTP "essentially unconstrained"
- WTP:C(B) = WTP constrained primarily by budget
- WTP:C(I) = WTP constrained primarily by information
- C<WTP = "Weak" free rider

Figure 2.3. Schematic Representation of a Model of Contribution to the Provision of a Public Good.

Statistical Model 1: Discrimination between "aware" contributors and noncontributors versus "unaware" noncontributors [level (1) in Figure 2.3], on the basis of information.

This statistical model does not involve an actual decision on the part of the respondent. Rather the model compares aware and unaware contributors to see if they might be distinguished on the basis of the information possessed by the individuals about nongame wildlife and related issues. Only a small percentage of those eligible to contribute to the checkoff actually contributed, around three percent. Awareness of the checkoff could be a major factor in explaining this phenomenon. The information possessed by respondents could in turn explain why they were not aware of the checkoff. The initially held hypothesis is that whether a respondent is aware of the existence of the checkoff is a function of the information possessed by the respondent, particularly information about nongame wildlife and related issues. Those aware of the checkoff are hypothesized to possess significantly more information about nongame wildlife and related issues than those who are unaware. In other words, "informed" respondents are more likely to be aware of the existence of the checkoff program.

Statistical Model 2: Discrimination between "aware" contributors versus "aware" noncontributors [level (2) in Figure 2.3], on the basis of utility, budget, and information.

This model is a general comparison of aware contributors and aware noncontributors, that is, all respondents who were aware of the existence of the checkoff. This model, then, attempts to determine which of the factors, budget, utility and information, explain the overall decision to contribute. The initially held hypothesis is that the decision whether to contribute is a function of a respondent's utility, budget, and information. It is hypothesized that "aware" contributors have significantly higher utility for nongame wildlife, a larger budget, and more information than do "aware" noncontributors.

Statistical Model 3: Discrimination between protest voters versus other "aware" noncontributors [level (3) in Figure 2.3], on the basis of utility.

Protest voters, individuals who are protesting either the provider of the public good or the vehicle used to collect the funds, are noncontributors, but may differ from other noncontributors, particularly with respect to the utility they derive from nongame wildlife. A higher level of valuation of, or a stronger positive attitude towards, nongame wildlife might overcome protest voting. Protest voting is probably a function of attitude towards the

checkoff or, in this study, the state government in general, or the Department of Game and Inland Fisheries in particular. Protest voters are considered to be zero or negative bidders, and so they may express a lower level of utility for nongame wildlife than other noncontributors. This model may be tested using data both for actual protest voters and noncontributors, who were aware of the checkoff, and for hypothetical protest voters and noncontributors, who were asked to indicate how they would respond having been made aware of the checkoff. The initially held hypothesis is that protest voters may be distinguished from other noncontributors on the basis of the utility they receive from nongame wildlife.

Statistical Model 4: Discrimination between contributors receiving primarily nongame wildlife utility versus contributors receiving primarily contribution utility [level (3) in Figure 2.3], on the basis of utility.

Contributors who indicate that they made their contribution based on nongame wildlife value were hypothesized to differ from those who contributed mainly based on their receiving contribution utility, as discussed in Chapter 2, with respect to the level of utility received from consuming nongame wildlife. This comparison was conducted because it is possible that those receiving primarily contribution utility might be receiving a high degree of nongame wildlife

utility as well. The initially held hypothesis is that contributors receiving primarily nongame wildlife utility may be distinguished from contributors receiving primarily contribution utility on the basis of utility. The hypothesis is that contributors receiving primarily nongame wildlife utility from contributing should indicate that they have a higher level of nongame wildlife utility than do contributors indicating that they were receiving primarily contribution utility.

Statistical Model 5: Discrimination between the three categories of respondents indicating that information was the primary constraint to their contribution [levels (4) and (5) in Figure 2.3], on the basis of information.

There are three main categories of contributors who indicated that information is the main constraint to their contribution: 1) Information was essentially not a constraint; they had "full" information; 2) Information was a constraint, but some amount was contributed; they had less than "full" information; and 3) information was a constraint such that nothing was contributed. Only "aware" respondents will be included in this model, since information was provided to the hypothetical respondents which would invalidate the model. The initially held hypothesis is that contributors who were essentially unconstrained by information, or who had "full" information, contributors who

were constrained primarily by information, or who had less than "full" information, and noncontributors who were constrained primarily by information may be distinguished on the basis of the information they possess. That is, it is hypothesized that the proxies for information will explain the choice of category by the respondent: contributors essentially unconstrained possess more information than those contributors who are constrained, while contributors who are constrained possess more information than those noncontributors who are constrained.

Statistical Model 6: Discrimination between the three categories of respondents indicating that budget was the main constraint to their contribution [levels (4) and (5) in Figure 2.3], on the basis of budget.

This three-category model is essentially the same as model 5, with the exception that budget is the main constraint to contribution. In this model, both actual and hypothetical responses will be used, since both types of respondents exist in the sample. The initially held hypothesis is that contributors indicating that they are essentially unconstrained by budget, contributors indicating that they were constrained primarily by budget, and noncontributors indicated that they were primarily constrained by budget may be distinguished on the basis of their budgets.

Statistical Model 7: Discrimination between free riders and nonvoters versus contributors [levels (4) and (5) in Figure 2.3], on the basis of utility, budget, and information.

Since free-riding and non-voting behavior are hypothesized to arise from behavioral factors, these individuals should not differ from contributors with respect to information, utility or budget. The initially held hypothesis is that nonvoters and strong free riders cannot be distinguished from contributors on the basis of budget, utility, or information. In other words, there should be no significant difference between free riders and nonvoters as a group and contributors.

4.4 Statistical Techniques

Some of the results of the survey relate mainly to the observation of behavioral and institutional aspects of the model of contribution. Essentially, the analysis of these results consists of a tally of the numbers of people in each category, a qualitative test of "categorical validity," where people are asked how they behaved, or would behave, in the case of the hypothetical responses.

For each of the seven statistical models presented earlier, a statistical technique was employed to determine if the hypotheses in each model are rejected or if they are confirmed by failing to reject the hypothesis.

Given the categorical nature of the dependent variables, the error terms of the models will not be normally distributed. Thus, tests of significance based on

parameters estimated using ordinary or generalized least squares methods (OLS, GLS) will be invalid. Further, predictions based on OLS and GLS estimates will not always lie within the range of possible choices. For these reasons, a qualitative choice regression technique was employed, using either dichotomous or polychotomous choices as the dependent variable.

The LOGIT model was chosen, since it is a commonly-used procedure with well-tested computer software, available for use in both dichotomous and polychotomous choice models. This technique ensures that the predicted probabilities that a respondent will "fall into" a particular category will always lie in the interval $[0,1]$ and sum to 1, by using a logistic functional form (Maddala, 1983). Parameter estimation is by the maximum likelihood method. In this study, the model was tested for statistical significance using a chi-squared test, which was calculated from the model log-likelihood ratio.³ The program employed was the SAS LOGIST procedure (SAS Institute, Inc., 1986). This program calculates the model adjusted likelihood ratio (R) as follows:

3. $(-2)(\log\text{-likelihood ratio index}) \sim \chi^2$, with degrees of freedom equal to the number of parameters in the model. This test is analogous to the F-test in OLS models.

$$R = (\text{model chi-square} - 2p) / [-2\log(0)]$$

where:

p = number of variables in the model

log(0) = maximum log-likelihood with only the intercepts in the model

This statistic is corrected for the number of parameter estimates in the model (p). The adjusted likelihood ratio is interpreted in the same way as the adjusted R^2 estimate in OLS regression. However, the values of R are generally lower than those for R^2 in an OLS model, unless many of the predicted values lie close to 0 or 1. A qualitative choice model performed on cross-sectional data may generally be expected to generate an R value of 0.1 to 0.3. Individual explanatory variables were tested for statistical significance using a chi-squared test. Finally, in the SAS LOGIST procedure, ordered choices are assumed for the dependent variable in the multinomial or polychotomous models. This assumption is appropriate for statistical models five and six, since the three categories or choices in each case are in fact ordered.

CHAPTER 5. Empirical Results

5.1 Survey Results

No problems were encountered in the administration of the survey. However, contributors responded at more than twice the rate as did noncontributors (Table 5.1). Several surveys were returned with their identification numbers intentionally obscured by the respondent. Where it was still possible to determine whether the survey was returned by a contributor or a noncontributor, a number less than one (to distinguish these surveys from the other surveys, which were numbered from 1 to 2000) was assigned. These surveys were included in the analysis. Three respondents indicated that the second survey mailing had been given to them by someone who had already returned the survey. These respondents were distinguished from the first mailing by placing a 1 at the end of the number, that is, first survey 524, second survey 5241. These three surveys were included in the sample, as they appeared to be legitimate responses. The raw data is in Appendix E.

Table 5.1 Summary of Response to Questionnaire.
 2000 questionnaires were sent: 1100 to
 noncontributors, 900 to contributors.

Noncontributors:

<u>Category</u>	<u>Number</u>	<u>Percent of 2000</u>	<u>Percent of 1100</u>
Usable (entered as data):	337	16.85	30.63
Indicated that they contributed:	25	1.25	2.27
Returned, but not useable:	13	0.65	1.18
Non-deliverable:	38	1.90	3.45
Not returned:	687	34.35	62.45

Contributors:

<u>Category</u>	<u>Number</u>	<u>Percent of 2000</u>	<u>Percent of 900</u>
Useable (entered as data):	535	26.75	59.44
Indicated that they did not contribute:	33	1.65	3.67
Returned, but not useable:	7	0.35	0.78
Non-deliverable	26	1.30	2.89
Not returned	299	14.95	33.22

Twenty-five respondents indicated that they had contributed to the checkoff when the Tax Department indicated that they had not. The opposite was true for 33 (Table 5.1). These surveys were excluded from the analysis, since it was impossible to tell whether these respondents were in fact contributors or noncontributors.

Respondents had little trouble answering most of the questions. However, the responses to the residence question, 18 were extremely variable, even for people living in similar areas. Specifically, people living in the same areas, based on postmarks, gave widely variable responses. Also, a number of respondents placed question marks by their responses, or made comments to the effect that they did not know the population of their area. For this reason, residence was included in the statistical estimation of model parameters as a dummy, 1/0, variable, the two categories being rural and "all else", urban, suburban, town.

The sample was validated by comparing survey results with 1980 Virginia census information. A detailed discussion of the results of the sample validation is in Appendix D. The sample correctly represents the urban-rural split in Virginia and the distribution of the state taxpayers by gender. However, the sample significantly

over-represents higher income and education levels. Also, the sample under-represents the lowest and highest age classes, and over-represents the age classes from 25-44. The sample correctly represents the age classes from 45-69. This result implies that the sample is biased with respect to education and income. Unfortunately, a telephone survey of nonrespondents was not possible, since the respondents had to remain anonymous, so the impacts of any response bias, where respondents differ significantly in important respects from nonrespondents, in the survey results cannot be estimated. If, for example, people with higher incomes and education value nongame wildlife more or are more likely to contribute than those with lower incomes and education, then the survey results may be biased towards those who have a greater interest in nongame wildlife or the checkoff.

All of the categories of the model of contribution behavior were represented by at least one respondent (Figure 5.1; Tables 5.2 and 5.3). Unfortunately, the large number of noncontributing respondents who claimed to be unaware of

(Key to Figure 5.1 on the next page):

C = Contribution
 WTP = Willingness to pay, or marginal benefits
 for nongame wildlife
 WTP(U) = WTP "essentially unconstrained"
 WTP:C(B) = WTP constrained primarily by budget
 WTP:C(I) = WTP constrained primarily by information
 C<WTP = "Weak" free rider

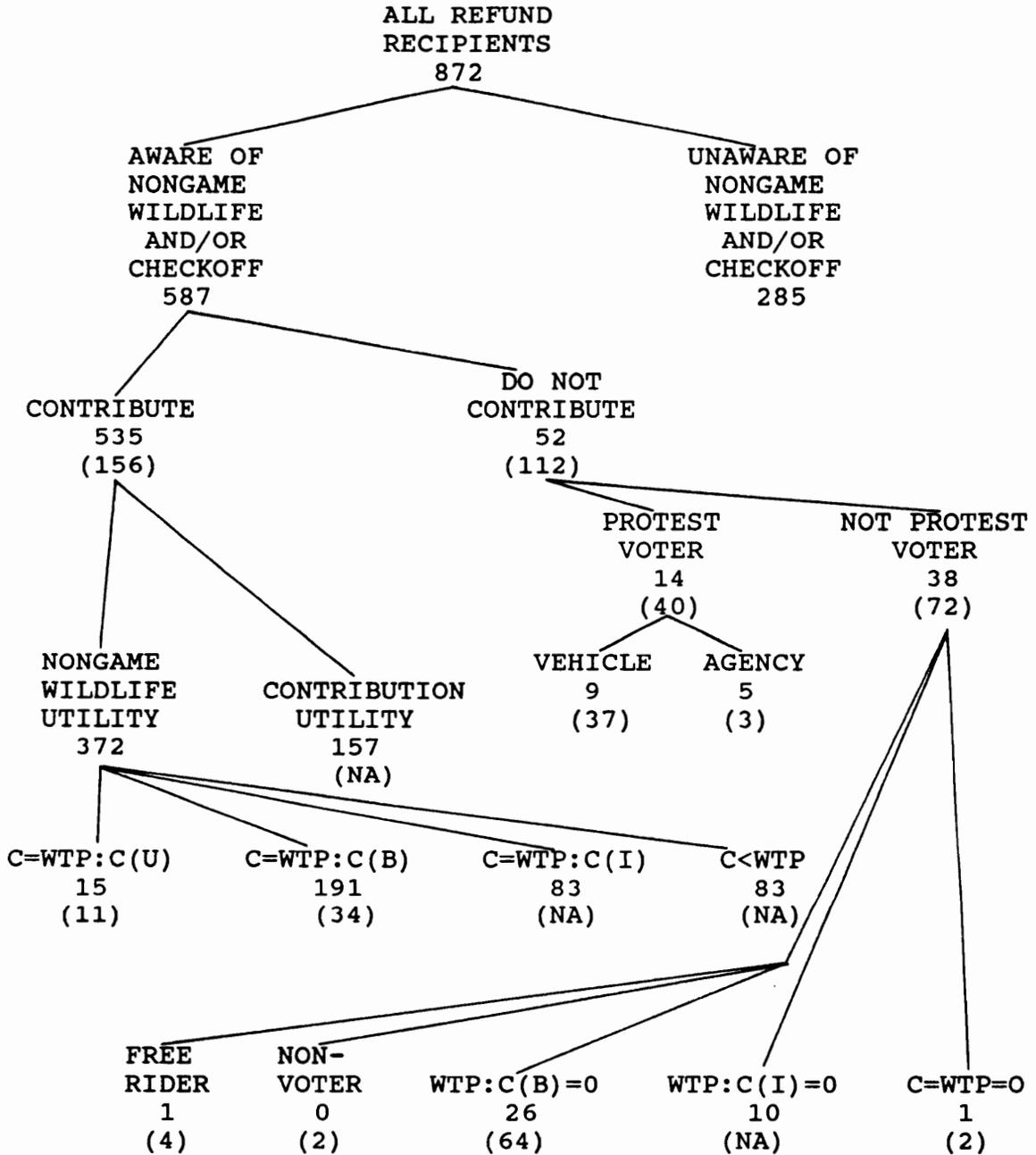


Figure 5.1 Schematic Representation of Response to Survey: number respondents in each category. Figures in parentheses are hypothetical responses of those who were initially unaware of the checkoff program, but who were given information about the checkoff, and were asked to indicate whether they would contribute, and why.

Table 5.2. Summary of Survey Responses of Noncontributors.
Number of respondents in each category of the
decision tree.

A. Question 6: Number indicating that they were and were
not aware of the checkoff:

Aware:	52
Unaware:	285

B. Question 7: Of those who were aware, the nature of their
reason for not contributing:

Do not value nongame wildlife:	1
Free rider:	1
Nonvoter:	0
Protest voter (government):	5
Protest voter (tax checkoff):	9
Lack of information:	10
Significant opportunity costs:	26

C. Question 8: Of those who were not aware of the checkoff,
the response to being given simple information about the
checkoff (hypothetical noncontributors and contributors):

Would not contribute:

Do not value nongame wildlife:	2
Free rider:	4
Nonvoter:	2
Protest voter (government):	3
Protest voter (tax checkoff):	37
Significant opportunity costs:	64

Would contribute:

On basis of nongame wildlife value (Essentially unconstrained):	11
But constrained by refund size:	16
But constrained by opportunity costs:	28
Because it seems like a good cause:	111

Table 5.3. Summary of Survey Responses of Contributors. Number of respondents in each category of the decision tree.

A. Question 2: Nature of primary utility received:

From nongame wildlife:	376
From contributing to a good cause:	157
Total:	533

B. Question 4: For those receiving utility from nongame wildlife, the major reason for the amount of the contribution:

Contribution based on nongame wildlife value (essentially unconstrained):	15
Smaller than it might have been due to budget constraint and/or opportunity costs:	191
Smaller than it might have been due to lack of information:	83
Weak free rider:	83
Total:	372

the checkoff, 285 of 337, means that the number of responses in the "aware" noncontributor categories was small. Of course, this result implies that a low level of awareness of the checkoff existed among noncontributors.

A major finding was that very few respondents indicated that they were engaging in either strong free-riding or in non-voting behavior. There was one "aware" noncontributor and four "hypothetical" noncontributors who indicated they were strong free riders, and no "aware" noncontributors and two "hypothetical" noncontributors who indicated they were nonvoters (Figure 5.1, Table 5.2). Recall that "hypothetical" contributors and noncontributors are those respondents who were not aware of the checkoff when they received the survey, and who were given information about the checkoff and then asked to indicate whether they, hypothetically, would contribute. Therefore, this study offers no significant evidence to confirm the existence of strong free riding. It is more precise to state that there is no evidence that respondents revealed free riding or non-voting behavior. One "aware" noncontributor and two "hypothetical" noncontributors indicated that they had a zero, or negative, willingness to pay for nongame wildlife. While this result may provide an accurate picture of these respondents' willingness to pay for nongame wildlife, it is possible that others who had a zero or negative willingness

to pay did not want to reveal that information. Such a result could derive from the existence of "social desirability bias", where people act in a way they perceive to be socially desirable or acceptable.

A second important survey result was the number of contributors (157 out of 533, 29.4 percent) who chose "it seems like a good cause" over "nongame wildlife is important to me" as the main reason for contributing, indicating the importance of contribution utility versus nongame wildlife utility to these respondents (Question 3; Figure 5.1, Table 5.3). Apparently, the act of contributing is important to many contributors. This result confirms the existence, as discussed in Chapter 2, of this aspect of utility derived from contributing to a public good. It is possible that both types of utility are derived from contributing. This question merely identified the primary source of utility derived from the contribution.

Another important finding was the number of protest voters, who do not contribute, either because they are protesting the government or the tax checkoff. They constituted 14 out of 52, or 26.9 percent "aware" noncontributors and 40 out of 112, or 35.7 percent "hypothetical" noncontributors (Figure 5.1, Table 5.2). These responses were often reinforced by written comments

received from protest voters and others, both contributors and noncontributors, that related to the budget situation in Virginia, and to the value of nongame wildlife. The comments suggested that nongame wildlife is important, that it should be part of the budget process, and that program officials should not be forced to raise funds via a checkoff. Further, a number of respondents indicated that, given that Virginia had a budget surplus, managers of nongame wildlife should not be raising funds via a checkoff. Some respondents suggested using the new Virginia lottery as a source of funds. Clearly, the institutional setting with respect to both the perceived importance of the good in the state budget, as well as the state budget situation are important factors for many taxpayers. Similarly, several respondents indicated their dissatisfaction with the tax situation, by crossing out "higher taxes", while leaving in "higher prices" in question 17a which read: "Air and water quality should be improved, even if it means paying higher taxes or higher prices for goods".

The situation with respect to the major constraints to contributing is complex. Contributors indicating that they were receiving **primarily nongame wildlife utility** in Question 3 were asked to indicate the main constraint to their contribution in Question 4. The results are presented

in Table 5.3, Part B. Slightly over half of these respondents indicated that budget and/or opportunity costs were the primary constraint to their contribution. Few "aware" contributors, 15 of 372, or about four percent, indicated that they were essentially unconstrained. An equal number, 83, or 22.3 percent, indicated that they were either primarily constrained by information, or were weak free riders. As was the case with strong free riders, it is possible that this relatively small number of weak free riders indicates that people will not reveal such behavior. Or, in contrast, it may be that budget and information constraints are important to practically all contributors. A further examination of this phenomenon is provided in Table 5.4. A comparison was made between the respondents indicating that information was the main constraint to their contribution versus the other three categories of actual contributors--essentially unconstrained, constrained primarily by budget, and weak free riders--on the basis of the means for two proxies for information, the information index, and the number of nongame wildlife-related publications received. In the same fashion, contributors constrained primarily by budget were compared to the other three categories of contributors--essentially unconstrained, constrained primarily by information, and weak free riders--on the basis of the

Table 5.4. Comparison of Contributors Constrained Primarily by Information and Budget to Other Contributors, On the Basis of Proxies for Information and Budget. Aware contributors only.

A. Information:

	(1) Contributors Constrained Primarily <u>by Information</u>	(2) Contributors in the Other Three <u>Categories</u>
Information index (possible range: 4-20):	11.99 (5.68)	11.26 (4.28)
Number of publications received:	1.25 (0.967)	1.56 (0.934)
N:	83	289

T-statistics for tests between categories 1 and 2:

Per capita gross income: 0.215
Total refund: 0.145

t, for $\alpha = 0.05$, with 1 degree of freedom = 1.96

B. Budget:

	(C) Contributors Constrained Primarily <u>By Budget</u>	(D) Contributors in the Other Three <u>Categories</u>
Per capita gross income:	\$16067 (1.58)	\$20998 (1.78)
Total Refund:	\$ 166 (1.00)	\$ 218 (1.14)
N:	191	181

T-statistics for tests between categories C and D:

Per capita gross income: 0.317

Total refund: 0.312

t, for $\alpha = 0.05$, with 1 degree of freedom = 1.96

means for the two proxies for budget, per capita gross income and total refund. T-values for the individual means are in brackets underneath the mean. The respondents indicating that they were primarily constrained by information do not differ significantly, either with respect to the information index, or the number of publications received, from those in the other three categories. A possible explanation is that budget factors also were important to those contributors indicating that information was the primary constraint to their contribution. The respondents indicating that they were primarily constrained by budget have a lower mean level of income and refund than those in the other three categories. However, the differences are not statistically significant. In conclusion, a distinction between the two constraint categories, information and budget, and the other categories of "aware" contributors receiving primarily nongame wildlife utility cannot be made on the basis of the proxies for information and budget.

All "aware" contributors were asked to indicate whether their contribution would be higher, lower, or not change, if they were given a higher refund, had lower opportunity costs, or had more information (Question 5). The information question could have been worded better, as several people wrote in "it depends on the information" to

indicate that, perhaps, increased information might cause them to decrease or increase their contribution, depending on how the information affected their attitudes towards the checkoff or nongame wildlife. A summary of responses to Question 5 is presented in Table 5.5. Table 5.5A summarizes the number of respondents indicating that they would increase their contribution if any of three conditions changed: 1) if the respondent's refund were larger, 2) if the respondent were faced with lower opportunity costs, or 3) if more information were provided about the checkoff and/or nongame wildlife. The respondent was given the choice of increasing, decreasing, or not changing his or her contribution given each of the above changes. Overall, more respondents indicated that their contribution would increase than indicated that their contribution would not change. The number of respondents indicating that their contribution would decrease in any of the three cases was only two. Table 5.5B summarizes the number of responses of where the individual indicated that his or her contribution would be larger, meaning that the constraint was important to the respondent. An important result is that 161 of 533, or 30 percent of all aware contributors indicated that all three of the constraints were important to their contribution.

Cross-tabulations of questions 4 and 5 are presented in Tables 5.6 and 5.7. Question 4 asks the respondent to

Table 5.5. Summary of Question 5. Number of "aware" contributors indicating that budget and information were constraints to their contribution.

A. Summary of All responses.

How contribution would change if:

	<u>Larger</u>	No Change	Blank*	<u>Smaller</u>
Refund larger	326	73	134	1
Opportunity costs reduced	290	91	153	0
Had more information	317	86	120	1

*Blank responses are for respondents who indicated that at least one of the categories would be "Larger", but left the others blank. These blank responses could be interpreted as a response of "No Change".

B. Number of "larger" responses in Question 5. Number of respondents indicating:

Information, refund, and opportunity costs:	161
Information and refund only:	51
Information and opportunity costs only:	23
Refund and opportunity costs only:	57
Information only:	83
Refund only:	57
Opportunity costs only:	49
None of the three:	<u>52</u>
Total	533
Missing:	1

Table 5.6 Cross-Tabulation of Questions 4 and 5. Includes aware contributors. Question 4 elicited the main constraint to their contribution. Question 5 elicited which of three types of constraints were important to their contribution.

Response to Question 4:	Response to Question 5:		
	<u>Refund</u>	<u>Opportunity Costs</u>	<u>Information</u>
Weak free riders	36/47*	31/52	48/35
Lack of information	50/33	36/47	75/ 8
Nongame wildlife value	8/ 7	5/10	3/12
Constraints (refund/ opportunity costs)	145/46	149/42	97/94

* Important/Not important

Table 5.7. Cross-Tabulation of Question 4 and 5, Detailed. Includes aware contributors. Question 4 elicited the main constraint to their contribution. Question 5 elicited which of three types of constraints were important to their contribution.

A. Treating individual missing responses in question 5 as missing values.

		Response to Question 5:							
		Y	Y	Y	N	Y	N	N	N
A. Refund		Y	Y	Y	N	Y	N	N	N
B. Opp. Costs		Y	Y	N	Y	N	Y	N	N
C. Information		Y	N	Y	Y	N	N	Y	N
Response, Question 4:									
Weak Free Rider		12	4	8	6	6	4	11	6
Information		30	1	12	5	1	0	15	0
Nongame Wildlife Value		2	0	1	0	2	2	0	4
Refund/Opp. Costs		72	38	11	4	5	7	3	6

B. Assuming that individual missing responses are equivalent to responding "no change" in question 5.

		Response to Question 5:							
		Y	Y	Y	N	Y	N	N	N
A. Refund		Y	Y	Y	N	Y	N	N	N
B. Opp. Costs		Y	Y	N	Y	N	Y	N	N
C. Information		Y	N	Y	Y	N	N	Y	N
Response, Question 4:									
Weak Free Rider		12	5	8	7	11	7	21	12
Information		30	1	13	5	6	0	27	1
Nongame Wildlife Value		2	0	1	0	5	3	0	4
Refund/Opp. Costs		72	43	14	4	15	29	6	7

In both charts, Y = a response of "larger"; N = a response of "smaller" in question 5, with missing responses treated as noted. If all three parts of question 5 were missing, the entire question was treated as missing. See Appendix B for wording of questions and data coding.

give the main reason for contributing the amount that he or she gave. The four possible responses are: 1) weak free rider, 2) lacked information to contribute more, 3) contribution based on nongame wildlife value (WTP, or "essentially unconstrained"), and 4) contribution constrained by refund amount (budget) and/or opportunity costs of contributing. The table presents the number of people indicating that a constraint was important and the number indicating that a factor was not important (important/not important), which was indicated by a response of "no change". As expected, many of the contributors indicating that information was the main constraint to their contribution (Question 4) indicated that information was an important constraint in Question 5. The same can be said for those indicating that budget was their main constraint.

Likewise, for those who indicated that they were essentially unconstrained, a smaller number indicated that each of the three constraints was important than indicated that they were not important. An important finding of Table 5.6, however, is that some respondents, 97 of 191, or 50.8 percent, who indicated that budget was the primary constraint to their contribution, stated that they would contribute more if they had more information. Likewise, many contributors who indicated that information was the main constraint to their contribution indicated that they

would contribute more if they had a larger refund or if they had lower opportunity costs: 86 total responses for both categories, out of 83 respondents. Also, the results of the cross-tabulations of questions 4 and 5 show that many of the respondents indicating that they were weak free riders indicated that budget and information were constraints to their contribution. Information and budget constraints, then, were important to at least some respondents in all of the four categories of contributors.

Table 5.7 is essentially the same as Table 5.6, with the exception that the responses to Question 5 are presented in more detail. For the responses to Question 5, "Y" means that the constraint was important and "N" means that the constraint was not important. Two tables are presented, and differ with respect to how missing responses are treated. The results for this table confirm the conclusions drawn from the results of Table 5.6. Perhaps the most important result is the number of weak free riders indicating that **only** information was a constraint to their contribution, 11 of 57, or 19 percent in part A, 21 of 83, or 25 percent in part B, suggesting that weak free riding may be related in some way to the information possessed by the individual at the time the contribution is made.

A cross-tabulation of Questions 3 and 5 is presented in Table 5.8. Again, two tables are presented, based on the treatment of missing values. In summary, contributors indicating that they were receiving primarily contribution utility indicated that budget and information were important constraints to their contribution. However, as a percent of the total for the two groups, a larger percentage of those receiving primarily contribution utility indicated that neither budget nor information constraints were important, as compared to those receiving primarily nongame wildlife utility (17 of 123, or 13.8 percent versus 16 of 281, or 5.7 percent, respectively; Table 5.8). This result may stem from the nature of contribution utility: the decision to contribute to a "cause" may be less dependent on the amount of information possessed by an individual, and less closely related to an individual's income, or budget, than the decision to contribute based on utility gained from a particular public good.

Several comparisons of categories were conducted based on the means of the survey variables, for example, the information index, age, and per capita income. Of particular interest are all contributors versus all

Table 5.8. Cross-Tabulation of Question 3 and Question 5. Includes aware contributors. Question 3 elicited whether the primary utility received from contributing is derived from contribution or from nongame wildlife. Question 5 elicited which of three types of constraints were important to their contribution.

A. Treating individual missing responses in question 5 as missing values.

		Response to Question 5:							
		Y	Y	Y	N	Y	N	N	N
A. Refund		Y	Y	Y	N	Y	N	N	N
B. Opp. Costs		Y	Y	N	Y	N	Y	N	N
C. Information		Y	N	Y	Y	N	N	Y	N
Response, Question 3:									
Contribution Utility:		42	8	13	6	8	5	24	17
Nongame Wildlife Utility:		118	43	33	15	14	14	28	16

B. Assuming that individual missing responses are equivalent to responding "no change" in question 5.

		Response to Question 5:							
		Y	Y	Y	N	Y	N	N	N
A. Refund		Y	Y	Y	N	Y	N	N	N
B. Opp. Costs		Y	Y	N	Y	N	Y	N	N
C. Information		Y	N	Y	Y	N	N	Y	N
Response, Question 3:									
Contribution Utility:		42	8	14	7	19	10	30	26
Nongame Wildlife Utility:		118	49	37	16	38	39	53	25

In both charts, Y = a response of "larger"; N = a response of "smaller" in question 5, with missing responses treated as noted. If all three parts of question 5 were missing, the entire question was treated as missing. See Appendix B for wording of questions and data coding.

noncontributors (Table 5.9), actual contributors versus hypothetical contributors (Table 5.10), and actual noncontributors versus hypothetical noncontributors (Table 5.11). In summary, the difference between the survey variable measures between the two categories in each table are not statistically significant, since the t-statistics, presented in Table 12, are less than 1.96 (which is the value of t for $\alpha = 0.05$, with 1 degree of freedom), in every case. Table 5.12 presents the results of these t-tests between the two categories of respondents presented in Tables 5.9, 5.10, and 5.11. Therefore, there is no significant difference between contributors and noncontributors, based on individual means for the proxies for utility, budget, and information. The **simultaneous** effect of these variables on the decision to contribute is examined in statistical model two, which is discussed later. Likewise, for the comparison of actual contributors versus hypothetical contributors (Table 5.10) and the comparison of "aware" noncontributors versus "hypothetical" noncontributors (Table 5.11), it cannot be stated conclusively that the two categories differ significantly in each case, on the basis of the individual proxies for utility, budget, and information.

Table 5.9. Summary of Survey Variable Means for Contributors and Noncontributors.

Variable	Noncontributors			Contributors		
	N	Mean	Std.Dev.	N	Mean	Std.Dev
Number of journals received	337	0.61	1.10	534	1.25	1.51
Information index	336	10.58	2.66	534	11.28	2.51
Use/option value*	196	3.59	0.959	384	4.19	0.792
Use/option value^	337	2.09	1.92	534	3.01	2.00
Existence value	325	3.71	0.883	507	4.37	0.665
Refund	281	\$170	\$191	470	\$192	\$178
Attitude index	333	14.98	2.59	531	16.50	2.33
Education index	337	4.46	1.63	532	5.16	1.53
Age	337	38.50	14.33	532	37.60	12.11
Household income	314	\$39049	\$22753	515	\$41408	\$22307
Per capita income	314	\$15283	\$11243	515	\$18879	\$11228
Contribution				500	\$10.36^^	\$11.50

* Non-response interpreted as a missing value

^ Non-response interpreted as a value of 0

^^ The Virginia Department of Game and Inland Fisheries reported an average contribution level of \$10.69 for that year (taxable year 1987).

Table 5.10. Summary of Survey Variable Means for "Aware" Contributors Versus Hypothetical Contributors.

Variable	Actual Contributors			Hypothetical Contributors		
	N	Mean	Std.Dev.	N	Mean	Std.Dev
Number of journals received	533	1.26	1.52	166	0.548	0.944
Information index	533	11.26	2.49	165	11.02	2.32
Use/option value*	383	4.19	0.791	95	3.94	0.873
Use/option value^	533	3.01	2.00	166	2.25	2.06
Existence value	506	4.37	0.663	162	4.08	0.756
Refund	470	\$192	\$178	151	\$181	\$174
Attitude index	530	16.51	2.31	165	15.54	2.46
Education index	531	5.16	1.53	166	4.51	1.56
Age	531	37.63	12.10	166	38.90	14.57
Household income	514	\$41464	\$22292	158	\$40134	\$22703
Per capita income	514	\$18891	\$11235	158	\$16094	\$12620

* Non-response interpreted as a missing value

^ Non-response interpreted as a value of 0

Table 5.11. Summary of Survey Variable Means for "Aware" Noncontributors Versus Hypothetical Noncontributors.

Variable	Actual Noncontributors			Hypothetical Noncontributors		
	N	Mean	Std.Dev.	N	Mean	Std.Dev.
Number of journals received	52	1.23	1.84	112	0.420	0.706
Information index	52	9.86	2.86	112	10.18	2.97
Use/option value*	35	3.60	1.03	61	3.05	0.825
Use/option value^	52	2.42	1.90	112	1.66	1.64
Existence value	51	3.59	0.87	106	3.21	0.825
Refund	45	\$205	\$284	79	\$133	\$138
Attitude index	52	14.81	2.91	109	14.30	2.48
Education index	52	4.38	1.63	112	4.45	1.74
Age	52	34.79	12.89	112	39.68	14.82
Household income	51	\$37843	\$20885	99	\$37689	\$23490
Per capita income	51	\$15309	\$ 9955	99	\$14131	\$ 9206

* Non-response interpreted as a missing value

^ Non-response interpreted as a value of 0

Table 5.12 Summary of Results of t-tests for Categories of Contribution Behavior Presented in Tables 9, 10, and 11.

Variable	Table 9 Contributors Versus Noncontribu- tors	Table 10 "Aware" Contributors Versus Hypothetical Contributors	Table 11 "Aware" Noncontribu- tors Versus Hypothetical Noncontribu- tors
Number of journals received	0.345	0.397	0.411
Information index	0.189	0.0700	0.0760
Use/option value*	0.479	0.215	0.416
Use/option value^	0.333	0.264	0.303
Existence value	0.593	0.288	0.381
Refund	0.0832	0.0415	0.226
Attitude index	0.436	0.286	0.132
Education index	0.313	0.300	0.0296
Age	0.0478	0.0669	0.249
Household income	0.0740	0.0418	0.00489
Per capita income	0.226	0.166	0.127

* Non-response interpreted as a missing value

^ Non-response interpreted as a value of 0

t, for $\alpha = 0.05$, with 1 degree of freedom (number of categories - 1) = 1.96

Contributors indicating that they received primarily nongame wildlife utility had higher levels of nongame wildlife utility, both use/option and existence value, than did contributors indicating that they received mainly contribution utility (Table 5.13 and Table 5.14). For questions 14A and 14B, a larger number indicates a higher level of utility. However, comparing the means of the proxies for nongame wildlife utility for the two groups showed that contributors indicating that they received primarily nongame wildlife utility did not differ significantly from the contributors indicating that they received mainly contribution utility (Table 5.15), since the difference between the means for these two groups was not statistically significant for any of the measures ($t < 1.96$, in each case). This result suggests that contributors indicating that they were receiving primarily contribution utility were receiving nongame wildlife utility at a level equal to those contributors indicating that they were receiving primarily good, or nongame wildlife, utility.

Finally, the attitude towards the refund, Question 15, differed between contributors and hypothetical noncontributors. It was hypothesized that contribution was more likely if the refund was viewed as transitory income. Table 5.16 shows that while a higher percentage of contributors viewed the refund as transitory income, the

Table 5.13 Cross-Tabulation of Question 3 and Questions 14a, 14b. Question 3 elicits the primary utility received from contributing. Questions 14A and 14B elicit the utility received from nongame wildlife. Includes "aware" contributors only.

A. Type of utility received (question 3) versus use/option value (question 14a).

	Q14A: Use/Option Value Response:					
	0*	1	2	3	4	5
Utility Received:						
Nongame Wildlife:	Number: 78	2	4	32	124	136
	Percent: 20.74	0.53	1.06	8.51	32.98	36.17
Contribution:	Number: 72	0	3	25	43	14
	Percent: 45.86	0	1.91	15.92	27.39	8.92

Missing: 1

*Note: Q14A was not answered if the respondent was not a "user" of nongame wildlife. If a respondent answered question 14B, a non-response to question 14A was interpreted as a value of 0 for question 14A.

B. Type of utility received (question 3) versus existence value (question 14b). All respondents were asked to complete question 14b, so there are no zero responses.

	Q14B: Existence Value Response:				
	1	2	3	4	5
Utility Received:					
Nongame Wildlife:	Number: 1	3	18	142	192
	Percent: 0.28	0.84	5.06	39.89	53.93
Contribution:	Number: 0	0	19	90	41
	Percent: 0	0	12.67	60.0	27.33

Missing: 28

Table 5.14 Cross-tabulation of Question 3 and Questions 14A + 14B. Type of utility received (question 3) versus total value (question 14A + 14B). Categories have been aggregated. Those who completed question 14A but not 14B are not included.

		Total Value Response:			
		2-4	5&6	7&8	9&10
Utility Received:					
Nongame	Number:	45	52	103	156
Wildlife:	Percent:	12.64	14.60	28.93	43.83
Contribution:					
	Number:	52	33	45	20
	Percent:	34.67	22.0	30.0	13.33

Missing: 28

Range for total utility (or total nongame wildlife value) = 2-10.

Table 5.15 Mean Values for Utility Proxies, for "Aware" Contributors Receiving Primarily Nongame Wildlife Utility and "Aware" Contributors Receiving Primarily Contribution Utility. T-statistics for individual means are below the mean. T-statistics for comparisons of means between the two categories for each measure are presented below the table.

	"Aware" Contributors Receiving Primarily:	
	<u>Nongame Wildlife Utility</u>	<u>Contribution Utility</u>
Q14A1 (use/option value) (where nonresponse = 0)	3.41 (1.82)	2.06 (1.04)
Q14A2 (use/option value) (where nonresponse = missing)	4.30 (5.61)	3.80 (5.05)
Q14B (existence value)	4.46 (6.76)	4.15 (6.72)
Q14A1 + Q14B	7.82 (3.59)	6.09 (2.92)
Number of journals received	1.48 (0.926)	0.73 (0.633)
"Environmental Attitude" Index:	16.84 (7.37)	15.71 (7.19)

T-Statistics for comparisons between means:

Q14A1:	0.496
Q14A2:	0.467
Q14B:	0.351
Q14A1 + Q14B:	0.571
No. journals:	0.383
Attitude Index:	0.356

t, for $\alpha = 0.05$, 1 degree of freedom = 1.96

Table 5.16. Comparison of Frequency of Responses: Contributors Versus Noncontributors Indicating That Their Refund Was Real or Transitory Income.

	<u>All Contributors</u>	<u>Hypothetical Non-contributors</u>	<u>"Aware" Non-contributors</u>
Real income:	314 (59.7%)	170 (84.6%)	33 (64.7%)
Transitory income:	212 (40.3%)	31 (15.4%)	18 (35.3%)

Chi-squared for comparison of contributors to hypothetical noncontributors = 40.49

Chi-squared for comparison of contributors to "aware" noncontributors = 0.4748

Chi-squared for $\alpha = 0.05$, with 1 degree of freedom = 3.84

difference between contributors and "aware" noncontributors is not statistically significant, using a chi-squared test, since the chi-squared statistic is less than the value of chi-squared at the 0.05 level. The difference between contributors and hypothetical noncontributors is significant at the 0.05 level. The chi-squared test is used since distributions rather than means are being compared. The author can suggest no reason why hypothetical noncontributors would be more likely to view the refund as real income. The role of this variable in determining contribution behavior was examined in combination with other factors, such as the size of the refund, in the qualitative choice models.

5.2 Results From Statistical Models

In Chapter 4, several hypotheses about individuals' choices of certain categories of the model of contribution behavior, or the categories to which individuals belong, as a function of proxies for information, utility and budget were presented, and a statistical technique, binomial and multinomial LOGIT analysis, was discussed as a means of estimating this relationship. The objective is to determine if certain categories in the model of contribution behavior

can be distinguished based on the values of the proxies for characteristics of respondents that are hypothesized to affect the choice of a category by the respondent. The results for the estimates of these statistical models are presented in this section. Several of the statistical models present results for those who were aware of the checkoff, separate from the results for those who were not aware of the checkoff, and thus gave hypothetical responses, that is "hypothetical" contributors and noncontributors. The model comparing free riders and nonvoters versus contributors was not estimated, due to an insufficient sample size. Only one "aware" noncontributor and four hypothetical noncontributors indicated that they were free riding; the comparable figures for nonvoters were zero and two, respectively. Also, the age variable, a proxy for attitude, was excluded from the analysis after preliminary results showed that it was highly correlated with income.

The results for the LOGIT models are shown below. For each statistical model, the value of the dependent variable assigned to each category included from the model of contribution behavior is reported, as well as the number of observations in each category. The number of respondents included in each behavioral category may be less than the number in Figure 5.1 or Tables 5.2 and 5.3 due to

missing responses for some of the proxies used as independent variables in each statistical model. The dependent variable value is either zero or one for statistical models involving two categories of the model of contribution behavior, the binomial logit models, and zero, one, or two for models involving three categories, the multinomial ordered logit models. In each case, the model chi-squared statistic is presented, along with its associated level of significance. Also included is the adjusted log-likelihood ratio. The parameter estimates for individual independent variables are then presented, including the parameter estimates and the associated chi-squared statistic, with its associated level of significance. An asterisk is included for those individual parameter estimates whose chi-squared values are significant at less than or equal to the 0.05 level.

For the multinomial ordered logit statistical models, the results distinguish between the three categories of contributors and noncontributors who are constrained to different degrees by budget and information: 1) those who are essentially unconstrained, 2) those who are constrained but contribute, and 3) those who are constrained such that no contribution is made. For each model, after the table of parameter estimates, a table comparing the actual data with the results predicted by the estimated model is provided.

The table shows what the model would predict for a result, based on the values of the independent variables, versus what the data actually showed in each case for each respondent. This comparison gives an indication of how well the statistical model compares to actual behavior, or how the statistical model "chooses" the categories, compared to what categories individual respondents actually chose. The list in Table 5.17 shows the notation for the variables that are used in the statistical models and tables of results.

Parameter Estimates and Discussion of Statistical Results

The results for each model are presented in the same order as they were discussed in chapter 4. The first statistical model distinguished between aware contributors and aware noncontributors versus unaware noncontributors on the basis of information. The dependent variable, representing the above two categories, in this statistical model does not reflect a conscious decision on the part of potential contributors. Rather, it is a classification of respondents, based on whether they were aware of the existence of the checkoff. The model reflects the hypothesis that "awareness" of the checkoff may be explained in terms of proxies for information possessed by respondents. The null hypothesis was that there would be no

Table 5.17. Notation Used for Variables in Presentation of Results of Statistical Models of Choice Behavior.

I. Dependent Variable: (choice or category) = DEC
 "decision", which reflects a category of the model of contribution behavior; takes on a value of 0,1, or 2.

II. Independent Variables:

A. Proxies for Utility

1. Nongame wildlife utility (benefits) received = UTIL. This variable is the sum of the value for both use/option and existence value, assuming that no response is a missing value. Range 2-10.
2. Residence = RES. 1 = urban, 0 = rural
3. Attitude towards nongame wildlife/environmental issues = ATT ("Environmental index"). Range 4-20; a larger value indicates a more "environmentalist" attitude.

B. Proxies for Budget

1. Income = INC.
Categorical, Range \$3750-\$100,000
2. Refund = REF.
Exact amount, or categorical value (Range \$20-\$420) entered.
3. Attitude towards refund: = REFAT.
1 = real income, 0 = transitory income.

C. Proxies for Information

1. Information index = INFO. Range 0-16
2. Number of Nongame wildlife and related publications received = PUBS
(this variable was also used as a proxy for utility)
3. Education = EDUC. Range 1-8.

Table 5.18 Summary of Statistical Model Results: Aware Contributors and Aware Noncontributors Versus Unaware Noncontributors, as a Function of Proxies for Information

1. Model Statistics:

Model Chi-Squared, 3 d.f. = 96.15 (p < .001)

Model Log-Likelihood Ratio = 0.287

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std.Error</u>	<u>Chi-squared</u>	<u>P</u>
Intercept	-1.173	0.3985	8.66	0.0032*
INFO	0.03317	0.02942	1.27	0.259
PUBS	0.5564	0.08129	46.85	<0.0001*
EDUC	0.2272	0.04820	22.22	<0.0001*

3. Sample size:

N = 583 Aware contributors and aware noncontributors
(dependent variable = 1)

283 Unaware noncontributors (dependent variable = 0).

difference between the groups, based on the proxies for information. The results for this statistical model are found in Table 5.18. The model chi-squared statistic is significant at the 0.05 level. The interpretation of the results is: the greater the number of publications received and the higher the level of education, the greater the probability that the respondent is aware of the checkoff program. The information index variable (INFO) does not contribute to explaining the difference between aware contributors plus noncontributors as compared to unaware noncontributors.

The second statistical model includes the overall decision by respondents of whether to contribute. That is, the model attempts to distinguish between only contributors and "aware" noncontributors, on the basis of all of the proxies for budget, utility, and information that were included in the survey, except age. The results of this statistical model are in Table 5.19. The results for this statistical model indicate that contributors and aware noncontributors can be distinguished on the basis of certain proxies for utility, budget, and information, since the model chi-squared statistic is significant at the 0.05 level. The results suggest that the probability of contribution increases with an increase in "environmentalist" attitude (ATT), increases with increasing

Table 5.19 Summary of Statistical Model Results:
Contributors Versus Aware Noncontributors, as
a Function of Proxies for Information, Budget,
and Utility.

1. Model Statistics:

Model Chi-Squared, 9 d.f. = 36.08 ($p < .001$)

Model Log-Likelihood Ratio = 0.250

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
Intercept	-4.685	1.4204	10.88	0.0010
ATT	0.1878	0.07642	6.04	0.014*
UTIL	0.1586	0.08179	3.76	0.0524
RES	0.4697	0.3898	1.45	0.228
PUBS	-0.1923	0.1089	3.12	0.0775
INFO	0.1595	0.06550	5.93	0.0149*
EDUC	0.2514	0.1246	4.07	0.0436*
INC	0.00000211	0.00000881	0.06	0.810
REF	-0.0006490	0.0008564	0.57	0.448
REFAT	-0.02063	0.3580	0.00	0.954

3. Sample size:

N = 431 Contributors (dependent variable = 1)

43 Aware non-contributors (dependent variable = 0).

media exposure (information index, INFO) related to nongame wildlife, and increases with an increased level of education. The coefficient on the level of nongame wildlife utility received (UTIL) is not significantly different from zero at the 0.05 level of significance ($p = .0524$), but would be at the 0.10 level. The other variables, residence (RES), number of publications (PUBS), and the proxies for budget, Income (INC), level of refund (REF), and attitude towards the refund (REFAT), do not significantly contribute to discriminating between the two categories. It is surprising that neither the level of income nor the level of refund contributes significantly to the contribution decision. The role of income and refund is examined in more detail in later statistical models.

The next two statistical models examine the decision to protest vote versus other noncontribution behavior, based on the proxies for utility. The hypothesis is that protest voters may be distinguished from other noncontributors on the basis of the utility received from contributing. Protest voters were compared to all other noncontributing respondents to the survey, with the exception of one "aware" and two "hypothetical" noncontributors who indicated that they were true zero bidders, that is, they had a true zero value for nongame wildlife. Since protest voters may also be zero bidders, these three respondents were excluded from

the analysis, to avoid having similar respondents in both categories. Therefore, protest voters were compared to all other noncontributors, except the three just noted, on the basis of the proxies for utility. Protest voters were hypothesized to have a lower level of utility for nongame wildlife than other noncontributors. The first statistical model compares "aware" protest voters versus other "aware" noncontributors. The results from this statistical model are reported in Table 5.20. The insignificant chi-squared statistic for the model suggests that aware protest voters cannot be distinguished from other aware noncontributors on the basis of measures of the level nongame wildlife utility received.

The second model of protest voting behavior is nearly identical to the first. Protest voters are compared to noncontributors who are not true zero bidders, or who have a zero willingness to pay for nongame wildlife, as a function of the proxies for utility. However, in this model, data for hypothetical protest voters and other hypothetical noncontributors are used. The results of this statistical model are in Table 5.21. This results from this model suggest that these two groups of respondents cannot be discriminated between, since the model chi-squared statistic is not significant at the 0.05 level. The results from these two statistical models imply that protest voters do

Table 5.20 Summary of Statistical Model Results:
 Protest Voters Versus Other Aware
 Noncontributors, as a Function of Proxies
 for Utility. Actual Behavior: "Aware" Protest
 Voters and Other "Aware" Noncontributors

1. Model statistics:

Model Chi-Squared, 4 d.f. = 3.57 (P = 0.4675)

Model Log-Likelihood Ratio = 0.0

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
Intercept	-3.986	2.154	3.42	0.0642
ATT	0.2506	0.1646	2.32	0.128
UTIL	-0.1277	0.1636	0.61	0.435
PUBS	0.04685	0.2021	0.05	0.817
RES	-0.2249	0.7880	0.08	0.775

3. Sample size:

N = 13 Aware protest voters (dependent variable = 1)

37 Other aware noncontributors (dependent variable = 0).

Table 5.21 Summary of Statistical Model Results: Protest Voters Versus Other Noncontributors, as a Function of Proxies for Utility. Hypothetical Behavior: Hypothetical Protest Voters Versus Other Hypothetical Noncontributors

1. Model statistics:

Model Chi-Squared, 4 d.f. = 4.70 (P = 0.3196)

Model Log-Likelihood Ratio = 0.0

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
Intercept	-0.8675	1.289	0.45	0.501
ATT	-0.04089	0.08710	0.22	0.639
UTIL	0.2267	0.1108	4.19	0.0408*
PUBS	-0.2960	0.3300	0.80	0.370
RES	-0.1633	0.5487	0.09	0.766

3. Sample size:

N = 37 Hypothetical protest voters (dependent variable = 1)

65 Other hypothetical noncontributors (dependent variable = 0).

not receive a lower level of nongame wildlife utility than do other noncontributors. A protest voter cannot be distinguished from other noncontributors on the basis of the proxies for utility. It is possible that protest voting, like free riding, is a purely behavioral phenomenon, that is, it is independent of the level of utility that the individual is receiving for the good in question.

The next statistical model compares contributors who received primarily nongame wildlife utility to contributors who received primarily contribution utility, on the basis of the proxies for nongame wildlife utility. A respondent indicating that he or she received primarily contribution utility could also have been receiving nongame wildlife utility. The hypothesis is that respondents indicated accurately which form of utility was more important to them, meaning that the two categories should be distinguishable on the basis of the values taken by the proxies for nongame wildlife utility. Respondents indicating that they received primarily nongame wildlife utility were hypothesized as having a higher level of nongame wildlife utility than those indicating that they received primarily contribution utility. The probability of a contributor indicating that they were receiving primarily nongame wildlife utility (versus contribution utility) was hypothesized to increase with increasing levels of nongame wildlife utility. The

probability that a contributor indicated that they were receiving primarily nongame wildlife utility was hypothesized to increase with an increasing number of nongame wildlife-related publications received and with a stronger "environmentalist" attitude. The results of this statistical model are presented in Table 5.22. The null hypothesis of no distinction between the groups is rejected, both for the model and for all of the individual variables, except residence, since the respective model chi-squared statistics are significant at the 0.05 level. These results imply that those individuals who indicate that they are receiving primarily contribution utility do not have as high a utility or as strong an attitude about the public good in question as do those who indicate that they are receiving mainly "good" (use, option, existence value) utility. While contributors receiving primarily contribution utility also receive utility from nongame wildlife, the amount of this additional utility is apparently not equal to the level of nongame wildlife utility received by contributors indicating that they received primarily nongame wildlife utility.

The fifth statistical model is a multinomial ordered logit model, with a dependent variable comprised of three ordered categories or choices. The three categories in this case are: 1) contributors indicating that they were

Table 5.22 Summary of Statistical Model Results:
Contributors Receiving Primarily Nongame
Wildlife Utility Versus Contributors
Receiving Primarily Contribution Utility, as
a Function of Proxies for Utility.

1. Model Statistics:

Model Chi-Squared, 4 d.f. = 80.83 (P < .001)

Model Log-Likelihood Ratio = 0.347

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
Intercept	-3.184	0.8497	14.05	0.0002*
ATT	0.1392	0.04920	8.01	0.0046*
UTIL	0.2583	0.04957	27.16	<0.0001*
PUBS	0.3327	0.09538	12.17	<0.0001*
RES	-0.4159	0.3001	1.92	0.1658

3. Sample Size:

N = 354 Contributors w/ nongame wildlife utility (dependent variable = 1)

146 Contributors w/ contribution utility (dependent variable = 0).

essentially unconstrained in their contribution, 2) contributors indicating that they were constrained primarily by information, and 3) noncontributors indicating that information was their primary reason for not contributing. The choice of category was hypothesized to be a function of information, which was measured by the three proxies for information. For reasons discussed earlier, only "aware" contributors and noncontributors were included in this statistical model--no data was collected for hypothetical contributors and noncontributors constrained primarily by information.

The results for this statistical model are presented in Table 5.23. The model does not demonstrate that there is a significant difference between the three categories, based on the proxies for information. Although the overall model statistics are significant, only the number of nongame wildlife-related publications received (PUBS) appears to significantly explain the difference between the three groups or the probability of choosing a category, based on the amount of information possessed by the respondent. Further, the summary of model predictions versus the data shows that the model always predicts a dependent variable value of one, which is equivalent to making a contribution constrained by information. This result is not surprising, given the distribution of the actual data, which is heavily

**Table 5.23 Summary of Statistical Model Results:
Multinomial Ordered Logit Models:
Respondents Indicating That Information Was
the Primary Constraint on Their Contribution,
as a Function of Proxies for Information**

1. Model Statistics:

Model Chi-Squared, 3 d.f. = 10.46 (P = 0.0151)

Model Log-Likelihood Ratio (R) = 0.172

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
INFO	0.1626	0.1021	2.54	0.111
PUBS	0.4082	0.1566	6.79	0.0092*
EDUC	0.1721	0.1592	1.17	0.280

3. Summary of Model Predictions Versus Data:

		Model		
		0	1	2
Data	0	0	10	0
	1	0	83	0
	2	0	15	0

4. Sample Size:

- N = 15 Contributors indicating that they were unconstrained (dependent variable = 2)
- 83 Contributors indicating that they were constrained primarily by information (dependent variable = 1)
- 10 Noncontributors citing information as the primary reason for not contributing (dependent variable = 0)

weighted towards this category. Because of the two problems just discussed, it cannot be stated that this statistical model confirms the hypotheses about respondents constrained primarily by information. That is, the statistical model does not do a good job of explaining this aspect of contribution behavior.

The next two statistical models are also multinomial ordered logit models, with dependent variables comprising three categories. In this case, the categories are: 1) contributors indicating that they were essentially unconstrained in their contribution, 2) contributors indicating that budget was the main constraint to their contribution, and 3) noncontributors indicating that budget was the main reason for their not contributing. The statistical models examine the choice of one of the three categories by a respondent as a function of his or her budget, measured by the proxies for budget. Two separate analyses were conducted. The first analysis included "aware" contributors and noncontributors. The second analysis included "hypothetical" contributors and noncontributors.

The results of the analysis using "aware" respondents are presented in Table 5.24. The model chi-squared is not significant at the 0.05 level. Therefore, the

Table 5.24 Summary of Statistical Model Results:
 Multinomial Ordered Logit Models:
 Respondents Indicating That Budget Constraint
 Was the Primary Constraint on Their
 Contribution, as a Function of Proxies for
 Budget. Actual Contribution Behavior: "Aware"
 Contributors and Noncontributors

1. Model Statistics:

Model Chi-squared, 3 d.f. = 8.13 (P = 0.434)

Likelihood ratio (R) = 0.098

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>P</u>
PCINC	0.00001469	0.00001914	0.59	0.443
REF	0.001785	0.001138	2.46	0.117
REFAT	-0.09011	0.4206	4.59	0.0321*

3. Summary of Model Predictions Versus Data:

		Model		
		0	1	2
Data	0	0	19	0
	1	0	164	0
	2	0	14	0

4. Sample Size:

- N = 14 Contributors indicating that they were unconstrained (dependent variable = 2)
- 164 Contributors indicating that they were constrained by budget (dependent variable = 1)
- 19 Noncontributors citing budget as the main reason for not contributing (dependent variable = 0)

null hypothesis of all parameters being equal to zero cannot be rejected. The summary of model predictions versus the data exhibits the same characteristics as the previous statistical model: the model always predicts the choice of the "middle" category, where the dependent variable is equal to one, implying a constrained contribution. The reason for this result may also be due, at least in part, to the predominance of this category of respondent in the actual data.

The results for the statistical model using hypothetical responses are in Table 5.25. This model performs better than the previous model, which used data based on actual behavior, that is for "aware" respondents. The model chi-squared statistic is significant at the 0.05 level. The author can suggest no reason why hypothetical responses are better explained by the proxies for budget than are "aware" responses. In this model, the attitude towards the refund is not a significant factor, perhaps because of the hypothetical nature of the response. However, the size of the refund appears to be important. As the refund increases, the probability that a respondent indicated that they would, hypothetically, contribute, either essentially unconstrained or constrained, increases. This result confirms the hypothesis about the size of refund. Income does not appear to be important factor for

Table 5.25 Summary of Statistical Model Results:
 Multinomial Ordered Logit Models: Respondents
 Indicating That Budget Constraint Was the Primary
 Constraint on Their Contribution, as a Function
 of Proxies for Budget. Hypothetical Contribution
 Behavior: Hypothetical Contributors and Non-
 contributors

1. Model Statistics:

Model Chi-squared, 3 d.f. = 10.27 (P = 0.0164)

Likelihood ratio (R) = 0.157

2. Summary of Parameter Estimates:

<u>Variable</u>	<u>_B</u>	<u>Std. Error</u>	<u>Chi-squared</u>	<u>_P</u>
PCINC	-0.00000774	0.000001639	0.22	0.6367
REF	0.004129	0.001679	6.04	0.0140*
REFAT	0.5831	0.4383	1.77	0.1834

3. Summary of Model Predictions Versus Data:

		Model		
		0	1	2
Data	0	21	20	0
	1	7	22	0
	2	0	10	0

4. Sample Size:

- N = 10 Indicated that they would be unconstrained contributors (dependent variable = 2)
- 39 Indicated that they would be contributors constrained by budget (dependent variable = 1)
- 41 Indicated that they would be noncontributors constrained by budget (dependent variable = 0)

hypothetical respondents. The summary of model predictions versus data shows that the predicted values for this model are closer to the original data, relative to the other two multinomial statistical models. Again, the distribution of the data, as well as the significance of the model statistics, could explain this result. The distribution of data is more even between categories in this model than in the previous two models.

CHAPTER 6. Conclusions

6.1 Caveats

Before drawing conclusions about the results of the survey, two caveats must be stated. First, the impossibility of making followup phone calls to nonrespondents to estimate response bias means that the respondents to the survey may not represent a truly random sample of the population of Virginia taxpayers, or of Virginians in general. If the sample is biased towards those interested in nongame wildlife, then an accurate picture of contributors and noncontributors may not have been obtained. Indeed, the results of the sample validation tests show that, with respect to income and education, the sample is biased, and the results of this study and previous studies indicate that people with higher educations and incomes are more likely to contribute and to contribute more [Applegate (1984), Applegate and Trout, (1984), Brown, et. al, (1986), Carothers and Knight, (1984), Cary, (1985), Manfredo and Haight, (1986)]. It may be that, if a more representative sample was obtained, income and information constraints

would have had different impacts on the contribution decision process than the results obtained in this study. Second, only tax refund recipients were surveyed. It is possible that these people differ from the general population of Virginia in some respects. Unfortunately, no information exists that would allow such a comparison. Therefore, the impact of this potential bias on the results of the study cannot be estimated. The author had no *a priori* reason to think that refund recipients would differ significantly from those who do not receive refunds in any respects that would affect the results of this study. Since there is no way to determine if this kind of bias exists, "refund recipient bias" is ignored in the discussion of the results.

6.2 Summary of Results of Survey and Statistical Models

This section presents conclusions with respect to the model of contribution behavior, the existence of free-riding and related behavior, and the use of tax checkoff programs to fund public goods.

6.2.1 The Model of Contribution Behavior

The model of contribution behavior developed in Chapter 2 appears to perform well in explaining behavior in an actual contribution situation; both the responses in each category of behavior and the statistical model results generally support the existence of multiple categories of contribution behavior. The questions, particularly questions 4 and 5, aimed at eliciting constraints to contribution show that several constraints may be acting on individuals simultaneously. For example, an individual indicating that his or her budget is the main constraint to the contribution may also feel that information is a constraint.

Another result that was particularly important was the number of contributors, 29.7 percent of all "aware" contributors, indicating that benefits derived from contributing to a cause was more important than nongame wildlife value. There are several implications of this result. First, people may derive a high degree of what Morrison (1971) calls "reform utility", and what this author has called "contribution utility" from voluntary contribution. Since this study involved contribution to nongame wildlife, which people may have perceived as being synonymous with endangered species, such utility could be important to some contributors. The large number of aware

contributors receiving primarily contribution utility may result from their having such perceptions. The extent of this phenomenon would no doubt depend on the good in question; for example, it is difficult to conceive of a group of people deriving such utility from contributing to the provision of roads. By comparison, contribution to bald eagle preservation or for housing for the homeless would likely contain a large component of contribution utility. In other words, a system based to an extent on voluntary donation may not work well for goods that do not generate "contribution" utility or inspire altruistic behavior.

Second, the existence of contribution utility means that the traditional idea of utility, which usually assumes that utility is derived from the consumption of a good, may have to be modified, in some cases, to include contribution utility. It is probable that contribution or "reform" utility derives, to some extent, from altruistic motivation, which in turn implies the inclusion of others' welfare into an individual's utility assessment or function. Contribution utility may also exist as "moral satisfaction", a good feeling derived from contribution to a cause. This definition is used by Kahneman and Knetsch (in press), who conclude that contribution utility both predicts and is a major component of willingness to pay for public goods.

Therefore, the utility derived from or willingness to pay for a public good may be determined by consumption as defined by neoclassical economic theory, but may also include altruistically-motivated "consumption". Finally, willingness to pay may be directly affected by individuals' perceptions about the nature of the process involved in producing a particular good, including the perceived "fairness" of the process. Thus, individuals may choose to protest vote, which is equivalent to giving a zero bid.

The results also suggest that a lack of awareness of the checkoff and a lack of information about the Virginia nongame wildlife program are important reasons for non-contribution. This lack of awareness could be due to individuals not seeing the checkoff line on the tax form, or to their not being informed of the existence of the checkoff by professional tax preparers. The latter factor could be important, since many individuals have a tax professional prepare their return. For example, Manfredo and Haight (1986) found that 28 percent of contributors in Oregon had someone else complete their tax return; the comparable figure for noncontributors was 58 percent. Also, several studies have reported that tax professionals were an important source of information about the existence of nongame wildlife tax checkoffs. The studies by Moss and Fraser (1984, Virginia), Cary (1985, Wisconsin), and Brown

et al. (1986, New York) found that around 11 to 19 percent of contributors found out about the checkoff from a tax professional.

The lack of information about the checkoff and about the use of funds for nongame wildlife management may imply that the assurance problem, that is, concern over the use of donated funds and/or the contributions of others, is also important. Finally, economic rationality factors, such as utility and budget constraint, affect the contribution decision. The traditional theory of consumption appears to play an important role in the decision whether to contribute, since the level of utility, income, amount of tax refund, and opportunity costs all played a role in certain aspects of the contribution decision.

The revelation of protest voting behavior on the part of a number of respondents is an important finding. This result suggests that the institutional setting and, possibly, the perception of the "fairness" of the funding process are important factors in the contribution decision. Sagoff (1988) discusses this aspect of behavior. One of his conclusions is that neoclassical economic factors alone do not explain peoples' valuation of the environment. He states that: "citizens may believe that environmental resources should be allocated on normative, political, and

cultural grounds, which citizens can understand, rather than on an efficiency principle, which may appeal to no one but the economists who invented it" [p. 62]. Protest voting, then may be a rejection of, or a zero bid on the value of the allocation process. It is also possible that contribution utility may, for some individuals, include value derived from having confidence in the political process. In a sense, contributing on the basis of contribution utility could represent a positive "vote" for the political process, or confidence in the justice of the process by which public funds are collected and allocated.

In summary, it may be that the decision to contribute in this case is similar to any other consumption decision with the addition that "contribution" utility and/or altruism enters into certain persons' utility assessments, information is not perfect and may be very important in the decision to contribute, and institutional and/or vehicle factors are important.

6.2.2 Free-Riding Behavior

The results of the survey do not support the existence of either strong free riding or non voting. The low numbers of responses to the questions designed to reveal such behavior (1 out of 52 "aware" noncontributors, 6 out of 112

"hypothetical" noncontributors) imply that far less free riding is occurring than economic theory would suggest. The strong free rider hypothesis suggests that no contributions will be made to the provision of a public good in a voluntary situation. This result suggests that other kinds of behavior may be occurring, which dominate or replace an individual's inclination to free ride. Therefore, the conclusion drawn by the self-interest model of voluntary behavior is not supported by this study. It is impossible, however, to say that the results absolutely refute the hypothesis, since it is possible that people may not reveal such behavior. Also, the study pertains to a particular good: nongame wildlife. It is possible that a similar study would find free-riding behavior with respect to the provision of some other good, such as voluntary funding of public highways. Further, the institutional situation will likely differ among specific contribution situations. However, this study does confirm the results of many previous studies, most of which were based on hypothetical markets, which refute the strong free-rider hypothesis, while most support the "weak" free rider hypothesis. It is, however, difficult to determine if weak free-riding is in fact occurring, and if so, whether it is a purely behavioral phenomenon, or if it relates in some way to the level of information or budget. In this study, weak free riders

indicated that such factors were important to the contribution decision.

Finally, the fact that contribution utility is important in explaining the decision to contribute in many cases, 157 of 535 "aware" contributors, means that traditional economic theory may not be a good model of behavior with respect to the provision of many public goods, and that free riding may be even less likely to occur with voluntary contribution to public goods than others. It is only possible to free ride on utility derived from use, or related values, such as existence value, of goods; one cannot free ride on contribution utility, even in the "weak" sense, since it is derived from the act of contribution. This conclusion is particularly important with respect to voluntary contribution to the provision of goods from which contribution utility can be derived, such as nongame wildlife.

In conclusion, the results of this study suggest that, at least, a modification of the traditional neoclassical economic theory is needed in order to adequately and accurately explain the behavior of individuals with respect to funding public goods. The assumptions of the traditional theory appear to be supported to the extent that income and good utility factors are important to the decision to

contribute, and that weak free riding appears to be occurring. However, as was just discussed, the phenomenon of weak free riding needs to be examined in more detail, in order to determine if it is a purely behavioral, i.e. self-interested, behavior, or if it relates more to assurance and information.

Implications for Non-Market Valuation Techniques

The results of this study have implications for the theory and use of contingent valuation surveys for nonmarket valuation. Briefly, contingent valuation (CV) is a survey-based method for estimating willingness to pay (or marginal benefits) for goods and services. The technique has been widely applied to the valuation of so-called "non-market" goods, such as wildlife. CV studies usually ask respondents to make bids that reflect their monetary valuation of some good, or of some change in the level of consumption of some good. The term "contingent" is used, since the market situation presented to the respondent is hypothetical.

One concern with the results obtained from such studies is that what people state in a hypothetical, CV, situation may be quite different from what they would do in an actual situation. People might also engage in strategic behavior.

The results of this study indicate that this concern may be legitimate. The fact that a small percentage of eligible people actually contributed, around three percent, while a large percentage of those previously unaware of the checkoff said that they would in fact contribute, around 58 percent, places doubt on the veracity of such hypothetical statements. Of course, the three percent figure must be interpreted in light of the fact that there is a low level of awareness of the checkoff. Nevertheless, this result, if it is significant, is important since it is just such hypothetical statements that form the basis of CV studies.

Finally, the importance of contribution utility to the decision to contribute on the part of a significant number of contributors in this study lends support to the conclusions reached by Kahneman and Knetsch (in press). Their study found that willingness to pay for a variety of public goods, including nongame wildlife and environmental quality and social causes, such as museums and breast cancer research, was predicted by independent measures of "moral satisfaction" derived from contributing to these goods and causes. Specifically, bids made by respondents in CV studies may reflect contribution utility instead of or in addition to the economic value of the goods in question. The implications are that, if the existence of contribution utility is ignored, then CV studies may be measuring utility

other than what is intended and/or the results obtained could be biased if only good utility is measured.

Also, this study lends support to the idea that protest voting is an important aspect of contribution behavior. Sagoff (1988) argues that protest votes reflect true zero bids (not strategic behavior), and that they should be treated as such. In CV studies, protest votes are often discarded as outliers or biased responses. If such bids are excluded, the estimates of willingness to pay may be overestimated. Again, such bids may reflect a zero value for the process of funding a good, or for the institutions involved with funding and/or provision, not necessarily for the good per se.

6.2.3 Some Institutional Implications

Conclusions about human behavior drawn from a single study in a particular institutional setting cannot be construed to apply to behavior in general over a wide variety of situations, and for a variety of goods. However, some important conclusions can be offered, assuming that the results of the study represent actual behavior. If strong free riding behavior is limited to an insignificant number of people, and if information is a major constraint to contributing, then the opportunity may exist for

increased use of voluntary funding of public goods, particularly if the government, or other provider, provides information pertinent to decision making by potential contributors. The provision of information would lead to increased awareness of the good and/or program in question, would decrease the transaction costs of contributing, and would probably improve the assurance situation, at least with respect to provision of the public good. As an example, several checkoffs for public goods might be used. Such a system would, in the author's opinion, be more just than the mandatory system of taxation currently in place, particularly since taxation creates both weak free riders and unwilling riders. It is possible, however, that the costs of administering such a system could be higher than for the current system of taxation. Also, the occurrence of weak free riding, if it is significant, could imply that some form of compulsory taxation is needed. Further, income redistribution, which is possible through the use of progressive taxation, would not be possible with a voluntary system. Therefore, a voluntary system, while it could be used, may not be socially acceptable if a guaranteed redistribution of income is desired. The only way to test such a system would be to apply it, in a sense, to experiment. As such, the nongame wildlife tax checkoff

programs may represent an experiment in alternative funding for a public good.

6.2.4 Tax Checkoff Programs

Several conclusions can be drawn with regard to the Virginia nongame wildlife tax checkoff program. First, an unanticipated result occurred with respect to the institutional setting in Virginia at the time of the study. A number of contributors and noncontributors indicated that the checkoff was inappropriate since the state had a budget surplus at the time.¹ Some said that, given this fact plus the perceived importance of nongame wildlife, the checkoff amounted to "begging" for money when the program should be a part of the budgetary process. Some indicated that they were contributing only because they correctly believed that contributions were the only way to fund nongame or endangered species programs in Virginia. Given the current budget deficit in the state, it would be interesting to see if more people would now contribute.

1. The state had a budget surplus of \$78 million in 1987, \$33.4 million in 1988. This study was conducted in 1988. These figures stand in sharp contrast to the comparable figures when the checkoff program was instituted. From 1979 to 1980, the budget deficit in Virginia grew from \$3.2 million to \$50.2 million, was \$107 million in 1981, and 176.3 million in 1982. (Data, Commonwealth of Virginia, 1988).

Many respondents were noncontributors due to a lack of awareness of the checkoff program. Also, a number of contributors indicated that information was a constraint to their contribution. In conversations with officials in the Virginia Department of Game and Inland Fisheries, the author was told that the information and public relations budget for nongame programs was, in their opinion, inadequate. From the standpoint of these managers, it would be important to know how information reaches potential contributors. While this information was not collected in the survey, other studies, such as the ones discussed in Chapter 3, have examined the sources of contributors' information, including Moss and Frazier's (1984) study of Virginia's checkoff program. Based on some survey responses and conversations with public managers and colleagues, the author believes that the checkoff suffers from both lack of visibility on the tax form and from wording that probably reduces contributions. For example, other checkoffs use terms such as "endangered" to describe their programs. The term "endangered" may be an easier one to which the public can relate, and it expresses some urgency. This aspect of checkoffs would be useful to study.

Some problems specific to this survey included the difficulty in designing a set of questions that would effectively distinguish hypothetical responses for people

who felt that they were constrained by information from "weak" free riders. Similarly, since information about the checkoff was given to hypothetical contributors, the role of information could not be easily distinguished, as opposed to, say budget constraints. Therefore, the impact of information possessed by potential contributors to the checkoff on their (admittedly hypothetical) contribution decision, including specific factors such as publications received, and exposure to different media, was not estimated. Such information would be useful to the Virginia Department of Game and Inland Fisheries, particularly for publicity purposes.

A number of respondents expressed concern over government use of tax money. Question 17A, which was designed to elicit attitudes about nongame wildlife, produced an unanticipated result from some respondents. In the question, tax increases and price increases were presented as being the same. The exact wording was: "Air and water quality should be improved, even if it means paying higher taxes or higher prices for goods". However, several people marked out "increased taxes" or commented on that aspect, but left "increased prices" as written. It appears that some people are protesting against taxes, but not against paying more for wildlife conservation. Thus, the relationship between attitudes about the good in

question and the vehicle for providing that good is an important factor in understanding contribution behavior. This relationship is illustrated by the existence of a considerable number of protest voters, 14 of 52 "aware" noncontributors, 40 of 112 "hypothetical" noncontributors. These people are probably not free riding, and they may not be making any assessment based on the usual definition of economic rationality, that is utility maximization constrained by budget. Thus, it is important to note that observed non-contribution may not indicate free riding behavior.

Based on the results of this study, as well as an examination of the literature on contribution behavior and the history of tax checkoff results, the author would recommend the following with respect to the Virginia nongame wildlife tax checkoff program:

1. To enhance revenues, change the wording on the tax form to reflect the use of money for endangered species.
2. Provide the potential contributors with information about the checkoff, the costs of provision, the budget situation, and the progress of contributions each year.
3. Allow contributors to increase their tax payment as well as decreasing their refund, as a means to contribute.
4. Provide incentives, such as premiums, to contribute that people would be aware of at the time of contributing.

6.3 Recommendations for Future Studies

Several recommendations can be made based on the results of this study with regard to future studies involving surveys. A particularly important result was the difference in response rate between contributors and noncontributors. The low response rate for noncontributors, plus the small number of responses for aware noncontributors (one third of noncontributors), made it impossible to test several hypotheses about this group of people. In order to receive a roughly equal number of responses from these two categories of respondents, noncontributors should make up two thirds of the sample. A third mailing of surveys would probably have increased the sample size as well.

It would be interesting to repeat this study under different institutional conditions. The two conditions that are most relevant to this study are the deficit/surplus situation in Virginia, which was discussed earlier, and the addition of other checkoffs to the Virginia tax form. At the time of the survey, Virginia had a considerable budget surplus. It was noted that Virginia is now facing a budget deficit, creating an opportunity for studying contributions to the tax checkoff under a different set of circumstances. Unfortunately, the study could not be replicated in Virginia under the same conditions, save the

budget situation, since three additional checkoffs were introduced in the year following this study.

The introduction of these other checkoffs, however, presents an opportunity for another kind of study. The question is whether total contributions would rise given the new checkoffs, or if the amount given would remain constant, and would simply be distributed among the checkoffs. The result of such a study would say much about the nature and extent of charitable giving, in the context of state tax checkoffs. Several authors have noted decreases in the amount given to nongame wildlife tax checkoffs when other checkoffs were added. In a study noted by Harpman (1984), contributions in Idaho (1982) decreased with the addition of an Olympics checkoff. However, in terms of overall charitable giving, people tended to contribute to both: on average, people who contributed \$1 to the Olympics checkoff gave \$0.69 to the nongame wildlife checkoff. This result lends support to the idea that individuals receive contribution utility. Applegate and Trout (1984), in a study of a number of states, reported an average decrease in contributions to nongame wildlife checkoffs of about \$100,000 when another checkoff was added. Vickerman (1989) reported an average decrease of 16.4 percent for all states that added one or more checkoffs to the nongame checkoff, under the same circumstances.

In Virginia, with the addition of three more checkoff opportunities, preliminary results for taxable year 1988 indicate that total giving increased over the previous year, but giving for the nongame wildlife program decreased. These preliminary results are as follows:

Total contributions:

Taxable Year 1987:

Nongame program:	\$502,802
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Taxable Year 1988:

Nongame program:	\$421,921
U.S. Olympic Committee:	93,153
Housing for homeless:	170,107
Natural areas acquisition:	<u>94,108</u>
Total, taxable year 1988:	\$779,289
In 1987 dollars:	749,500

The total given for all checkoffs for 1988 is larger than that for 1987. Without further information on changes in incomes, changes in levels of refunds, and impacts of tax law changes, it is impossible to determine exactly how much of this increase is due to increased giving due to altruism and related behavior. However, it appears that with more opportunities to receive contribution utility, the total level of contributions increased. It is possible that the decrease in contributions to the nongame wildlife tax

checkoff were due primarily to individuals diverting some of their contributions to the natural areas acquisition fund, which is conceptually close to the nongame fund. If that is the case, contributions to the nongame and natural areas funds increased.

Finally, what if the checkoff system were changed to allow anyone to contribute, and not just those with tax refunds? The addition of people who owe money to those receiving refunds could significantly increase the total level of contributions. In discussions with the author, Virginia officials expressed concern for the continuation of checkoff programs that allow contribution only by refund recipients. It is possible that the federal and state governments will move to eliminate most tax refunds. Some officials believe that this change will occur within ten years. If this change occurs, then the provision of mechanisms by which people can increase their taxes could be particularly important. Likewise, a more important role may be played by direct mail-in contributions, implying a greater need for public information campaigns. Obviously, a funding alternative is to include nongame wildlife programs in the general budget process.

The point just made brings out another aspect that might be interesting to study: are refund recipients

different in some way from those who owe money on their taxes? Such information would be useful both for interpreting the results of this study, since any bias this difference is causing is unknown, as well as estimating the impact of changing the tax checkoff format to allow contribution by people who owe tax money, since their likelihood of contribution might be estimated in comparison to refund recipients. The results of this study as well as future studies might also benefit from having actual data on individual respondents' incomes, refunds, and contributions.

The role of information and assurance in contribution should be examined in detail, particularly with respect to how individuals form expectations about the results of their contribution. This study would have benefited from the inclusion of questions aimed at examining the assurance factor, particularly since a number of respondents indicated a lack of information as to what use would be made of their contributions. However, if such questions had been included, the survey would have been so long that most people probably would not have returned it. A further examination of the role of information in the contribution decision would be useful, and might include several factors. First, how people find out about the checkoff would be useful, particularly to the agency in receiving the funds.

Second, the relative importance of information and economic rationality in making a contribution decision could be examined in detail. Such a study could shed light on the nature of "weak" free riding, particularly whether this phenomenon is mainly behavioral, as neoclassical theory would suggest, or if it relates more to the information possessed by the individual, or the assurance of provision of the good. Finally, the relative importance of information as a determinant of both good and contribution utility versus a transaction cost of contributing could be examined. More specifically, the impacts of information provided by the agency, for example, a nongame wildlife department, would be useful for the agency to know.

Another factor worth examining is the role of learning or experience in contributing to a checkoff program. Evidence for the importance of experience with respect to the nongame program was provided earlier: the level of contributions to the nongame program decreased only slightly or, in a sense, not at all if the contributions were merely split between the nongame and natural areas acquisition programs, when other checkoffs were added. This result implies that experience or, perhaps, loyalty, was an important factor in individuals' decisions to contribute to the nongame program versus the new checkoffs. The experience factor could be treated as an information

problem, where people update their information, from year to year, on the checkoff, the good in question, and the provider of the good. The role of assurance could be treated in a similar way, since peoples' perceptions are likely to change over time. Such a study should address assurance with respect to the likelihood of others' contributions as well as the provision of the good or service by the provider. Finally, the role of reference groups in the decision to contribute should be examined. Contributions may be affected by membership in environmental and wildlife organizations and might be increased if efforts were made to elicit contributions through such groups.

In summary, in order to provide a clearer understanding of voluntary contribution to the funding of public goods in general, and tax checkoff programs specifically, additional studies could focus on one or more of the following:

1. The assurance problem (including expectations about others' contributions and about the provision of the good).
2. The role of learning and experience.
3. A detailed examination of information: provision cost, updates of contributions, budget, and the transaction costs of contributing.
4. The impact of other checkoffs on the total amount contributed, as well as on the amount contributed to the nongame wildlife tax checkoff.
5. The impact of incentives on contribution.

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**Appendix A. Discussion of the Optimal Level of Contribution,
Constrained by Budget**

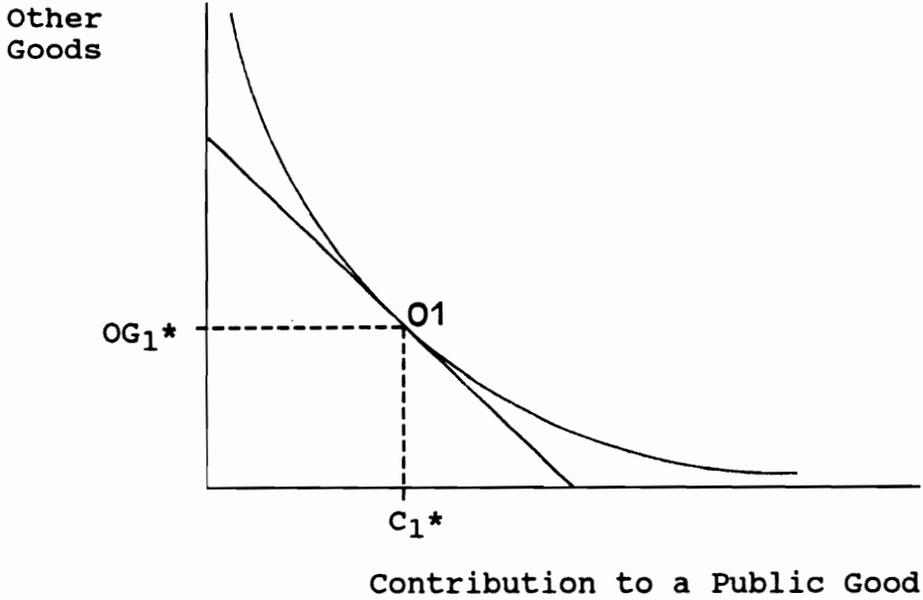
This discussion provides a more detailed examination of the concepts related to budget constraints and the level of contribution that were presented in Chapter 2. In summary, three categories of contributors and noncontributors were offered, based on their budget constraint:

1. Contributors, essentially not constrained by their need for a subsistence income.
2. Contributors, constrained by their need for a subsistence income.
3. Noncontributors, constrained by their need for a subsistence income such that their contribution is zero.

The discussion uses the neoclassical economic concept of maximization of utility subject to a budget constraint as the basis for analyzing the above categories.

A neoclassical economic representation of the optimal level of contribution to a public good versus consumption of other goods, where income (or budget) changes is shown in Figure A1. The discussion assumes that an individual contributes if it is optimal for them to do so and that there is no free riding. The first graph (A1.1) shows the optimal level of total consumption for an individual, for contribution to a public good and for all other goods. The optimal level of consumption is the tangency, point O1, between the indifference curve for contribution versus all other goods, and the individual's

A1.1. Initial Position



A1.2. Increase in Income

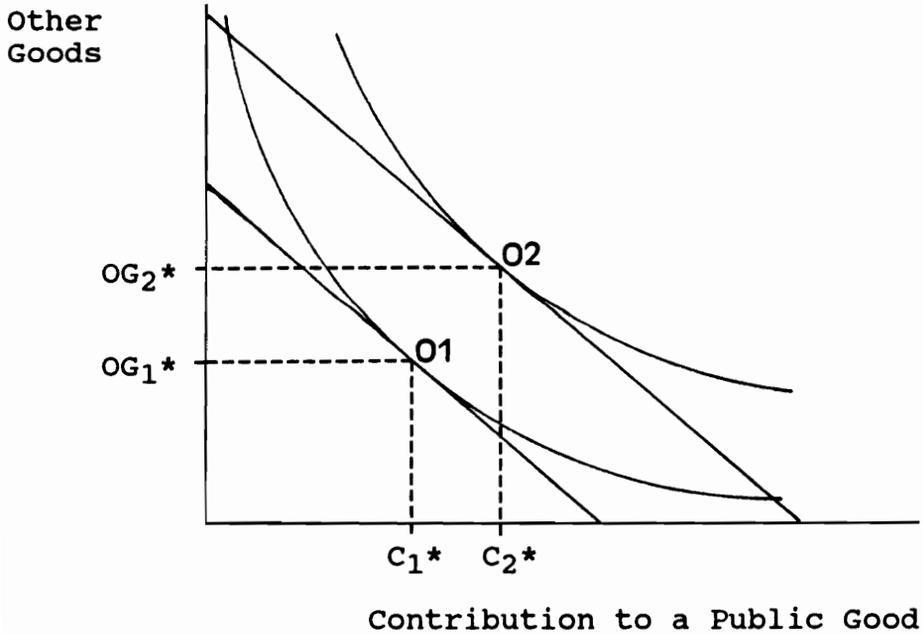
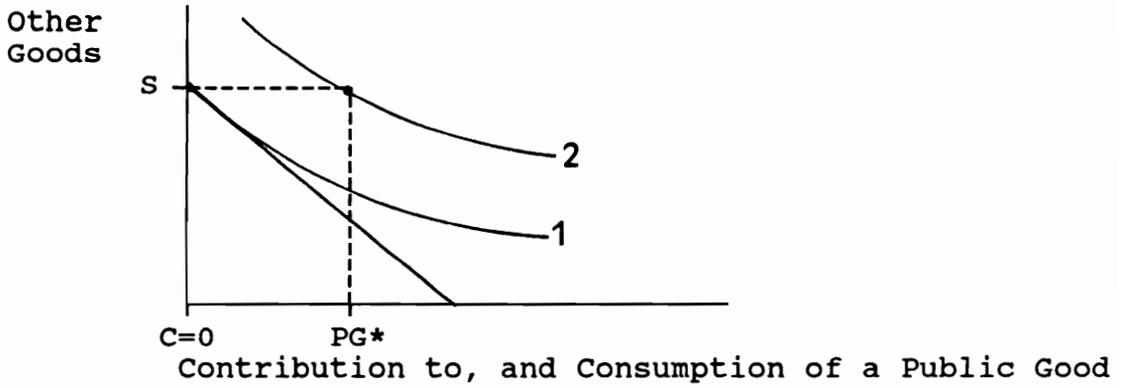


Figure A1. Optimal Level of Consumption: Contribution to the Funding of a Public Good Versus Other Goods. A1.1 Initial position. A1.2 Increase in income, allowing increased consumption.

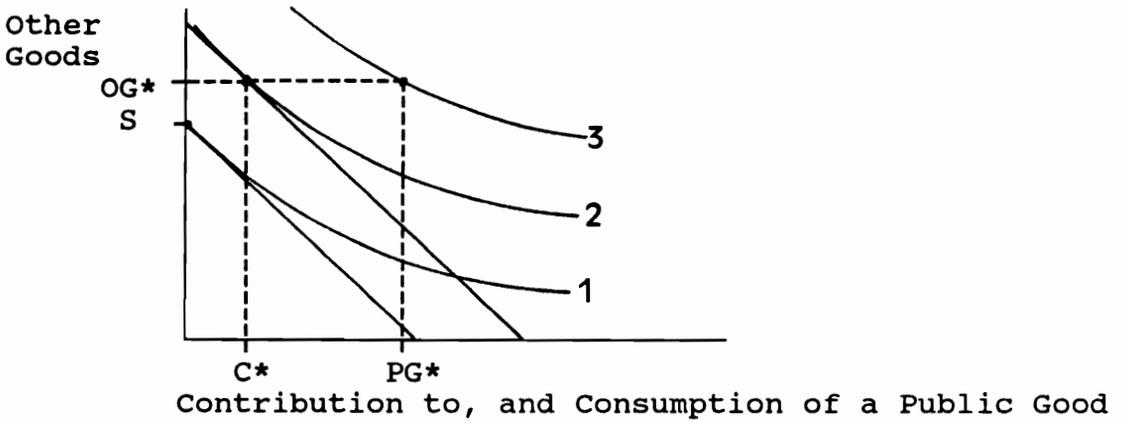
budget constraint (budget being equal to income). The second graph (A1.2) shows the effect of increasing income. The budget constraint shifts outward, allowing greater consumption of both contributions and all other goods (point O2). This representation of a change in the budget constraint shows only one of several different ways in which the level of consumption could change. Other new optimum levels could occur, resulting in different levels of consumption of both contribution to public goods and all other goods, depending on the size of the change in income, the relative "prices" of goods and contribution, and the shape of the indifference curve.

Next, assume that an individual has some basic level of income needed to support him or her, what will be referred to as a subsistence level of income. An individual's income may be less than, equal to, or greater than the subsistence level. If an individual's income is less than or equal to the subsistence level, no contribution is likely to be made, since that individual's income will be required for basic personal needs. This situation assumes, of course, that contribution to a public good is not a basic personal need. If an individual's income is greater than the level of income required for subsistence, then a contribution can be made. This concept is illustrated in Figure A2. Three

A2.1 Individual's Income Equals Subsistence Level



A2.2 Individual's Income is Above Subsistence Level



A2.3 Individual's Income is Well Above Subsistence Level

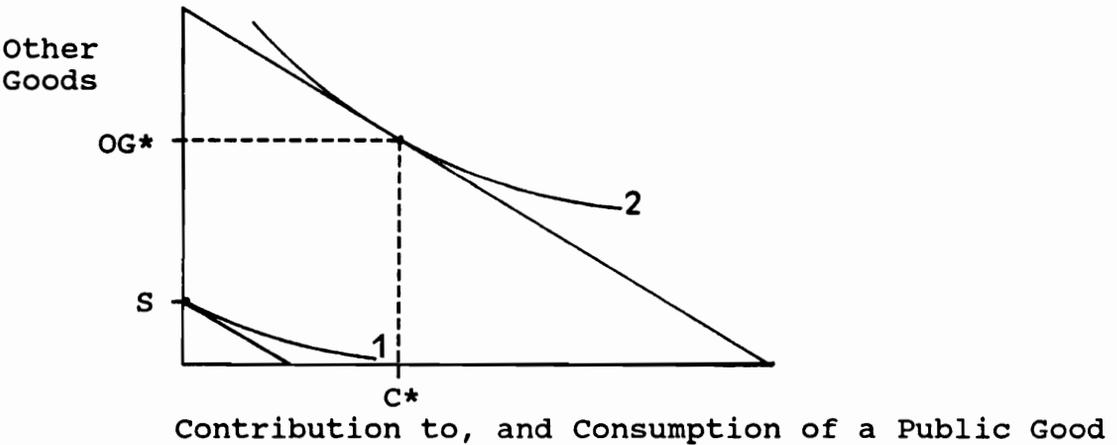


Figure A2. Graphical Representation of Contribution to the Funding of Public Good, Constrained By Budget.

figures are presented, each representing a similar situation to that shown in Figure A1.1. For each of the three figures, the **same** subsistence level of consumption of goods other than contribution to a public good is assumed (S); the scale of the graphs is different. In graph A2.1, the individual's income is equal to the subsistence level of income, therefore no contribution is made. The individual might be expected to derive utility at a level represented by indifference curve 1. However, assuming that the public good is provided, and given the intrinsic nature of a public good, the individual still consumes some of the public good. Thus the actual optimum level of consumption is reflected by indifference curve 2, and a level of consumption of the public good equal to PG^* . This is not free riding behavior, since the individual's willingness to pay is constrained to be zero. It is the intrinsic nature of public goods consumption that allows the individual to move to a higher indifference level, and to consume PG^* .

In graph A2.2, the individual's income is marginally greater than the subsistence level, but he or she has the ability to make a contribution. The optimal level of consumption is represented by the tangency of the budget line with the indifference curve, resulting in a level of contribution of C^* and a level of consumption of other goods of OG^* . The increase in income allows the individual to

move from the level of total utility represented by indifference curve 1 to the level of total utility represented by indifference curve 2. For an individual who contributes, the level of contribution could equal the level of consumption of the public good ($C^* = PG^*$). However, as in Figure A2.1, the individual might be able to reach an even higher indifference curve if actual consumption of the public good is greater than the level of contribution, C^* . This possibility is represented as point PG^* and indifference curve 3 in Figure A2.2.

In graph A2.3, an individual with an income that is large relative to the subsistence level is shown. This individual has a larger level of contribution and consumption of other goods than does the individual represented in A2.2. Otherwise, this situation is identical to that described in the previous graph. Again, the individual could have a higher level of utility for the public good than C^* .

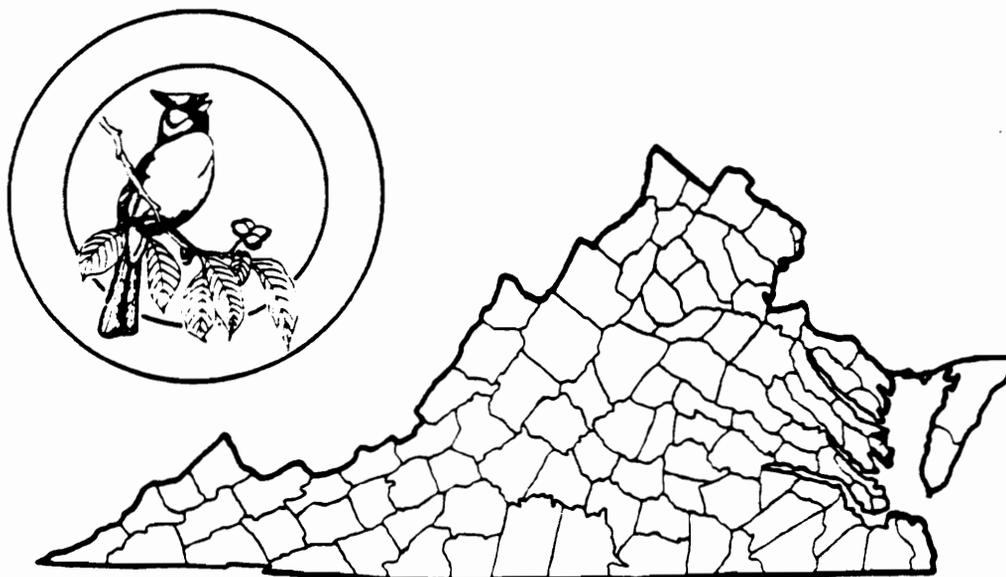
These three graphs illustrate the three categories listed earlier. An individual whose income is equal to or less than the subsistence level of income is constrained such that his or her contribution is zero. An individual whose income is greater than the subsistence level of income will probably contribute, but will be constrained by their

budget. Finally an individual whose income is far greater than the subsistence level of income will be likely to contribute for the same reason. However, given the large size of such an individual's income relative to the subsistence level, such an individual is "essentially unconstrained" in the contribution decision. It should be noted that an individual who is living above the subsistence level, but who gives an amount less than that indicated by the tangency between the budget constraint and the indifference curve, C^* in graph A2.2 and A2.3, is a weak free rider. An individual who contributes nothing in the same situation is a strong free rider.

Appendix B. Survey Instrument and Data Coding

I. Survey Instrument

VIRGINIA NONGAME WILDLIFE: A SURVEY



This survey is designed to determine how the citizens of Virginia feel about nongame wildlife and the Virginia nongame wildlife tax checkoff fund. All information is strictly confidential. If you wish to comment on any questions or express additional opinions, please feel free to use the space in the margins. Your comments will be taken into account.

Thank you very much for your help and effort.

Department of Agricultural Economics
Virginia Tech
Blacksburg, Virginia 24061

1. Did you contribute part of your Virginia state tax refund to the Nongame Wildlife Fund? If you did, you would have checked line 24A (Authorized Deductions from Overpayment: Virginia Nongame Wildlife Program Contribution) on your Virginia state tax form. You also would have received a thank-you letter:

- A. Yes
 B. No

** IF YOU ANSWERED "YES" TO QUESTION 1, THEN PLEASE GO ON TO QUESTION 2 **

** IF YOU ANSWERED "NO" TO QUESTION 1, THEN PLEASE GO ON TO QUESTION 6 (QUESTIONS 2, 3, 4, AND 5 SHOULD BE ANSWERED ONLY IF YOU CONTRIBUTED TO THE CHECKOFF) ***

2. What was the amount of your contribution to the Nongame Wildlife Fund? (Available from the tax form, or from your thank-you letter):

- A. The exact amount (from the tax form or letter) was: \$ _____
 B. I do not know the exact amount, but it was approximately:
 \$1-\$3 \$4-\$6 \$7-\$9 \$10-\$12
 \$13-\$15 \$16-\$18 \$19-\$21 \$22-\$24
 \$25-\$29 \$30-34 \$35-\$39 \$40 or more
 C. I do not remember

3. Which most nearly describes your reasons for contributing to the checkoff fund? (choose one):

- A. Nongame wildlife is important to me.
 B. It is a good cause.

** IF YOU ANSWERED "A." TO QUESTION 3, THEN PLEASE GO ON TO QUESTION 4 **

** IF YOU ANSWERED "B." TO QUESTION 3, THEN PLEASE GO ON TO QUESTION 5 **

**** PLEASE ANSWER QUESTION 4 ONLY IF YOU ANSWERED "A" TO QUESTION 3 ****

4. Which of the following best describes your contribution (choose only one):
- A. _____ I contributed a few dollars, and was not thinking of exactly how much Virginia nongame wildlife was worth to me over the last year.
 - B. _____ I contributed a few dollars, and might have contributed more if I had a better idea of what the tax checkoff or nongame wildlife is.
 - C. _____ I was thinking of how much Virginia nongame wildlife was worth to me over the last year and gave an amount that approximately reflects that worth.
 - D. _____ I was thinking of how much Virginia nongame was worth to me over the last year, but gave less than that amount because of the small size of my refund, or because I had other important uses for my refund.

**** PLEASE GO ON TO QUESTION 5 ****

Next, we would like to ask you if you might be inclined to change your level of contribution, if conditions changed.

5. Please indicate how you might change your contribution to the tax checkoff if the following situations occurred (Please answer A through C):

	Then my contribution would be:		
	Larger	Smaller	No Change
A. If my refund were larger	_____	_____	_____
B. If I did not need most of my refund for other uses	_____	_____	_____
C. If I had more information about what my contribution will be used for	_____	_____	_____

**** PLEASE GO ON TO QUESTION 9 (QUESTIONS 6, 7, AND 8 SHOULD BE ANSWERED ONLY IF YOU DID NOT CONTRIBUTE TO THE CHECKOFF) ****

** PLEASE ANSWER QUESTION 6 ONLY IF YOU ANSWERED "NO" TO QUESTION 1 **

6. Were you aware of the existence of the Virginia nongame wildlife tax checkoff program before receiving this survey?

- A. _____ Yes
 B. _____ No
 C. _____ Don't Remember

** IF YOU ANSWERED "NO" OR "DON'T REMEMBER" TO QUESTION 6, PLEASE GO TO QUESTION 8 ON THE NEXT PAGE **

** IF YOU ANSWERED "YES" TO QUESTION 6, PLEASE ANSWER THE FOLLOWING QUESTION:

7. What is the major reason why you did not contribute to the nongame tax checkoff fund (please check only one from the following list):

A. _____ I do not value nongame wildlife.

I value nongame wildlife, but:

B. _____ Since the checkoff is voluntary, I do not need to contribute to it.

C. _____ Since I am one person out of many in Virginia, my contributing to the checkoff will not really make a difference.

D. _____ I am not satisfied with the performance of the Virginia state government, or with Virginia wildlife programs.

E. _____ I need my tax refund for other uses.

F. _____ I knew very little about the tax checkoff program, so I did not contribute

G. _____ I do not believe that voluntary contributions to government programs should be collected by checkoff programs

** PLEASE GO ON TO QUESTION 9. SKIP QUESTION 8 ON THE NEXT PAGE **

**** PLEASE ANSWER QUESTION 8 ONLY IF YOU ANSWERED "NO" OR "DON'T REMEMBER" TO QUESTION 6 ****

8. Could you please tell us whether or not you would contribute to the Virginia nongame tax checkoff and why, given the following information:

Nongame wildlife includes any species of animal not hunted, fished, or trapped. Some examples include songbirds and endangered species such as the bald eagle. The Virginia Non-Game Checkoff Program funds the research and management of nongame wildlife in Virginia. If you receive a tax refund, you may designate that some or all of it go to the nongame fund. There is a space near the bottom of the Virginia state tax form for this purpose.

Which of the following best describes what you would be likely to do, based on what your tax refund situation was this year (please check whether you would or would not contribute, then check the reason for your decision. Decide whether you would or would not contribute and check only one of the reasons):

_____ I would contribute:

- A. _____ an amount that I think approximates the value to me of nongame wildlife in Virginia over the last year
- B. _____ a few dollars because my refund was very small
- C. _____ a few dollars because I have other uses for my refund that are more important to me
- D. _____ a few dollars because the checkoff seems like a good cause

_____ I would not contribute:

- A. _____ because I have other uses for my refund
- B. _____ because my one contribution is not likely to make a difference
- C. _____ because the checkoff is voluntary and I don't need need to contribute
- D. _____ because I do not value nongame wildlife
- E. _____ because I am dissatisfied with the Virginia state government or with Virginia wildlife programs
- F. _____ because I do not believe that voluntary contributions to government programs should be collected in this way

**** PLEASE GO ON TO QUESTION 9 ON THE NEXT PAGE ****

Next, we would like to ask about some environmental, wildlife and news activities:

9. The following is a list of outdoor, wildlife, natural history, and environmental publications. Please check which ones you receive:

- | | | | |
|-----------------------------|-------------------|-----------------------------|-------------------------|
| A. <input type="checkbox"/> | Field and Stream | H. <input type="checkbox"/> | Ranger Rick |
| B. <input type="checkbox"/> | Outdoor Life | I. <input type="checkbox"/> | Audubon |
| C. <input type="checkbox"/> | American Hunter | J. <input type="checkbox"/> | Natural History |
| D. <input type="checkbox"/> | Ducks Unlimited | K. <input type="checkbox"/> | National Geographic |
| E. <input type="checkbox"/> | National Wildlife | L. <input type="checkbox"/> | Sierra |
| F. <input type="checkbox"/> | Virginia Wildlife | M. <input type="checkbox"/> | Nature Conservancy News |
| G. <input type="checkbox"/> | Sports Afield | N. <input type="checkbox"/> | Outside |

Other (please list): _____

10. How often do you read a newspaper?

- A. Never
 B. Less than once a week
 C. Once a week
 D. More than once a week
 E. Every day

11. How often do you watch television news programs?

- A. Never
 B. Less than once a week
 C. Once a week
 D. More than once a week
 E. Every day

12. How often do you watch public television (PBS) or listen to public radio (NPR)?

- A. Never
 B. Less than once a week
 C. Once a week
 D. More than once a week
 E. Every day

13. About how many times a week do you watch nature or wildlife programs on TV? (for example, on PBS or the DISCOVERY channel):
- A. _____ Never
 - B. _____ Less than once a week
 - C. _____ Once a week
 - D. _____ More than once a week
 - E. _____ Every day

Now, would you please indicate how important different aspects of wildlife are to you.

14. The following includes some reasons why nongame wildlife might be valuable. Please indicate if you agree or disagree that the following are important or valuable to you. If you are a "user" (viewer, photographer, feeder, etc.) of nongame wildlife, please answer both A and B. If you are not a "user" of nongame wildlife, please answer only B.
- A. I am a "user" of nongame wildlife (viewing, photography, feeding, etc.). I would be willing to pay money to ensure that I can continue to "use" nongame wildlife in the future:
- | | | | | |
|--------------------------|--------------|--------------------------------------|-----------------|-----------------------------|
| <u>Strongly</u>
Agree | <u>Agree</u> | <u>Neither Agree</u>
Nor Disagree | <u>Disagree</u> | <u>Strongly</u>
Disagree |
|--------------------------|--------------|--------------------------------------|-----------------|-----------------------------|
- B. Whether or not I am a "user" of nongame wildlife (viewer, photographer, feeder, etc.), I enjoy knowing that nongame wildlife exists and would be willing to pay money to ensure that it continues to exist, for now and for future generations:
- | | | | | |
|--------------------------|--------------|--------------------------------------|-----------------|-----------------------------|
| <u>Strongly</u>
Agree | <u>Agree</u> | <u>Neither Agree</u>
Nor Disagree | <u>Disagree</u> | <u>Strongly</u>
Disagree |
|--------------------------|--------------|--------------------------------------|-----------------|-----------------------------|

The next two questions concern the Virginia state tax refund:

15. How would you characterize your Virginia state tax refund this year? (Please check only one):
- A. Too small to be useful
 - B. Important; to be used like any other income
 - C. Not like income; to be used for something special
16. It would help us in our study if you could let us know what your Virginia state tax refund was last year:
- A. The exact amount (from tax form) was: \$ _____
 - B. I don't have the exact amount, but it was about:
 \$1-\$40 \$41-\$80 \$81-\$120 \$121-\$160
 \$161-\$200 \$201-\$240 \$241-\$280 \$281-\$320
 \$321-\$360 \$361-\$400 more than \$400
 - C. I did not receive a refund
 - D. I do not remember

Our next concern is with your feelings about several issues:

17. Please indicate whether or not you agree with the following
(Please answer A through D):

A. Air and water quality should be improved, even if it means paying higher taxes or higher prices for goods:

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
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B. Widespread use of pesticides in agriculture should be continued, even if there is some risk to wildlife:

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------------------	----------	----------------------

C. Economic growth and development should continue, even if it means that wildlife habitat is often converted to commercial uses:

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------------------	----------	----------------------

D. Endangered species should be preserved, even if it means that some major projects, such as dams or roads, are not built:

Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
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Finally, we would like to ask some questions about yourself to help us interpret the results.

18. How would you describe where you live:

A. City/Suburb/Town with population about:

<input type="checkbox"/> 100,000 or more	<input type="checkbox"/> 5,000 - 10,000
<input type="checkbox"/> 50,000 - 100,000	<input type="checkbox"/> 2,500 - 5,000
<input type="checkbox"/> 25,000 - 50,000	<input type="checkbox"/> 1,000 - 2,500
<input type="checkbox"/> 10,000 - 25,000	<input type="checkbox"/> less than 1,000

B. Rural:

19. What was the last grade or class in school that you completed?

A. <input type="checkbox"/> 8th grade or less	E. <input type="checkbox"/> grad of 2-year college
B. <input type="checkbox"/> Some high school	F. <input type="checkbox"/> grad of 4-year college
C. <input type="checkbox"/> Graduated high school	G. <input type="checkbox"/> Masters
D. <input type="checkbox"/> Some college	H. <input type="checkbox"/> Doctorate

20. What is your current age?

A. <input type="checkbox"/> under 20	E. <input type="checkbox"/> 35-39	I. <input type="checkbox"/> 55-59
B. <input type="checkbox"/> 20-24	F. <input type="checkbox"/> 40-44	J. <input type="checkbox"/> 60-64
C. <input type="checkbox"/> 25-29	G. <input type="checkbox"/> 45-49	K. <input type="checkbox"/> 65-69
D. <input type="checkbox"/> 30-34	H. <input type="checkbox"/> 50-54	L. <input type="checkbox"/> 70 or over

21. Your gender? Male Female

22. What is the total number of persons in your household, including yourself? (circle one):

1 2 3 4 5 6 7 8 9 10 11 12 13 or more

23. Please place a mark next to the group which best represents the total annual income, before taxes, of all the members of your immediate family living in your household.

- A. Under 7,500
- B. 7,500 - 10,000
- C. 10,000 - 15,000
- D. 15,000 - 20,000
- E. 20,000 - 25,000
- F. 25,000 - 30,000
- G. 30,000 - 35,000
- H. 35,000 - 40,000
- I. 40,000 - 50,000
- J. 50,000 - 75,000
- K. 75,000 or over

We welcome any comments you may have concerning nongame wildlife or the Virginia nongame wildlife tax checkoff fund. Feel free to write any comments you may have on the back of this questionnaire booklet.

Thank you very much for your time and effort.

If there is anything else you would like to tell us about nongame wildlife in Virginia, or about the nongame tax checkoff fund, please use this space to do so.

Also, any comments you may have concerning this survey or this study would be appreciated.

Your contribution to this effort is very much appreciated. If you would like a summary of the results, please write to us at this address:

Jim Ferguson
Department of Agricultural Economics
Virginia Tech
Blacksburg, VA 24061

II. Data Coding, By Survey Question

NUM	Survey Number
1-900	Contributor
901-2000	Non-contributor (from Va. Dept. of Taxation)
Q1	Did you contribute?
1	Yes
0	No
Q2	Amount of contribution
\$exact	Exact amount
OR	
2	\$1-\$3
5	\$4-\$6
8	\$7-\$9
11	\$10-\$12
14	\$13-\$15
17	\$16-\$18
20	\$19-\$21
23	\$22-\$24
27	\$25-\$29
32	\$30-\$34
37	\$35-\$39
42	>= \$40
OR	
Blank	I do not remember
Q3	Main reason for contributing
1	Nongame wildlife is important to me
0	It seems like a good cause
Q4	Which best describes your contribution
1	Partial free rider
2	Constrained by information
3	Contribution = willingness to pay
4	Constrained by budget

- Q5A** How contribution might change if refund were larger
- | | |
|---|-----------|
| 1 | Larger |
| 2 | Smaller |
| 3 | No change |
- Q5B** How contribution might change if did not need refund for other uses
- | | |
|---|-----------|
| 1 | Larger |
| 2 | Smaller |
| 3 | No change |
- Q5C** How contribution might change if had more information about what contribution is used for
- | | |
|---|-----------|
| 1 | Larger |
| 2 | Smaller |
| 3 | No change |
- Q6** Aware of existence of checkoff before receiving survey?
- | | |
|-------|----------------|
| 1 | Yes |
| 0 | No |
| Blank | Don't remember |
- Q7** Major reason for non-contribution
- | | |
|---|---|
| 0 | Do not value nongame wildlife |
| 1 | Free rider |
| 2 | Non-voter |
| 3 | Protest voter, government |
| 4 | Significant opportunity costs |
| 5 | Insufficient information |
| 6 | Protest voter, checkoff institution |
| 7 | Usually contribute, but did not this year
(added ex post, in response to comments) |

Q8 For those unaware of checkoff, how would you behave, based on simple information?

Would contribute:

- 1 Contribution = willingness to pay
- 2 Constrained by budget (refund)
- 3 Constrained by significant opportunity costs
- 4 Since it seems to be a good cause

Would not contribute:

- 5 Significant opportunity costs
- 6 Non-voter
- 7 Free rider
- 8 Do not value nongame wildlife
- 9 Protest voter, government
- 10 Protest voter, checkoff institution

Q9 Publications received

- # The total number of publications was entered, including applicable write-ins

Q10 How often do you read a newspaper?

- 0 Never
- 1 Less than once a week
- 2 Once a week
- 3 More than once a week
- 4 Every day

Q11 How often do you watch television news programs?

- 0 Never
- 1 Less than once a week
- 2 Once a week
- 3 More than once a week
- 4 Every day

- Q12** How often do you watch public television (PBS) or listen to public radio (NPR)?
- 0 Never
 1 Less than once a week
 2 Once a week
 3 More than once a week
 4 Every day
- Q13** About how many time a week do you watch nature or wildlife programs on TV? (for example, on public television (PBS) or the DISCOVERY channel)
- 0 Never
 1 Less than once a week
 2 Once a week
 3 More than once a week
 4 Every day
- Q14A** Nongame use/option value: willing to pay for continued use?
- 0 Strongly disagree
 1 Disagree
 2 Neither agree nor disagree
 4 Agree
 5 Strongly agree
- Q14B** Nongame existence value: willing to pay for continued existence?
- 0 Strongly disagree
 1 Disagree
 2 Neither agree nor disagree
 4 Agree
 5 Strongly agree
- Q15** Attitude toward state tax refund
- 0 Too small to be useful
 1 Important; to be used like any other income
 2 Not like income; to be used for something special

Q16 Amount of state tax refund

\$exact	Exact amount of refund
OR	
20	\$1-\$40
60	\$41-\$80
100	\$81-\$120
140	\$121-\$160
180	\$161-\$200
220	\$201-\$240
260	\$241-\$280
300	\$281-\$320
340	\$321-\$360
380	\$361-\$400
420	>= \$401
OR	
0	I did not receive a refund
OR	
Blank	I do not remember

Q17A Air and water quality should be improved, even if it means paying higher taxes or higher prices for goods.

5	Strongly agree
4	Agree
3	Neither agree nor disagree
2	Disagree
1	Strongly disagree

Q17B Widespread use of pesticides in agriculture should be continued, even if there is some risk to wildlife.

1	Strongly agree
2	Agree
3	Neither agree nor disagree
4	Disagree
5	Strongly disagree

Q17C Economic growth and development should continue, even if it means that wildlife habitat is often converted to commercial uses.

- 1 Strongly agree
- 2 Agree
- 3 Neither agree nor disagree
- 4 Disagree
- 5 Strongly disagree

Q17D Endangered species should be preserved, even if it means that some major projects, such as dams or roads, are not built.

- 5 Strongly agree
- 4 Agree
- 3 Neither agree nor disagree
- 2 Disagree
- 1 Strongly disagree

Q18A How would you describe where you live

- 1 City
- 2 Suburb
- 3 Town
- 4 Rural

Q18B How would you describe where you live: city, suburb, or town with population about:

- 8 100,000 or more
- 7 50,000 - 100,000
- 6 25,000 - 50,000
- 5 10,000 - 25,000
- 4 5,000 - 10,000
- 3 2,500 - 5,000
- 2 1,000 - 2,500
- 1 less than 1,000

Q19 What was the last grade or class in school that you completed?

- | | |
|---|--|
| 1 | 8th grade or less |
| 2 | Some high school |
| 3 | Graduated high school |
| 4 | Some college |
| 5 | Grad of a 2-year college |
| 6 | Grad of a 4-year college |
| 7 | Masters |
| 8 | Doctorate (also included were write-ins for law degrees and medical degrees) |

Q20 What is your current age?

- | | |
|----|------------|
| 17 | Under 20 |
| 22 | 20-24 |
| 27 | 25-29 |
| 32 | 30-34 |
| 37 | 35-39 |
| 42 | 40-44 |
| 47 | 45-49 |
| 52 | 50-54 |
| 57 | 55-59 |
| 62 | 60-64 |
| 67 | 65-69 |
| 72 | 70 or over |

Q21 Your gender?

- | | |
|---|--------|
| 0 | Male |
| 1 | Female |

Q22 Total number of persons in household, including respondent

Exact number entered, up to 12

13 entered for 13 and over

Q23 Household annual income, before taxes (\$)

1, converted to	3,750	Under 7,500
2, converted to	8,750	7,500-10,000
3, converted to	12,500	10,000-15,000
4, converted to	17,500	15,000-20,000
5, converted to	22,500	20,000-25,000
6, converted to	27,500	25,000-30,000
7, converted to	32,500	30,000-35,000
8, converted to	37,500	35,000-40,000
9, converted to	45,000	40,000-50,000
10, converted to	62,500	50,000-75,000
11, converted to	87,500	75,000-87,500
12, converted to	100,000	100,000 or over

Appendix C. Cover Letters, Postcard Followup, and Tax Form

Cover Letter for First Mailing. Size is Reduced from the Original.

VIRGINIA TECH

Department of Agricultural Economics

Blacksburg, Virginia 24061

November 21, 1988

Dear Virginia Citizen:

Nongame wildlife species, that is, those which are not hunted, fished, or trapped, are an important aspect of Virginia's wildlife resource. The Virginia Department of Game and Inland Fisheries manages nongame wildlife using management funds provided by a voluntary checkoff on the Virginia state tax form. Nongame wildlife is part of our heritage and our environment. Therefore, future decisions about the use of the tax checkoff, as well as about nongame wildlife management, will affect the citizens of Virginia.

Your household is one of a small number selected in the state of Virginia to give their opinion on this matter. Your response is important so the study can correctly represent the opinions of Virginians about issues facing nongame wildlife and the agencies that manage nongame wildlife. Since your answers are important, we would like the questionnaire to be completed by the member of the household who completed the 1987 Virginia tax form (the form for taxable year 1987). If a professional tax preparer completed your tax form, then the adult member of your household who was most involved in completing the tax form should complete the questionnaire.

The answers you provide will be kept strictly confidential. The identification number on the return envelope is for mailing purposes only. This is so that we can check your name off the mailing list when your questionnaire is returned. Your name will never appear on nor be associated with the questionnaire.

Some of the results of this research (relating to the tax checkoff) have been requested by the Department of Game and Inland Fisheries. The results will help the Department to better manage nongame wildlife in accordance with the wishes of the citizens of Virginia. We shall be happy to supply you with a summary of the results if you simply write to us at the above address. Please do not put your name and address on the questionnaire. I would be happy to answer any question you may have. Please write or call me or Dr. Sandra S. Batie. We can be reached at: (703) 961-5381.

Thank you for your assistance.

Sincerely,



Jim Ferguson
Graduate Assistant

Text of Postcard Followup.

November 30, 1988

Last week a questionnaire was mailed to you seeking your opinions about some issues regarding nongame wildlife in Virginia. Your household is one of a small number in the state of Virginia to give their opinions on these matters.

If you have already completed and returned it, please accept our sincere thanks. If not, please do so soon. It is important that your household also be included in the study to correctly represent the opinions of Virginia citizens.

If you did not receive the questionnaire or if it is misplaced, please call (703) 961-5381 or write, and I will immediately send you another.

Sincerely,

A handwritten signature in cursive script that reads "Jim Ferguson".

Jim Ferguson
Graduate Assistant

Cover Letter for Second Mailing. Size is Reduced from the Original.

VIRGINIA TECH

Department of Agricultural Economics

Blacksburg, Virginia 24061

December 13, 1988

Dear Virginia Citizen:

About three weeks ago a questionnaire was sent to you seeking your opinions about some issues regarding nongame wildlife in Virginia. As of today, your completed questionnaire has not been received.

This study is being conducted because it is important that citizen opinions be taken into account in any future decisions concerning nongame wildlife management in Virginia.

I am writing you again because of the importance each questionnaire has to the usefulness of this study. Your household is one of a small number selected in Virginia to participate in this study. Only 1 out of every 900 people in Virginia is being asked to complete this questionnaire. In order for the results to accurately reflect the opinions of all Virginia residents, it is essential that each household selected to participate return their questionnaire. As mentioned in the last letter, the questionnaire should be completed by whoever completed the 1987 Virginia state tax return (for taxable year 1987). If a professional tax preparer completed the tax form, then the questionnaire should be completed by the adult member of the household who was most involved with completing the tax form.

In the event that your questionnaire has been misplaced, a replacement one is enclosed. If you have any questions please write or call me or Dr. Sandra S. Batie. We can be reached at: (703) 961-5381.

Your cooperation is greatly appreciated.

Sincerely,



Jim Ferguson
Graduate Assistant

Copy of 1987 Virginia State Tax Form. The Nongame Wildlife Checkoff is Line 24(a). Size is Reduced from the Original.

760 Virginia Individual Income Tax Return 1987

Form 760 Virginia Individual Income Tax Return 1987. Includes sections for Name and Address, Filing Status, Exemptions, Deductions, Income Tax, Credits, and Authorized Deductions. Includes a box for 'BE SURE TO SIGN YOUR RETURN ON BACK'.

Appendix D. Summary of Results of Sample Validation

Summary of Results of Sample Validation

The validation was conducted by comparing the results of the survey sample to corresponding data from the 1980 census. The data for income were deflated to 1980 levels; no adjustments were made to the other data. Since the survey was designed using the same categories as were used with the census, the analysis was relatively simple. The number of people observed to be in each category for each variable was compared to the number expected from the 1980 census. This expected number was calculated by taking the total number of responses to each variable in the survey, and multiplying by the percentage that was observed for each category in the 1980 census. The chi-squared statistic was calculated for each variable as:

$$x^2 = \sum_{ij} [(O_{ij} - E_{ij})^2 / E_{ij}]$$

The number of degrees of freedom was calculated as:

$$(r-1)(c-1)$$

Where:

- O = observed number of occurrences in a cell
- E = expected number of occurrences in a cell
- ij = cell formed by the intersection of column i
with row j
- r = total number of rows
- c = total number of columns

Results of Sample Validation, continued.

Tests:

1. Age: Chi-squared = 228.284.

Chi-squared for $\alpha = .005$, 11 degrees of freedom = 26.757

Conclusion: reject the null hypothesis that the sample is not significantly different from the population with respect to age. Specifically, the sample under-represents the lowest and highest age classes, over-represents the age classes from 25-44, and relatively closely represents the age classes from 45-69. Note that the population in this case is the number of people over 16 employed in the work force.

2. Sex: Chi-squared = 7.508 (12.309 for contributors, 0.0 for non-contributors)

Chi-squared for $\alpha = .005$, 1 degree of freedom = 7.879

Conclusion: The sample is representative of the general population with respect to sex. The sample of non-contributors is very close to the general population, while the sample of contributors is not.

3. Education: Chi-squared = 799.40
Chi-squared for $\alpha = .005$, 5 degrees of freedom = 16.750

Conclusion: the sample is not representative of the general population with respect to educational level. Specifically, the sample over-represents higher education levels.

Results of Sample Validation, continued.

4. Income: Chi-squared = 484.98
Chi-squared for $\alpha = .005$, 7 degrees of freedom =
20.278

Conclusion: the sample does not represent the general population with respect to income. Specifically, the sample under-represents the lowest income categories, is fairly close in the middle income categories, and over-represents the highest few categories.

5. Residence: Chi-squared = 0.785
Chi-squared for $\alpha = .05$, 1 degree of freedom
= 3.841

Conclusion: The sample is representative of the general population with respect to urban versus rural residence. It should be noted that this test was conducted only on the rural/urban classification of residence. The variability in peoples' responses made a more detailed analysis (using more narrowly-defined categories) impossible.

Appendix E. Survey Data

24	1	1	1	3	0	1	1	3	0	3	4	2	2	2	4	0	140	3	4	3	3	2	5	4	27	1	4	9
26	1	4	1	1	3	0	2	3	3	4	3	3	3	4	5	0	5	4	4	3	1	8	3	17	0	4	9	
27	1	5	1	2	1	1	0	4	4	4	5	5	2	7	4	100	4	4	5	2	2	7	4	32	1	2	7	
29	1	11	0	1	1	1	0	4	4	2	4	4	0	6	5	60	5	5	2	2	8	5	42	1	3	6		
30	1	1	1	1	1	1	3	3	3	2	5	5	1	120	4	83.87	5	5	5	1	6	6	27	1	2	7		
31	1	1	4	1	1	1	1	4	3	3	4	5	1	100	5	5	5	4	3	4	6	27	1	2	4	6		
33	1	2	1	2	3	3	1	4	4	2	2	5	2	420	4	4	3	3	2	5	7	27	0	3	7	7		
34	1	5	0	3	3	1	4	1	3	2	1	5	5	60	5	5	2	2	7	5	32	1	1	4	4	6		
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36	1	10	1	4	1	1	2	1	4	4	3	5	5	20	3	4	5	4	2	3	57	1	1	4	4	6		
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53	1	2	0	3	1	3	0	4	4	3	2	4	1	340	3	4	4	5	3	2	27	1	4	9	4	9		
54	1	5	1	4	1	1	1	8	3	1	4	0	5	20	5	5	4	5	1	8	4	32	0	1	7	7		
57	1	14	1	4	1	1	3	1	4	3	3	1	4	60	4	4	4	5	2	7	4	27	0	2	7	4		
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289	1	10	1	1	3	1	3	1	1	5	5	1	28.55	5	4	5	4	2	7	8	27	0	2	6		
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293	1	5	1	2	3	3	1	1	4	4	2	2	420	5	4	4	3	2	7	4	37	0	3	11		
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1949 0	4 0 4 4 0 1 4 1	0 5 3 4 4 3 1 7 52 0 4 10
1952 0	4 3 4 2 4 2 4 4 0	

VITA

James Montgomery Ferguson was born April 17, 1954 in Furstenfeldbruck, West Germany. His parents are Col. Lucian M. Ferguson and Avis Allen Ferguson. After attending grade school in several loctions around the U.S., he graduated from Fort Hunt High School, Fairfax County, Virginia, in June 1972. He attended the University of Virginia from 1972 to 1974, then was lured away to Virginia Tech by the prospect of becoming a forester. Jim graduated with a B.S. in forest management in 1976. Like most foresters at that time, it was on to graduate school or drive a bus. Preferring the former, Jim started graduate school immediately in the Department of Entomology, although he was really studying forest ecology. After occupying a no-man's land between Forestry and Entomology for a little over two years, Jim received his M.S. in Entomology in May 1979. His main area of study was forest ecology and dendrochronology (thesis title: The Development and Application of a New Technique in Dendrochronology).

From 1979 to 1982, Jim worked as a research associate in the Department of Fisheries and Wildlife, and as a forest scientist with the American Institute of Dendrochonology.

In between jobs and degrees, he traveled extensively in the western U.S., Europe, and India. Jim entered the MBA program at Virginia Tech in 1982. For the next two years, he studied in that program while working in the MBA office, filling a multitude of roles. In the fall of 1984, he entered the Phd program in Forestry Economics at Virginia Tech. After running into serious financial difficulties, he transferred to the Department of Agricultural Economics in the fall of 1985. During his tenure (sic) as a graduate student in Agricultural Economics, Jim worked on a major acid rain economics project for the EPA and the U.S. Forest Service (yielding two publications), gave a paper on forest products trade at the First Radford University Conference on International Economic Competitiveness, and worked on the Virginia REAP project.

"Dulcius Ex Asperis" ["Sweeter After Adversity"]

-motto of the Clan Ferguson

A handwritten signature in cursive script that reads "James M. Ferguson". The signature is written in black ink on a white background.