Essays on Nonprofit Competition

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Abstract

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The predominant objective of this dissertation is the analysis of competition among nonprofits in a market. The focus is on exploring nonprofit behavior in markets in which they demand revenue from various sources. Chapters 1 and 2 of this dissertation examine the effects of nonprofit competition on the receipt of charitable donations and the extent of revenue diversification of an organization, while Chapter 3 evaluates the performance of a fundraising mechanism in the presence of one or more nonprofits in a market.

The nonprofit sector has been expanding rapidly over the past decade, particularly in the United States (US). The reasons for such a growth - the shrinking government sector along with the increasing demand for the goods and services provided by nonprofit organizations - is easy to understand. What is unclear are the consequences of the unrestrained proliferation of nonprofit organizations, especially in the absence of a corresponding increase in the resources to sustain such an expansion. Herein, lies the motivation underlying this dissertation. In addition, each chapter also seeks to provide guidance to nonprofit managers and policy makers about feasible strategies in an increasingly competitive environment.

In the first chapter, I empirically estimate the effect of nonprofit competition on the charitable donations received by them. The total impact of competition is decomposed into two effects to capture the two different channels through which nonprofit competition can affect charitable donations. First, is the fundraising effect that examines the change in donations caused by adjustments in the fundraising efforts of nonprofits in response to

varying degrees of competition. Second, the non-fundraising effect examines the changes in donations caused by competition driven adjustments in other organizational strategies, including management expenses, changes in the mission statement and shifts in volunteer reliance. The estimation is conducted at the nonprofit and aggregate levels, using a simple instrumental variable regression approach on US public charity data obtained from their annual tax returns from 1998-2003. The key finding of this chapter is that an increase in nonprofit competition leads to a decrease in the average amount of charitable donations received. At the same, the aggregate donations by all donors in a market increases marginally due to greater nonprofit competition, indicating the probability of wasteful shifting of donor contributions between organizations.

The second chapter, then, goes on to take a broader view of nonprofit finances by investigating the effect of nonprofit competition on the extent of revenue diversification of the organizations. Though there exists an extensive discussion on the importance of revenue diversification for nonprofits, the question of how the revenue diversification strategy evolves with market competition has not been considered. This chapter seeks to contribute to the literature through an empirical examination of how the nonprofit competition influences the level of revenue diversification. The theoretical prediction derived from the transaction cost theory is that nonprofit competition will have a negative effect on revenue diversification. However, based on the econometric methods applied to a sample of US public charities, similar to the one used in the previous chapter, I do not find convincing evidence that nonprofits change their income portfolio in response to increasing competition in a market.

Growing nonprofit competition reduces the receipt of charitable donations by a typical nonprofit organization. In such a situation, there is also no indication that nonprofits increasingly seek to sustain themselves by looking towards multiple sources of revenue. Given the dominance of private contributions in the income portfolio of nonprofits, it will be useful to focus on mechanisms adopted by nonprofits to raise charitable donations. Because nonprofit level data, that is aggregated over donors, cannot be utilized to study individual behavior, I adopt a different method in the final chapter of this dissertation.

In the third chapter, which is a joint work with Sergey Rabotyagov, we experimentally examine the effect of using lotteries in conjunction with provision points to finance public goods. While the existence of a threshold reduces free-riding, it does not completely eliminate the incentive of individuals to donate zero for the public good. This prompts the question of whether there is a fundraising mechanism that works better in raising funds. Our proposed use of a lottery along with the threshold requirement is compared to the provision point mechanism in a laboratory experimental setup. We also test a modification of our lottery design that is ideal for situations with multiple threshold public goods. This new mechanism eases the coordination among the potential donors and prevents the diversions of contributions for the lottery prize. We find that the lottery with provision point outperforms the provision point mechanism by increasing the frequency with which the public good is provided as well as the amount of average individual contribution. The findings have implications for crowdfunding websites that have becoming an increasingly popular tool used by nonprofits for the provision of public goods.

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

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DEDICATION

to my family

Chapter 1

EFFECTS OF NONPROFIT COMPETITION ON CHARITABLE DONATIONS

1.1 Introduction

The nonprofit sector in USA has been growing steadily in size for more than a decade. Between 2000 and 2011, the number of nonprofits has increased by 25 percent. In 2012, nearly 1.6 million nonprofits, not including religion congregations and smaller organizations, were registered with the Internal Revenue Service (IRS). The rapid growth of nonprofits is considered beneficial due to the greater provision of goods and services by the charitable organizations, supplementing the efforts of the government. However, the increasing number of nonprofits also increases the competition for limited resources among them.

This chapter studies the effect of competition among nonprofits on the revenue earned by these organizations, to investigate whether an increase in their supply of goods and services is feasible. In particular, I look at the revenue generated from charitable donations by individual donors and foundations. Many nonprofits are reliant on private contributions as a major source of revenue. In 2011, private charitable donations to public charities and religious organizations totaled $298.42 billion, accounting for about 24 percent of the total revenue of reporting public charities, after excluding organizations that derive their funding mainly through fees for goods and services from private sources. The focus is on donative nonprofits which predominantly depend on donative support from private sources and provide pure public goods, distributional public goods or private goods with some external benefits.

A growing literature investigates why a representative donor gives to nonprofit organizations and how these organizations behave, without paying attention to the interaction of the nonprofits in the market structure. The primary contribution of this paper is to estimate the total effect of nonprofit market competition on charitable donations. The hypotheses

underlying the paper is derived by extending the model of competition among horizontally differentiated nonprofits to incorporate a wide range of nonprofit behavior that competition influences. Furthermore, I empirically decompose the total effect of competition into a fundraising effect and a non-fundraising effect, in order to analyze two different channels through which nonprofit competition can affect charitable donations.

One of the impacts of nonprofit competition is on their fundraising expenses. Fundraising expenses are those expenses that nonprofits spend to raise money and can include any cost incurred in soliciting donations, memberships and grants. Existing papers have examined how competition for funds affects fundraising by nonprofits, though, with contradictory evidence (Feigenbaum, 1987; Thornton, 2006; Castaneda et al., 2008). Since fundraising efforts by the nonprofits influence the amount of donations received by them, there is an indirect effect of competition on charitable donations (Weisbrod and Dominguez, 1986; Posnett and Sandler, 1989; Okten and Weisbrod, 2000; Khanna et al., 1995; Khanna and Sandler, 2000).

In addition to fundraising, there are many other strategies that nonprofit organizations can adopt in the face of rising competition for donations, such as changes in expenses on staff perquisites and administrative costs, emphasis on innovation and choice of product and service mix. When a donor learns about the changes in these various aspects of nonprofit behavior due to competition, they adjust their charitable contributions. This is referred to as the non-fundraising effect of competition on giving by donors. The distinction between the two channels through which nonprofit competition can affect donors arises from the increasing attention on fundraising by nonprofit managers and scholars. More importantly, fundraising expenses of nonprofits has positive and negative effects on donors, creating ambiguity about its net effect. Thus far, there have been no attempts to estimate the effect of nonprofit competition on charitable donations along with an explanation of what causes the observed effects.

The motivation behind this chapter is to understand the implications of increasing nonprofit competition for nonprofit policies and managerial strategies. First, the results of this study can be helpful in determining the need for control over the rapid growth of nonprofits. They can also be applied to evaluate policies that regulate competition among nonprofits.

An example of such a policy is the increased monitoring of nonprofits by the Internal Revenue Service (IRS) following the new tax return filing requirements of the Pension Protection Act of 2006. Second, the impact of mergers among nonprofits on charitable donations can be examined, a necessary analysis in the absence of merger guidelines for nonprofits. The investigation of whether the fundraising or the non-fundraising effects of competition dominates can also assist nonprofit managers in deciding their action plan when pitted against each other in their struggle for the charitable dollar.

I use the annual tax return data of US nonprofits from 1998-2003 to empirically investigate the effect of the competition on charitable donations. The instrumental variables method is used to estimate the effects of market competition by overcoming identification issues. This chapter is the first study to instrument the index of nonprofit competition to reduce bias caused by endogeneity of market competition. Since a decline (increase) in the total contributions does not necessarily imply lower (higher) donation receipt for all individual nonprofits, the estimation exercise is carried out at the average nonprofit level as well as the aggregate level. This enables us to understand the consequences of nonprofit competition for the society at large as well as for the nonprofit managers.

The key findings of this chapter is that aggregate donations by all donors in a market increases due to greater nonprofit competition. Yet, at the nonprofit level the two effects are negative, with the total effect of competition on the average charitable donations received by a nonprofit being adverse. The reduction in average receipt of charitable donations by a nonprofit is driven by the fundraising effect of competition operating through augmented fundraising expense of the organization. Fundraising is the predominant strategy used by nonprofits when confronted with many rivals, accounting for more than half of the change in charitable donations. While competition encourages that some donors to contribute more, they do so only by marginal amounts causing a decline in the average receipts of donations by the nonprofits.

The structure for the remainder of the chapter is as follows. The next section provides a background discussion of nonprofit competition. Section 1.3 describes the data and the estimation methodology. Section 1.4 presents the empirical results. Section 1.5 discusses the findings with special attention to nonprofit policy and managerial implications. Section

1.6 concludes. Appendix A contains all tables and figures to which this chapter refers.

1.2 The Nonprofit Firm and Market

Economic theories analyze competition among nonprofits for charitable donations from an industrial organization perspective. The nonprofit market is characterized by monopolistic competition, where many organizations supply similar but differentiated goods and services. There is an "inherent propensity for donative nonprofit organizations to specialize" (Bilodeau and Slivinski, 1998). For example, educational institutions differ in the type of the education they provide and their target population. Rose-Ackerman (1982), the first to discuss the market structure of nonprofits in her model of fundraising, presents nonprofits as being differentiated along one dimension - ideology.

Donors give to nonprofits because of the benefits from the output, the warm-glow they receive, out of self-interest or altruistic concerns about the society (Andreoni, 2006). Regardless of the reasons for giving, utility of donors is an increasing function of their amount of charitable contribution. The donors' choice of nonprofit becomes relevant when the horizontally differentiated nature of nonprofit markets is incorporated into the utility maximization model. While giving, donors decide how much to donate as well as which nonprofit to support. With the existence of several nonprofits producing similar goods and services, donors' preferences over the organizations' ideologies, shares of their revenue devoted to output, perquisite expenses, use of innovative technologies and other behavioral aspects of the nonprofit organizations start to matter. The amount of donation a donor makes to a specific nonprofit reflects their preferences on all or some of these aspects. Given this structure of the model, if increasing competition among nonprofits affects one or many of these facets of nonprofit behavior, then we should observe changes in the donation levels by donors. There can also be a change in the nonprofit organizations, supported by the donors.

Many papers theoretically predict how change in the number of competing nonprofits in a market will affect the different aspects of nonprofit behavior. One such strategic nonprofit decision affected by the nonprofit competition for scarce donor resources is fundraising. Fundraising, a "vibrant, innovative and highly professional industry" (Andreoni, 1998), is

important because it influences charitable donations received by nonprofits. Therefore, any effect of competition among nonprofits on fundraising will reflect on the donations of the donors. This is referred to as the *fundraising effect* of nonprofit competition on charitable donations. The direction of this effect of competition is governed by two factors.

First, is the relationship between nonprofit competition and fundraising expenses. Rose-Ackerman (1982) discusses how competition for donations can lead to excessive fundraising by nonprofits even when donors care about fundraising expenses. Castaneda et al. (2008) theoretically prove that an exogenous increase in nonprofit competition increases fundraising expenditures. While Rose-Ackerman recognizes that donors have some preferred ideology and tend to donate to nonprofits that match their preferences, neither paper gives value to the fact that entry of nonprofits in a market increases the welfare of donors by reducing the average distance between the closest nonprofit and donors' preferred ideology. Aldashev and Verdier (2010) address the shortcoming in a model that demonstrates how the effect of nonprofit competition on fundraising depends on the type of donors in the market. If the number of donors in a market is fixed, the only way a nonprofit can increase its donations is by convincing the individuals of its relative importance, thereby escalating the fundraising expenses of the organization. On the other hand, with a variable size of the donor market, fundraising can 'awaken' potential donors to give. In this scenario, if there are too many rivals, the expected return from each dollar spent in fundraising declines. A rational nonprofit ends up in not spending much on soliciting donors. Thus, the fundraising effect of nonprofit competition on charitable donations is positive or negative depending on the nature of the donor market.

There is some empirical evidence that complements the above theories on the relationship between nonprofit competition for donations and fundraising. The first study by Feigenbaum (1987) examines competition among medical research charities for donations and finds that organizations spend less on fundraising and more on administrative expenses under intense competition. Thornton (2006) builds on the work of Feigenbaum (1987) by studying a broader set of nonprofits. Unlike the previous study, he finds a positive relationship between fundraising expenses and nonprofit competition. Castaneda et al. (2008) support their theoretical predictions by showing that greater nonprofit competition increases

the fraction of donations allocated to fundraising. Therefore, there is a significant effect of competition among nonprofits on their fundraising expenses but there is a lack of consensus in the literature about the direction of the effect.

Second, is the effect fundraising by nonprofits has on donors. It positively affects donations by influencing donor preferences, reducing the search cost of donors and signaling the quality of nonprofits (Bilodeau and Steinberg, 2006). On the contrary, solicitation diverts funds away from the final product, generating a negative price effect on giving by donors. The overall impact of fundraising on charitable donations depends on the magnitudes of the two opposing forces. There are many papers that have estimated the donation production function, which states the relationship between fundraising expenses of a nonprofit and charitable donations received by it, depending on other characteristics of the organization and donors. These studies confirm the significant effect of fundraising on donations (Weisbrod, 1998; Posnett and Sandler, 1989; Okten and Weisbrod, 2000; Khanna et al., 1995; Khanna and Sandler, 2000). Empirical findings of this strand of literature have been divergent, making it necessary to consider how the two factors that affect the fundraising effect of competition interact to predict if it is positive or negative.

The above mentioned theoretical and empirical papers, with the exception of Castaneda et al. (2008) have one limitation. They focus on fundraising as the only choice variable of nonprofits and assume all other aspects of the organizations behavior as exogenous. As mentioned above, there are additional strategies that nonprofits resort to when faced with increasing competition such as choice of the next project, adoption of newer technology, greater dependence on volunteers. Insofar as these choice variables of nonprofit are affected by changes in the degree of competition in the donation market, the charitable contributions will change accordingly if donors care about these other choice variables of nonprofits. There are two papers (Economides, 1993; Pestieau and Sato, 2006) that that theoretically prove the effect of nonprofit competition on the locational and quality of output choices of nonprofits.

The effect of nonprofit competition on charitable donations working separate from fundraising intervention is what I call the *non-fundraising effect*. This effect of competition, as defined in this chapter, encompasses changes in multiple behavioral aspects of nonprofits that affects donors. The increase in competition for donations "acts to check massive rent

extraction and to keep nonprofits oriented towards customers" (Glaeser, 2002). With intense rivalry for limited donations, nonprofits will implement various strategies that appeal to donors, unlike a monopolistic nonprofit with the inclination to slack off. Competition in a market will induce organizations to enhance efficiency by reducing managerial or perquisite expenses, wiser selection of projects, improve quality of production and encourage innovation, leading to greater contributions by donors. This is in line with the findings of Castaneda et al. (2008) that increasing competition increases the share of donations devoted to output and decreases in perquisite consumption. The issue that remains unresolved is how all these varying changes in the different nonprofit strategies, stemming from competition, impacts charitable donations.

It is important to note that the existence of the non-fundraising effect of competition is based on an assumption about the exchange of information between donors and nonprofits. It is often mistakenly believed that fundraising is the sole means through which information flows from nonprofits to donors. However, there is recent heightened interest in the other sources through which it is possible for donors to obtain information about nonprofits. Mandatory public disclosure of annual returns of nonprofits, third-party charity ratings (Chhaochharia and Ghosh, 2008; Grant, 2010; Yoruk, 2013) and flow of information through social networks (Shang and Croson, 2009) enable donors to learn about different nonprofits, evaluate them and decide on whom to donate to and how much to contribute. Donors are no longer completely reliant on nonprofits to 'awaken' them into giving. Access to the details of a nonprofit on the internet, a news report about the importance of Charity Navigator to asses nonprofits or a simple tweet about a new nonprofit in the block are examples in which donors can learn about nonprofits. Recent research shows that donors increasingly rely on public financial information as a tool to guide donation decisions by distinguishing relative efficiency among competing firms (Lammers, 2003). The presence of external sources of information allows constant scrutiny by donors of all nonprofit characteristics. This enables donors to directly respond to adjustments in nonprofit behavior due to competition, even in the absence of fundraising.

Based on these considerations, the hypothesis is that the non-fundraising effect of nonprofit competition on charitable donations is positive whereas the fundraising effect is posi-

tive or negative, depending on the nature of the donor market and net effect of fundraising on donations. The mechanisms underlying these effects of competition are about donors' response in terms of the amount of their donations. This will allow predictions about changes in aggregate donations by all donors in a market. At the same time, donors can also respond to adjustments in nonprofit behavior due to varying degrees of competition by simply choosing to support a different organization. In this event, the average donations received by nonprofits need not change in the same direction as the aggregate donations. The average donations per-nonprofit will increase, decrease or remain unaltered, depending on the extent of change in total donations compared to number of nonprofits claiming a share of the total contribution. For instance, if donors respond to growing nonprofit competition by increasing their donations marginally or if they merely switch their funds to better performing nonprofits, the average donations will decrease despite an increase in the total donations collected at the market level. If such is the case, estimates of aggregate donations will not prove useful in informing individual nonprofits about how their revenues will be affected by competition. To avoid misleading inferences, I estimate the direct and indirect effects of nonprofit competition at the aggregate as well as the nonprofit level of donations and fundraising.

1.3 An Empirical Model of Nonprofit Competition

This section discusses the compilation of the nonprofit data along with the choice of variables and their statistical properties. It then outlines the empirical strategy for estimating the direct and indirect effects of nonprofit competition on charitable donations.

1.3.1 Data

The data is obtained from the annual tax returns of US nonprofits from the periods 1998 to 2003. Public charities, those nonprofits with charitable, religious, educational, scientific, literary, environmental and other purposes are exempt from filing taxes under Section 501(c)(3) of the Internal Revenue Code. A subset of public charities with revenue greater than $25,000 and excluding faith-based organizations must annually file some version of the Form 990 with the IRS. The forms have details on the nonprofits' mission, programs,

and finances. The National Center for Charitable Statistics (NCCS) at the Urban Institute collects the information from the forms and makes it available for researchers as convenient datasets. The data for this chapter comes from the NCCS-GuideStar National Nonprofit Research Database (NCCS, 2013) which contains observations on all nonprofits required to file the Form 990 and Form 990-EZ in the sample period. I augment the data with geographic level variables from the Bureau of Labor Statistics (BLS, 2013) and Bureau of Economic Analysis (BEA, 2013).

The nonprofit data is valuable for organization level analysis but is also erroneous in nature. The sample used for the empirical analysis is, therefore, systematically cleaned following the methodology outlined in previous papers (Andreoni and Payne, 2003; Thornton and Belski, 2010; Heutel, 2014). Nonprofits with clear evidence of reporting errors are eliminated from the sample, reducing the sample by about 20 percent of the original size.[1] Inability to calculate the valid age of the nonprofits because of missing or faulty ruling year data leads to the nonprofits being dropped from the study. The sample is restricted to nonprofits within a recognizable geographic extent and discrepancies in the geographical identifiers of the remaining nonprofits are corrected. Finally, I retain nonprofits with at least one year of positive donations and fundraising expenses in the sample. There are a few nonprofits that are established with sufficient financial backing or are entirely reliant on grants from the government or one individual, making it unnecessary for them to compete for charitable donations. Including nonprofits with no receipt of donations and outlays on fundraising over the entire panel in the sample will not inform the hypothesis and can lead to biased conclusions.

1.3.2 Variables

An empirical analysis of competition must begin with the definition of a market. Since nonprofits originate when there is market failure, traditional price based definitions of market are rendered useless. While some studies in the nonprofit literature have used a product-

[1]These included: having donation or other sources of revenue exceed total revenue, or having fundraising or other expenditures exceed total expenditures, reporting a negative value for private donations, government grants, fundraising expenses, management expenses or program service revenue.

based definition, others have specified nonprofit markets for charitable donations in terms of geographical areas (Twombly, 2003; Harrison and Laincz, 2008; Nunnenkamp and Öhler, 2012). Casual observation of nonprofits suggests that a combination of the two approaches is better suited in characterizing the market for charitable donations. A market in this chapter includes all nonprofits supplying similar goods and services that are actual or potential competitors within a well-defined area.

I first define the relevant product market by identifying nonprofits that donors regard as substitutes. Since charitable contributions mirror the demand for the good or service provided by the nonprofit, those producing similar outputs are considered substitutable. The National Taxonomy of Exempt Entities (NTEE) developed by the NCCS is used to define the product market. The NTEE is a classification system that divides the universe of nonprofits into 26 major groups under 10 broad categories based on the kind of output provided. Based on the NTEE core codes, I club nonprofits providing substitutable services into distinct sectors. For example, nonprofits working to protect individuals against spousal abuse (A71), child abuse (A72) and sexual abuse (A73) are clustered under one sector - abuse prevention.

Once the nonprofits are classified under various sectors, the geographic regions within which they are considered substitutes by the donors are identified. I choose the Metropolitan Statistical Area (MSA) as the appropriate geographic unit for analysis. MSAs are defined to include local economic regions with populations of at least 100,000 and contain more than one county.[2] Continuing with the example of the abuse prevention, all nonprofits in this sector located within an MSA will constitute a market. This geographic dimension of the market can be inappropriate in two cases. First, the MSA boundaries are overly narrow for large organizations like the UNICEF and the Red Cross that have national and international presence. Second, easy transfer of funds anywhere in the world over the internet is now a fact. These two factors can potentially result in misleading estimates of the effect of market competition on donations. To lessen such bias, previous papers (Thornton, 2006; Castaneda et al., 2008) suggest restricting the nonprofit sectors to those that satisfy

[2]The 1999 MSA delineation is used in this paper. The metropolitan areas was re-defined by the Office of Management and Budget in 1999, in the middle of the sample.

the following criteria:

1. The nonprofits that are local in terms of consumption of output provided and source of donations.

2. The nonprofits that are reasonably homogeneous across MSAs.

3. The nonprofits that provide outputs that are substantially distinct from for-profit firms.

4. The nonprofits that receive a nontrivial fraction of their revenues from private donations.

The selected 16 sectors are listed in Table A.1. The average number of nonprofits across the sectors displays considerable variation, justifying the importance of the product-based competition. A total of 280 MSA based geographical markets are possible for each sector of nonprofits. Each sector and MSA pairing represents a distinct market. The final sample includes 29,836 distinct nonprofits spread over 3460 markets in the six years.

Market competitiveness of nonprofits is measured by the Herfindahl-Hirschman index (HHI), a traditional indicator common in the field of industrial organization. The HHI is calculated by summing the squared market shares of each nonprofit in a market. Total revenues of nonprofits is used to calculate market shares. Competition among nonprofits is lessened when there is (1) a reduction in the number of nonprofits due to exit of some organizations from the market or (2) increase in the market share of fewer nonprofits. These cause an increase in the HHI, implying a negative relationship between competition and HHI.

The summary statistics of HHI for the different sectors is presented in Table A.2. According to the U.S. Department of Justice's merger guidelines, the nonprofit markets are moderately to highly concentrated over the sample time periods.[3] Specifically, nonprofits in

[3]Unconcentrated markets: HHI below 1500; moderately concentrated markets: HHI between 1500 and 2500; highly concentrated markets: HHI above 2500 (DoJ, 2013).

sectors providing crisis prevention, food programs and family counselling, compete within markets that are substantially more concentrated relative to performing arts and home health care centers. Public housing organizations face intense competition being the least concentrated sector in the sample.

There are alternative indicators of market competitiveness, e.g. number of nonprofits in a market. Relying on the number of nonprofits in a market as a measure of competition is an intuitive approach but it does not consider the relative sizes of organizations, which can play an important role in competition. Both the aspects are better captured in the HHI. If nonprofits in a market are homogeneous, the use of the number of firms or the HHI makes little difference. Given the horizontal differentiation of competing nonprofit as well as the large variation in their sizes, I preferred the HHI as the measure of market competition.

There is an inverse correlation between the number of nonprofits and the HHI in a market. Figure A.1 provides a visual illustration. The figure plots the average number of nonprofits and average HHI over the sample period. Both graphs also show an increasing trend in competition among the nonprofits, despite the variability across the 16 sectors. The absolute growth rate in the average number of nonprofits from 1998 to 2003 is around 30 percent whereas the absolute growth rate in the average HHI over the same time period is 9 percent, demonstrating the difference in the two measures of competition.

Charitable donations is measured by the public support received by a nonprofit in a year. It is the amount of contributions that a nonprofit gets from individual donors, foundations and from affiliated organizations or federated fundraising campaigns. I include donations from foundations and indirect public support through other organizations because such giving is typically motivated by the same reasons as individual donors and should be affected by nonprofit competition in a similar manner. It is important to note that this variable is computed at the nonprofit level with aggregation over donors which prevents us from drawing inferences about donors.

The other important variable in this study is fundraising expenditure of nonprofits. It includes the costs of soliciting contributions from the public and can include campaign printing, publicity, mailing, staffing and other costs. This expense captures the advertising effect in attracting donations. However, there is also a negative effect of fundraising, the

price of giving, which is defined as the after-tax cost of contributing a marginal dollar of output. Following previous papers (Weisbrod and Dominguez, 1986), I define price of giving as:

$$p = \frac{1}{1 - \frac{fr}{don}} \tag{1.1}$$

where fr is the fundraising expenses of a nonprofit and don is charitable donations received by it.

Table A.3 reports the summary statistics for the key variables. The first panel reports the statistics for the variables at the nonprofit level followed by the MSA and state level variables. For the nonprofits in my sample, charitable donations is the second largest source of revenue after proceeds from sale of goods and services for which they receive tax-exemption. Grants from federal, state or local governments are also important. However, for all nonprofit level variables the standard deviations relative to the mean are large due to the presence of extreme observations.

1.4 Empirical Strategy

Using the above described data, I estimate the relationship between nonprofit competition and charitable donations at the nonprofit and market levels. Across-market variation in degree of competition is used to estimate the regression coefficients.[4]

1.4.1 Nonprofit Level

Examining the effect of competition among nonprofits on the amount of charitable donations received by them, through the fundraising and non-fundraising, requires estimating the two following equations:

$$\begin{aligned} lndon_{imt} \;=\; & \beta_0 \;+\; \beta_1 lnHHI_{mt} \;+\; \beta_2 lnfr_{imt} \;+\; \beta_3 lnp_{imt} \;+\; \beta_4 lngg_{imt} \;+\; \beta_5 X_{1imt} \\ & +\; \beta_6 X_{2mt} \;+\; \beta_7 T_t \;+\; \beta_8 Sector_t \;+\; \epsilon_{imt} \end{aligned} \tag{1.2}$$

[4]Despite the panel structure of the data, fixed effects estimation is not adopted in this paper because HHI, the primary independent variable, does not display much variation within the short span of six years in the panel.

$$lnfr_{imt} = \gamma_0 + \gamma_1 lnHHI_{mt} + \gamma_2 lngg_{imt} + \gamma_3 lnliabilities_{imt} + \gamma_4 X_{1imt} + \gamma_5 X_{2mt} + \gamma_6 T_t + \gamma_7 Sector_t + \varepsilon_{imt} \quad (1.3)$$

In the first equation, private donations to nonprofit i in market m at time t (don_{imt}) is regressed on an index of market competition (HHI_{mt}), fundraising expenditure of nonprofit i (fr_{imt}), price of giving to nonprofit i (p_{imt}) and government grants obtained by nonprofit i (gg_{imt}). This is the typical donation function that determines the factors influencing charitable donations to nonprofit organizations. Eq.1.2 additionally takes into account the interaction of nonprofits in a market through competition. The second equation is a fundraising equation that specifies how fundraising expenses respond to changes in competition faced by nonprofits, controlling for government grants and other determinants of fundraising expenses (I_1).

X_1 and X_2 are vectors of exogenous nonprofit and geographic level controls that influence charitable donations and fundraising expenses. The following variables are used as controls in both specifications: all sources of nonprofit income, value of all assets, age of the nonprofits, MSA level per capita income, population and unemployment rate along with the share of the population over the age of 65 in the state, a dummy variable equal to one if the governor is affiliated with the Democratic party and the share of US Congressional and Senate representatives for the state affiliated with the Democratic party.

The equations also include year fixed effects, T_t to account for temporary difference across time. Another set of fixed effects, $Sector_t$ are also present to take care of time-invariant differences across the sectors. In particular, these dummy variables capture the dissimilarities in the nature of the goods and services provided by the nonprofits such as degrees of consumption rivalry. A region could do with one crisis prevention hotline that is non-rival but would need several shelters for the homeless.

The parameters of interest are those that estimate the fundraising and non-fundraising effects of nonprofit competition on charitable donations. The coefficient β_1 in Eq.1.3 is the non-fundraising effect of competition on the average donations received by nonprofits in the market. It is the estimated rate of change in the average charitable donations with respect to a unit change in the market HHI.

The fundraising effect of nonprofit competition on charitable contributions involves estimation of two components - the effect of competition on fundraising and the effect of fundraising on donations. The coefficient of γ_1 in Eq.1.3 captures the first component. The second component, referred to as the total fundraising elasticity of donations (β_f), encompasses the positive and negative effects of fundraising on donations. It is obtained by differentiating Eq.1.2 with respect to $lnfr_{imt}$:

$$\beta_f = \beta_2 + \beta_3 \frac{fr}{(don - fr)} \tag{1.4}$$

β_f is computed from the regression coefficient and the data on fundraising expenses and charitable donations of individual organizations. Combining the two components, $\beta_f \gamma_1$ provides the estimate of the fundraising effect of competition on charitable donations operating through solicitation efforts of the nonprofits.

There are two approaches that can be used to estimate the simultaneous equation model specified by Eqs.1.2 and 1.3. The single equation estimation involves estimating the two equations separately whereas in the system estimation the two equations are estimated jointly. Although the system estimation has the advantage of using more information to provide more precise parameter estimates, the more robust single equation approach is adopted in this chapter. Wooldridge (2002), cautions that unless all equations in the system are properly specified, the system estimates will not be consistent.

Consistent estimates of the effects of nonprofit competition on charitable donations requires addressing identification challenges arising from endogeneity of the independent variables. For nonprofits there are potentially three factors which can cause endogeneity omitted variable bias, measurement error and simultaneity. First, omitted variables bias occurs from the failure to include variables that affect donations, fundraising and competition levels in Eqs.1.2 and 1.3. For instance, ability of personnel or their dedication to the mission that are correlated with both the income and expenses of nonprofits. There are also market specific unobserved characteristics that can affect donations and competition levels in the market at the same time.

Second, measurement errors in the variables is a cause of concern in this dataset because

the information in the Forms 990s is self-reported and subject to lax monitoring by the IRS. Expenses are often inconsistently reported by nonprofits who fear being judged inefficient by potential donors. Random measurement errors in the dependent variable do not affect the estimated coefficients, but they enlarge the standard errors making detection of any significant effect more difficult. Even when the errors are not random, the slope coefficients in the regression are unbiased. On the other hand, I rely on econometric techniques to address measurement errors in the independent variables. Yet, there remains the possibility of the estimated coefficient being biased due to under-reporting of expenditures by some nonprofit organizations.

Third, the absence of a unidirectional relation between the independent and dependent variables is likely to bias the OLS estimates. Market competition, fundraising and government grants can be simultaneously determined.[5] Consider, for instance, the nonprofit sector in Louisiana in the aftermath of Hurricanes Katrina and Rita (Auer and Lampkin, 2006). The disaster caused several organizations to close down temporarily or permanently. While some nonprofits received increased levels of giving to nonprofits from individuals, foundations, parent organizations, local, state and federal governments, many were uncertain about their incomes. If an exogenous event can cause charitable donations, competition index, fundraising and government grants to be correlated, then there is a problem of simultaneity.

A solution to the identification problem is to use instrumental variables estimation to reduce the potential biases due to endogeneity. Fundraising, government grants and the competition index are instrumented by the respective variables: (1) total nonprofit liabilities (I_1), (2) government transfers at the market level, and (3) average competition index across all other markets in the state that provide similar goods and services.

Fundraising expenses of nonprofits is instrumented by their total liabilities, a proxy for the financial security of the organization (Andreoni and Payne, 2011; Heutel, 2014). If a nonprofit has high liabilities in a year then it will adjust its fundraising expenditures. Furthermore, the level of private donations that a nonprofit receives in a given year will not to

[5] A growing literature (Andreoni and Payne, 2003, 20011) shows that fundraising is also endogenously determined, though the direction of bias is uncertain.

be affected by the total liabilities because it is unlikely for donors to have information on the contemporaneous financial conditions of a nonprofit. Regional level measures of government transfers to individuals and nonprofits for which no current services are performed is used as an instrument for government grants. These consists largely of retirement and disability insurance benefits, medical payments, unemployment insurance benefits, supplemental security income payments, food stamp payments, and other assistance payments. This instrument satisfies the exogeneity assumption as it represents the aggregate government giving in a county in a particular year and does not reflect the actions of the donors.

Finding good instruments for market competition, which are relevant but uncorrelated with the error term, is challenging. The obvious determinants of nonprofit market competition are demographic and socio-economic factors indicating the demand for the services of the nonprofit within the geographical area. Yet, none of these can be instruments because they are directly correlated with contributions by donors. Donors, however, are not to be influenced by nonprofits in other areas since those do not supply them with any output. They are not likely to take into consideration the conditions in other markets while deciding on their contributions to a particular nonprofit, ensuring the exogeneity of this instrument. The average level of the HHI across all other markets producing similar output within the state is used as an instrument. The competition of similar nonprofits in other markets across a state should be a good indicator of the market structure.

With the instruments above, two-stage least squares (2SLS) method is applied to the two equations. This empirical strategy will provide credible estimates if the instruments are strong predictors of the endogenous variables. The validity of the three instruments is justified through Table A.4 which reports the results of the first stage regression of the endogenous variables in Eqs.1.2 and 1.3.[6] The coefficients of all the instruments are statistically significant and the F statistics on the joint significance of the instruments are large. This is a just identified system in which the bias due to weak instruments is approximately zero. The estimated coefficients of fundraising, government grants and HHI are then used

[6]The first stage equations for Eqs.1.2 and 1.3 are:
$lnHHI_mt = f(lnaverageHHIinothermarkets, lnliabilties_{imt}, lntranfers_{imt}, X_1, X_2$
$lnfr_{imt} = f(lnaverageHHIinothermarkets, lnliabilties_{imt}, lntranfers_{imt}, X_1, X_2)$
$lngg_{imt} = f(lnaverageHHIinothermarkets, lnliabilties_{imt}, lntranfers_{imt}, X_1, X_2)$

to compute the predicted variables, which in turn are used to estimate the second stage structural equations at the nonprofit level.

1.4.2 Market Level

To test the hypothesis that nonprofit competition affects charitable donations and fundraising, in aggregate, estimations of the donation and fundraising equations are carried out at the market level. Each market is now an observation, instead of individual nonprofits. Sum of donations by all donors in a market ($aggdon_{mt}$) and aggregate fundraising expenses by competing nonprofits ($aggfr_{mt}$) are replaced as the dependent variables in Eqs.1.2 and 1.3 respectively. I eliminate nonprofit level controls from the equations since they do not have any external effects on the society. The empirical model, specified for market m in time t, is:

$$lnaggdon_{mt} = \beta_0 + \beta_1 lnHHI_{mt} + \beta_2 lnaaagfr_{mt} + \beta_3 X_{2mt} + \beta_4 T_t + \beta_5 Sector_t + \epsilon_{imt} \tag{1.5}$$

$$lnaggfr_{mt} = \gamma_0 + \gamma_1 lnHHI_{mt} + \gamma_2 X_{2mt} + \gamma_3 T_t + \gamma_4 Sector_t + \varepsilon_{imt} \tag{1.6}$$

OLS regressions are used to estimate Eqs.1.5 and 1.6. The non-fundraising effect of nonprofit competition on aggregate charitable donations is given by β_1 whereas the fundraising effect is $\beta_2\gamma_1$.

1.5 Impact of Nonprofit Competition: Estimates

The first two subsections present the results of the regressions of the equations at the nonprofit and the market levels. I then use the estimates to compute the direct, indirect and total effects of nonprofit competition on charitable donations.

1.5.1 Nonprofit Level Estimates

In Table A.5 I start off with the estimation results of Eq.1.2, followed by those of Eq.1.3. Column (1) reports the OLS estimates of the donation function in Eq.1.2. The OLS coefficient of HHI is 0.00296 percentage points and not statistically significant. In column (2), I

instrument for HHI, fundraising expenses and government grants and estimate the model by 2SLS. As discussed above, this addresses the issues of endogeneity. The HHI coefficient is now 0.108 percentage points. Comparison of the HHI coefficient in column (1) and column (2) suggest a downward bias in the least square model. A 10 percentage point increase in the HHI in a market is associated with a 1 percentage point increase in charitable donations received by a nonprofit on average. Put differently, lesser competition directly increases the average donations received by the nonprofits.

The coefficient on the other covariates in column (2) of Table A.5 are consistent with previous work. Fundraising has a significant positive relation with donations and the fundraising elasticity varies between zero and one. The price of giving coefficient is negative. There is also weak evidence of government grants crowding out of donations, in accordance with results of previous papers (Kingma, 1989; Simmons and Emanuele, 2004; Gruber and Hungerman, 2007; Andreoni and Payne, 2011). Revenue generating sales by nonprofits also crowds out voluntary giving, probably because donors associate it with a decline in the marginal utility of main output. Age, a proxy for reputation of a nonprofit has a statistically significant positive effect of charitable donations.

In columns (3) and (4) I estimate the fundraising equation in Eq.1.3 using OLS and 2SLS respectively. The downward endogeneity bias, observed above, is evident since the OLS estimate of HHI is smaller than its 2SLS counterpart. A 10 percentage point increase in HHI reduces fundraising expenses of nonprofits by 2 percentage points on average. Competition, therefore, leads to greater average fundraising expenses by nonprofits. The positive relation between nonprofit competition and fundraising agrees with the findings of Feigenbaum (1987) and Castenda et al. (2008). The departure from the findings of Thornton (2006) can be attributed to a shorter time panel over which the donor market is fixed. According to the hypothesis stated in Section 1.2, the negative and statistically coefficient of per-nonprofit fundraising expenditure suggests that the size of donation market is fixed and fundraising is aimed at stealing away donors from rivals.

Again in accordance with Andreoni and Payne (2011), more government grants flowing into nonprofits reduces their fundraising efforts. There is evidence of older and bigger nonprofit to be fundraising more.

1.5.2 Market Level Estimates

Table A.6 reports the aggregate level estimates of OLS regressions of Eqs.1.5 and 1.6. In columns (1) and (2), the negative and statistically significant coefficients of HHI indicates that a 10 percentage point increase in HHI causes a 7 percentage point and 23 percentage point decrease in the aggregate donations and aggregate fundraising expenses, respectively. The high magnitude of the HHI coefficient in Column 4 hints at the existence of excessive fundraising in the market. Nonprofits do not engage in cooperation in terms of their fundraising strategies, as is also illustrated with the nonprofit level estimates. One must be careful with this interpretation because marginal fundraising expenditures are not observed, making it difficult to correctly determine whether there is too much (as a percentage of total revenue) being spent on fundraising.

1.5.3 Total Effect

The total effect of HHI on charitable donations is computed from the above estimation results and is summarized in Table A.7. Column (1) presents the effects at the nonprofit level. The non-fundraising effect of HHI on charitable donations received by a nonprofit is the coefficient of HHI in Eq.1.2, presented in column (2) in Table A.5, namely 0.108. The fundraising effect of competition on charitable donations is the HHI coefficient in column (4) of Table A.5 times the total fundraising elasticity. The mean total fundraising elasticity, calculated by the formula in Eq.1.4 for each individual organization is -2.12. This implies that the negative price effect of fundraising dominated the positive effect of attracting donors. Since larger fundraising expenses reduces the inflow of donations, the decline in fundraising caused by increased HHI has a positive impact on donations received per-nonprofit. The average fundraising effect of nonprofit competition on charitable donations per-nonprofit is 0.45.

Summing the two effects, we see that the total effect of a 10 percentage point increase in HHI is approximately 6 percentage point increase in per-nonprofit charitable donations. In other words, greater competition among nonprofits in a market leads to a decline in the amount of charitable donations received on average by a typical nonprofit organization.

Over 80 percent of the decrease in donations can be attributed to adjusted fundraising strategies of nonprofits.

Column (2) of Table A.7 presents the effects of nonprofit competition on the aggregate charitable donations. The market level total effect of nonprofit competition and its constituents are opposite to those at the nonprofit level. On aggregate, the non-fundraising effect of increased HHI on donors accounts for 40 percent of the decline in donations whereas the fundraising effect via fundraising causes 60 percent of the decline. Thus, competition among nonprofits causes a growth in to the total pool of contributions in the market, with a larger part of the increase being the result of aggressive fundraising by the nonprofits.

Tables A.8 and A.9 provides the results of several checks for the robustness of the main outcomes at the nonprofit level. In general, I find that the results are robust to the inclusion of a time variable to account for the increasing trend in charitable consumption, trimming the data set of the top 1 percent of observations in charitable donations and fundraising expenses, and to expansion of the sample to include organizations with zero charitable donations and fundraising expenses over the six years of the model. I also consider a subset of only those markets which include nonprofits with zero fundraising in all six years. Interestingly, the HHI has a larger positive effect on charitable donations than the base model, strengthening the hypothesis of non-fundraising effect of market competition on charitable donations through changes in non-fundraising aspects of nonprofit behavior. The market level regression estimates under these alternate specifications are the same results as reported in Table A.6.

1.6 Discussion

In this section, I bring together the estimation results to answer the main question of this chapter: what is the effect of nonprofit competition and what drives this effect? The answer has many implications about nonprofit policies, mergers, nonprofit strategies and donor behavior.

An increase in nonprofit competition causes a decrease in charitable contribution received on average by a nonprofit. This decline in donations occurs primarily because of the response of donors to fundraising. Nonprofits resort to more fundraising when confronting greater

competition but excessive fundraising is not well perceived by donors. The changes in the non-fundraising strategies by nonprofits also has a negative effect on the average donations. This is possible if the nonprofits do not correctly implement these strategies or if donors are not sensitive to such changes. Further research is needed to identify what causes the negative non-fundraising effect of competition and how nonprofit managers can utilize them to their benefit.

There is positive (negative) effects of competition (HHI) on the aggregate donations received by all nonprofit in the market in a year. However, the increase in aggregate charitable contributions in a market, due to greater competition, does not translate into higher donative earnings for all nonprofits. An increase in the aggregate charitable donations with a simultaneous decrease in the average is possible only if the increase in number of nonprofits dominates the increase in the total contributions due to competition, as measured by HHI. One possible explanation is that donors do not adjust their monetary contributions by large amounts when reacting to changes in nonprofit competition. The entry of a nonprofit into a market pushes up the amount of total donations because some donors who are enthused by the new organizations ideology or observe greater efficiency in operation of existing nonprofits. Yet, a majority of the donors do not vary their charitable donations with respect to changes in nonprofit behavior. They might switch their donations from one nonprofit to another, without increasing the amount of contributions very much. Additionally, the donor market is fixed in nature with no new donors entering to push up the level of donations. Thus, the rise in giving is not substantial enough, reducing the share of donations enjoyed by each nonprofit.

With the development of the nonprofit sector, a primary concern of scholars is that the private organizations would fail to address social goals during the provision of goods and services with external benefits. Shleifer (1998) points out that such fears "can be addressed through government contracting and regulation, without resorting to government ownership". Given the importance of government regulation in maintaining the standards of the nonprofit sector, it is necessary to be careful about the impact of policies on nonprofit and donor behavior.

The rapid growth in the nonprofit sector over the last decade has increased competition

among nonprofits. The findings of this chapter suggests that this has caused an increase in aggregate donations flowing into the sector but not by very large amounts. As a result, the average receipt of charitable donations of a nonprofit has decreased. Fundraising expenses of nonprofits have also increased at the same time. For a typical nonprofit heavily reliant on charitable donations as a source of revenue, there will be lesser funds available for the production of the output. In reality, the increase in aggregate donations is because of few foundations or donors and it gets unevenly distributed in favor of a handful of nonprofits, while most organizations are left to fight it out.

So should there be regulation of the number of nonprofits in a market? The results of the above analysis are applied to a practical example to evaluate how changes in market competition can affect the nonprofit sector. In 2006, the Pension Protection Act modified the tax codes with respect to filing of annual returns by nonprofits. Prior to 2008, nonprofits with gross receipts less than $25,000 did not have to make any annual tax filings with the IRS. The Congress then mandated that these small organizations file their returns using a new form, the Form 990-N. Any nonprofit that failed to do so for three consecutive tax years would automatically have their tax exemption status revoked. Following this policy, there has been a crackdown by the IRS on numerous small nonprofits, causing a decrease in competition in the charitable donations markets.

According to the total effect estimated in this chapter, this will decrease the aggregate charitable donations that flow into a nonprofit market but not by significant amounts. There will be an increase in the average donations received by the nonprofits that continue to operate, who will devote lesser shares of their incomes on fundraising expenses. Consequently, the provision of goods and services on average by nonprofits will increase. One important caveat is worth mentioning here. The sample data of this study includes those nonprofits that have gross receipts greater than $25,000. The tax modification will mostly affect smaller nonprofits that have greater reliance on public donations and face more intense competition. While the signs of the direct and indirect effects of market competition should continue to hold, the estimated magnitudes will be different.

The evidence in this chapter shows the economic benefits and costs of mergers. There is growing support for nonprofit mergers among practitioners and experts in nonprofit manage-

ment. Nonprofit mergers, by reducing the number of competing organizations in a market, will increase per-nonprofit receipt of charitable donations but reduce the aggregate contributions in the nonprofit sector. The trade-off between more aggregate funds and average receipts by nonprofits highlights the need for deeper understanding of the process.

1.7 Conclusion

In this chapter I estimate the effect of nonprofit competition on charitable donations, indicating the varying impact that different nonprofits strategies can have on donors. I show that greater competition among nonprofits increases the aggregate donations by all donors in the market. In spite of the marginal increase in the amount of money leaving the pockets of some donors, the competition proves detrimental for the average donations received per-nonprofit. It is also harmful because of the excessive fundraising that nonprofits undertake to deal with the competition. There are noteworthy policy implications for individual nonprofits as well the sector as a whole.

Since no single study can embrace all aspects of an issue, there are limitations in this chapter too. First, the choice of market construction can be an issue of criticism. A uniform satisfactory approach to identify nonprofit markets should be addressed before the study of nonprofit competition can make serious headway. Second, the data used is restrictive because larger regional, national and international markets for donations is kept out of its scope. Several smaller nonprofits were also not examined due to lack of data. Third, the quality of the data itself is questionable. Access to more reliable data from a larger universe of nonprofits will also prove helpful. This is the first attempt at measuring the total effect of nonprofit competition on charitable donations. Additional studies are necessary to add to the robustness of the results and take our understanding of nonprofit competition forward.

Overall, the study indicates that nonprofit competition is an important determinant of charitable donations. We should move beyond the individual-level analysis of nonprofits in our attempt to enhance our understanding of nonprofit and donor interaction. The following chapter extends the analysis of changes in the competitive environment on nonprofits to look at the use of revenue diversification as a tool to compensate the decline in charitable donations.

Chapter 2

EFFECTS OF NONPROFIT COMPETITION ON REVENUE DIVERSIFICATION

2.1 Introduction

For several years revenue diversification has been discussed as a powerful strategy available to nonprofit organizations. It is the practice of relying on multiple sources of revenue. It has been linked to various indicators of financial health of nonprofit organizations. Despite the importance of this topic, the question of how the revenue diversification strategy evolves in response to changes in a nonprofit organization's market conditions has not been considered. Instead, the focus of researchers has been on examining the performance implications of multiple revenue sources. (e.g., Chikoto and Neely (2013); Carroll and Stater (2009); Hager (2001)). However, to provide correct guidance on the strategic behavior of nonprofits it is important to understand how an organization's choice of revenue diversification changes in response to changing market conditions.

A significant development in the nonprofit sector has been the increasing competition among the nonprofit organizations. The sector in USA has been growing steadily in size for more than a decade. Between 2000 and 2010, the number of all registered nonprofits has increased by 24 percent. In 2010, nearly 1.6 million nonprofits, not including religion congregations and smaller organizations, were registered with the Internal Revenue Service (IRS). More nonprofits increase the competition for limited resources among the organizations.

Nonprofit competition can have strong economic effects on individual organizations and the market. Increased competition increases the expenditure on soliciting funds and decreases perquisite expenses (Feigenbaum, 1987; Castaneda et al., 2008). It also leads to a decline in the charitable donations received by nonprofit organizations. By introducing greater number of rivals that can better cater to the ideologies of some donors, nonprofit competition changes the distribution of donations among organizations, without any signifi-

cant increases in the aggregate amount of contributions (Chapter 1). These adverse effects of competition on nonprofits indicate the need for a strategy to deal with these repercussions.

There is a general perception that the fiscal pressures caused by the expanding nonprofit sector along with shrinkage of public and private giving have created the need for new sources of income for the organizations. The increasing costs and the demands for greater organizational accountability have also led to revenue diversification (Fischer et al., 2011; Carroll and Stater, 2009). However, no systematic empirical investigation of this presumed link has been studied. This chapter seeks to contribute to the literature on diversification strategy through an empirical examination of how the nonprofit competition for resources influences the extent of revenue diversification.

The theoretical prediction in this chapter about the effect of competition on the level of nonprofit revenue diversification hinges on the transaction cost theory. Transaction cost theory (Williamson, 1979) has been applied to for-profit firms to suggest that there will be a reduction in the level of diversification in response to competitive conditions because of the increase in the marginal cost of managing diversity (Bowen et al., 2011; Bergh, 1998; Bergh and Lawless, 1998; Hill and Hoskisson, 1987).

2.2 Theory and Hypothesis

A nonprofit's optimal level of revenue diversification will depend on the economic gains from diversification versus the costs arising from it. Though several theories have been advanced to explain the choice of income portfolios by nonprofit organization, the resource dependence theory is most frequently referred to in the literature of revenue diversification. It explains that "the key to organizational survival is the ability to acquire and maintain resources" (Pfeffer and Salancik, 1978). There also exists numerous empirical studies that consistently show that diversification of revenue positively affects nonprofits. While some scholars focus on measures of financial health such as stability (e.g., Yan et al. (2009); Carroll and Stater (2009); Kingma (1993), capacity for growth (e.g., Chikoto and Neely (2013); Keating et al. (2005); Greenlee and Brown (1999), others find support for increased longevity (Hager, 2001) and organizational legitimacy (Galaskiewicz and Bielefeld, 1998). At the same time there are a few cautioning voices about taking the positive relationships

for granted (Mayer et al., 2012).

The expected benefits must be balanced against the costs of pursuing revenue diversification. Nonprofits incur additional costs when they adopt multiple sources of revenue (Frumkin and Keating, 2011). One of the important costs are transactions costs. Transactions costs are unavoidable in any economic system - profit maximizing markets, governments, nonprofits - which involves exchange of resources among two parties. Generally, they are viewed as a spectrum of institutional or organizational costs that do not arise from the production of goods (Falconer and Whitby, 1999). Although largely ignored as frictions in a system, the necessity of organizations recognizing transaction costs when taking decisions was expounded by Williamson (1979).

With regard to revenue diversification by nonprofits, transaction costs are those associated with managing and accounting for multiple funding sources. More than one source of income increases the complexity of managing a portfolio of revenues and imposes limits on organizations (Coase, 1937). This in turn raises the cost of internal governance. Frumkin and Keating (2011) show that nonprofits with weak revenue diversification experience considerably higher administrative and fundraising costs.[1] There can be several reasons for increases in transaction costs, the amounts of which will depend on the nature of diversification.

First, there can be an increase in the transaction costs of maintaining a diverse income portfolio through an elaborate structure and specialized staff. Sustaining complex dependency relationships among the various income channels is expensive, as successfully coordinating each income stream requires considerable management (Gronbjerg, 1992, 1993; Powell and Friedkin, 1986). Second, each income comes with a set of requirements that must be satisfied to ensure continued support. Gronbjerg's case-study of government grants and contracts demonstrate the intense control exerted by public authorities to safeguard statutory and legislative standards. Similarly, an ethnographic study of government contracting in 18 NPOs reports that managers must learn the ways to bend the rules to deal with con-

[1] Administrative and fundraising costs can be used as proxies for transaction costs of nonprofits. However, they are not the same. While the theory of transaction costs is based on the avoidable costs arising from exchange between two economic agents, administrative and fundraising costs are choice variables of nonprofit organizations that can be curtailed or increased.

flicting demands (Bernstein, 1991). There is also evidence of greater numbers of finance and marketing personnel in arts organizations, replacing voluntary members (DiMaggio, 1996; Adams and Perlmutter, 1991) in response to higher levels of earned income. Third, distinct types of resource providers differ in their views of effectiveness, wanting different evaluation indicators (Tuckman, 1998). Fourth, there are implicit costs arising from conflict within a nonprofit over questions of appropriateness of a particular income stream. Kearns (2007) posits that nonprofits are multi-decision-maker organizations with diverse constituents' preferences. Such organizational tensions can be difficult to manage (DiMaggio, 1996). All this lead to increasing transactions costs.

Transaction cost theory posits that if changes in a nonprofit's competitive environment entails expending more resources towards acquiring, monitoring, integrating, and coordinating its income generating activities then such competition would be expected to increase the costs of revenue diversification. Increased competition is more likely to increase uncertainty about funding and will require higher levels of differentiation on the part of the nonprofit. This will, in turn, increase the costs of coordinating its many activities. Moreover, when there are greater number of nonprofits striving for a limited monetary pool in various fund markets - donations, government grants, foundation grants, product sales, it will be costlier for organizations to identify and obtain newer sources of income. For instance, Ashley and Faulk (2010) advice nonprofit managers and fundraisers to apply to many foundations simultaneously because of differential assessment of financial ratios. Such a process that involves screening of suitable foundations, reviewing funding initiatives, completing application forms and preparation of proposals and reports, is costly. For similar reasons, a lot of emphasis is given to generating outstanding evaluation and financial reports, often by hiring specialists to engage in manufacturing efficiency measures (Frumkin and Kim, 2001; Ashley and Faulk, 2010).

The assumption underlying this argument is the existence of diseconomies of scale. Nonprofits have limited administrative or managerial capacity that cannot be instantly adjusted. The fight for resources due to competition will escalate the pressures on the limited amounts of managerial capacity of a nonprofit. This will, therefore, be expected to raise the opportunity cost of keeping managerial resources devoted to non-mission spending. Since the net

benefit from allocating scarce managerial resources to sustaining diverse income channels is reduced, nonprofits will choose to lower its level of diversification.

Hypothesis: Nonprofit competition will negatively affect the level of revenue diversification by a nonprofit, ceteris paribus.

In other words, if there are two nonprofits with similar industry and organization specific characteristics, then the nonprofit in the more competitive market will have higher transaction costs of revenue diversification, compared to the one with greater market power. Assuming that expected returns from diversification are same for both nonprofits, the expected net benefit from choosing a diverse income portfolio will be lower for the first nonprofit. As a result, the incentive to diversify will be toned down in the face of increased competition. The following sections in this chapter describes the data, the empirical methodology and results used to test this hypothesis. Appendix B contains all tables and figures to which this chapter refers.

2.3 Methods

2.3.1 Dataset

The data for the empirical analysis come from the Digitized Database of the National Center for Charitable Statistics (NCCS). As mentioned in Chapter 1, this database contains observations on all nonprofits required to file the Form 990 and Form 990-EZ in the fiscal years from 1998 to 2003. The advantage of the digitized database is the availability of information on the various constituents of total contributions, enabling the construction of comprehensive indices of revenue diversification. Despite the caveats to using the tax return forms, primarily the exclusion of organizations grossing less than $25,000 and allegations of misreporting of costs, it remains the primary data for studying nonprofit finance (Chang and Tuckman, 1994; Frumkin and Keating, 2011; Hager, 2001; Greenlee and Trussel, 2000; Carroll and Stater, 2009; Mayer et al., 2012).

Although this database is verified by the NCCS, to improve the quality of the reported data, the sample used in this chapter is subject to systematic data cleaning, slightly different from the steps involved in Chapter 1 because of different variables involved. I consider

only public charities with non-zero total revenue. Total revenue is calculated by adding its constituents instead of relying on the self-reported variable. There are 319,486 such nonprofits over the 6 year panel. For the regression analysis, the sample is further restricted to nonprofits within recognizable geographic extent and discrepancies in the geographical identifiers of the remaining nonprofits are corrected. Inability to calculate the valid age of the nonprofits because of missing or faulty ruling year data led to the nonprofits being dropped from the study. This yields an unbalanced panel of 169,972 total observations over the 6-year time period, which includes 37,616 different organizations. Although the greatest majority of organizations (61.4%) are observed every year under analysis, the number of organizations observed each year varies and includes 4,068 (2.4%) organizations that filed 990 forms in only one year during the time period. All the financial variables are adjusted for inflation using the Consumer Price Index (CPI).

2.3.2 Variables

Revenue Diversification

Revenue diversification refers to the relatively equal reliance on revenue generated from a variety of revenues (Chang and Tuckman, 1994). The use of diversified revenue structures was originally suggested as a corporate finance strategy by Markowitz (1952a). His work on portfolio theory considers how an optimizing investor will behave. Given the negative correlation between risk and return, an investment with high expected return should be chosen if the desired amount of risk is known. If the desired expected return is known, the theory explains the steps in selecting investments that offer the lowest risk. But Markowitz states that a portfolio cannot be made up of investments that are chosen individually. It is important to consider the portfolio as a whole to allow the benefits of diversification - chief among them, a reduction in the riskiness of the portfolio in the face of uncertainty.

Since nonprofit organizations are also subject to uncertainty in income, the tenets of the portfolio theory can, therefore, be extended to them. In fact, Jegers (1997) argues that nonprofits weigh both the expected return and the risk of funding streams when choosing revenue structures. The diversification of revenue is commonly believed to be a best practice

among nonprofit managers and is often their foremost funding objective. Tuckman and Chang (1992) stress that nonprofits seek to increase their organization's equity, in spite of their primary mission oriented goals.

Traditionally nonprofits were either donative or commercial in nature depending on whether they received virtually most of their income from charitable donations or from commercial activities (Hansmann, 1980). The concept of revenue diversification has caused the line of distinction to be blurred. The key idea of diversification is the generation of revenue from multiple sources. Nonprofit organizations rely on a variety of sources to finance their operations. In addition to charitable contributions from several entities and fees from the sale of goods and services, nonprofit organizations also earn incomes from asset management and various other channels. Tuckman and Chang (Chang and Tuckman, 1994) identify nine categories of revenue for nonprofit organizations. These are:

1. direct public support,
2. indirect public support,
3. government grants,
4. program service revenue,
5. membership dues,
6. interest, dividends, other investment and net rental income,
7. net sale of assets,
8. special fund-raising, and
9. revenue from all other sources.

While some scholars consider a comprehensive list of revenue channels (e.g., Keating et al. (2005); Froelich (1999); Young (2007); Calabrese (2011); Chikoto and Neely (2013))

many group them into broader categories. Some researchers rely on three revenue streamscontributions, earned and investment income (e.g., Keating et al. (2005); Carroll and Stater (2009)), while others expanded the revenue streams into four major categories private contributions, government grants, earned and investment income (e.g., Yan et al. (2009)). The choice of constituents of the measure of revenue diversification depends on the nature of the 990 data used by the researchers. Given the richness of the data used in this chapter, I model revenue diversification in three ways by including three sources of revenue (RD3), four sources of revenue (RD4) and nine sources of revenue (RD9). The definition of each revenue sources used to define the measures of revenue diversification along with the corresponding line number of each item as reported on Form 990 is provided in Appendix B.

The diversification of revenue among the different sources is typically quantified by the Hirschman-Herfindahl Index (HHI). Tuckman and Change (1994) was the first to apply the HHI to revenue diversification while studying nonprofit finance and has since been consistently in the literature. In the current chapter, Hirschman-Herfindahl Diversification index is calculated in the following way:

$$RD = \frac{1 - \sum_{i=1} R_i^2}{1 - \frac{1}{n}} \tag{2.1}$$

where R_i is the share of revenue generated by each of revenue source, $i = 1, 2, ., n$. The denominator ensures that the RD has a maximum value of 1, instead of $1 - \frac{1}{n}$, when the revenue is distributed equally among the sources (i.e., perfect diversification). At the other extreme, if income is derived from one source (i.e., no diversification) then the index equals 0. This implies that the RD ranges from 0 to 1, irrespective of the number of sources of revenue, with higher values indicating greater levels of diversification among nonprofit revenue structures.

Table B.1 reports the median level of revenue diversification from 1998 to 2003. Overall, the extent of revenue diversification is not very high among nonprofits. The levels of diversification are greater when the index is constructed using a finer categorization of revenue sources. Indeed, it is more plausible that nonprofits appraise individual channels of revenue, not limiting their choices to donative, commercial and investment incomes. Irrespective of

the index, the average trend in revenue diversification over this period has been downward, contrary to general perception. The forth column shows the growth in the number of non-profit organizations during the same period. The objective of this study is to examine whether a causal relationship exists between the two variables.

However, the averages in Table B.1 can mask a great deal of variation across geographical regions. This is revealed by the median level of revenue diversification across the states in Figures B.1, B.2 and B.3. These differences can be explained by several factors such a state-wise differences in tax laws, regional economies and philanthropic cultures.

A nonprofit's activity is also likely to impact the number of revenue sources available to it. The nature of some activities make them open to multiple sources of income and more desirable to private and public donors (Chang and Tuckman, 1994). The median values of revenue diversification for each activity category are presented in Table B.2. Activity categories are based on the National Taxonomy of Tax Exempt Entities (NTEE) classification created by the National Center for Charitable Statistics which, groups the universe of nonprofits according to the major activities they perform. The revenue diversification index is the greatest for nonprofits in the Arts, Culture, and Humanities and Animal Related categories. On the other end of the spectrum are nonprofits in International/Foreign Affairs and National Security and Religion Related/Spiritual Development categories with low levels of diversification.

The table also highlights that the portfolio selections also depends on the activities of nonprofits. While nonprofits in some categories demonstrate low diversification with RD3, they have a high values for RD9. For example, nonprofits in Public Protection: Crime Prevention, Legal Administration/Services have a 0.06 level of RD3 but a 0.277 level of RD9. [2]

[2]Negative values on a particular income stream challenge this measure because it results in revenue concentration measures that exceed a value of 1. Because a net loss on a particular income stream cannot buffer an organization in hard times, negative incomes were reset to a value of 0. This also required that I adjust total revenues to be equal to the sum of the forgoing components rather than the values given on the 990 forms.

Nonprofit Competition

I use the same measure of market competition as used in Chapter 1. The construction of the variable is very briefly mentioned here. A market in this chapter includes all nonprofits supplying similar goods and services that are actual or potential competitors within a well-defined area. Initially, a product market is defined by identifying nonprofit organizations that donors regard as substitutes in terms of their output. Based on the NTEE core codes, nonprofits providing substitutable services are clubbed into distinct sectors. Once the nonprofits are classified under various sectors, the geographic regions within which they are considered substitutes by the donors are identified. The Metropolitan Statistical Area (MSA) is chosen as the appropriate geographic unit for analysis. MSAs are defined to include local economic regions with populations of at least 100,000 and contain more than one county.

This geographic dimension of the market can be inappropriate in two cases. First, the MSA boundaries are overly narrow for large organizations like the UNICEF and the Red Cross that have national and international presence. Second, easy transfer of funds anywhere in the world over the internet is now a reality. These two factors can potentially result in misleading estimates of the effect of market competition on donations. To lessen such bias, previous papers (Thornton, 2006; Castaneda et al., 2008) suggest restricting the nonprofit sectors to those that satisfy the following criteria:

1. The nonprofits that are local in terms of consumption of output provided and source of donations.

2. The nonprofits that are reasonably homogeneous across MSAs.

3. The nonprofits that provide outputs that are substantially distinct from for-profit firms.

4. The nonprofits that receive a nontrivial fraction of their revenues from private donations.

The selected 16 sectors are listed in Table B.3. It also shows the number of nonprofits and MSAs in each sector. Each sector and MSA pairing represents a distinct market.

The degree of concentration in a market is also measured by a Herfindahl-Hirschman index (HHI), which is calculated by:

$$Conc = \sum_i S_i^2 \tag{2.2}$$

where S_i^2 is the sum of the squared market shares of each nonprofit in a market. Total revenues of nonprofits is used to calculate market shares. Competition among nonprofits is lessened when the index increases, which is when there is (1) a reduction in the number of nonprofits due to exit of some organizations from the market or (2) increase in the market share of existing nonprofits. The advantage of this measure over alternative indicators of market competitiveness, such as number of nonprofits in a market, is that it takes into account the number of nonprofits in a market as well as their relative sizes of organizations.

Nonprofit Controls

In addition, the financial status and exogenous characteristics of a nonprofit will determine its choice of revenue diversification. In keeping with prior literature, the following variables are included to control for nonprofit level factors.

Organization slack: Organizational slack is measured by administrative and fundraising inefficiency, which are the ratios of administrative and fundraising expenses (lines 14 and 15 on IRS form 990), respectively, to total expenses (line 17 on IRS form 990).[3] Such non-programmatic expenses have been associated with greater leverage available to nonprofits to adjust their finances during trying times (Tuckman and Chang, 1991). Conversely, nonprofits with a higher proportion of administrative and fundraising expenses to total expenses have been argued to have a diminished ability to generate financial returns on their expenses in the form of solicited donations or investment earnings, leading to greater need for revenue diversification (Frumkin and Keating, 2011; Greenlee and Brown, 1999; Jacobs and

[3]Negative expenses were reset to a value of 0. This also required that I adjust total expenses to be equal to the sum of the forgoing components rather than the values given on the 990 forms.

Marudas, 2009; Tinkelman and Mankaney, 2007; Keating et al., 2005). Irrespective of the whether organization slack is positively or negatively linked with revenue diversification, it does affect the revenue choice of nonprofits.

Financial position: There is a general consensus in the literature that revenue diversification is a key indicator of financial status of a nonprofit organization. It is then plausible that organizations with poor financial performance might be encouraged to alter their revenue portfolio to achieve greater revenue diversification, whereas financially strong organizations may not diversify in the absence of the need to improve their conditions. On the contrary, a nonprofit with good financial record will find it easier to participate in capital markets and convince donors and foundations about their efficiency. In such a situation, there will be a positive relationship between the financial strength and level of revenue diversification of a nonprofit organization. While some rigorous studies take cognizance of the reverse causality (Carroll and Stater, 2009), many choose to ignore it.

One proxy of financial strength of a nonprofit is the financial flexibility of an organization.[4] It can be measured by its equity balance, the difference between year-end liabilities and assets (lines 59b and 66b of IRS form 990). Greater value of equity balance indicate greater potential for success. Operating margin is also used as a measure of organizational performance. An organization's operating margin is calculated by subtracting expenditures from revenues and dividing this by total revenue.

Types of Nonprofit: The primary fundraising structure of a nonprofit organization is also likely to influence its revenue portfolio. Hansmann (1980) and Weisbrod (1998) distinguish between commercial and donative nonprofit organizations. Both authors argue that these two categories of nonprofits operate in different funding environments and have different structures for generating capital (Jegers and Verschueren, 2006). Chang and Tuckman (1994) find that there are differences between the two types in their levels of revenue diversification. For this analysis, a dichotomous variable is used to identify organizations with a majority (greater than 50%) of total revenue generated from donations (line 1d on IRS form 990) as donative and to compare them to nonprofits in which the majority of total

[4]Due to the presence of outliers, the value of equity balance was reset to a floor value of 25.

revenue consists of earned income from sales of goods, securities and investments, and fees for service.

Size and Age of Nonprofits: New and small nonprofits confront the "liability of newness" (Chambré and Fatt, 2002; Stinchcombe and March, 1965) and are likely to be constrained in generating income from investments or commercial ventures. In contrast, a mature nonprofit or one led by an experienced manager is more likely to have gradually differentiated its sources of income over time, including the building of endowments to generate investment income (Kimberly and Miles, 1980). Smaller and newer organizations also probably have fewer number of projects to finance and their need to continuously search for increased funding is lesser. Some nonprofits studies use total expenses to measure organizational size while others use total assets. Due to many disadvantages of using total assets, total expenses (line 17 of IRS form 990) are used in this chapter following the convention in the literature.

Table B.4 reports summary statistics for the full dataset used in the analysis. The first three variables in the first panel are the three different measures of the extent of revenue diversification. The varying means of the indices emphasize the necessity of considering each as a separate dependent variable. The average concentration index over all nonprofit for the sample during the time period under analysis is 2719. According to the U.S. Department of Justice's merger guidelines, the nonprofit markets are highly concentrated. Yet the high standard deviation suggests noteworthy variation in competition among nonprofits over time. Similarly, there is significant variation in the size of nonprofit organizations, as total expenses averaged $3.58 million with a standard deviation of $10 million during the time period. The very low mean for ratio of administrative and fundraising expenses to total expenses demonstrates the possibility of misreporting of expenses by nonprofit organizations. This is likely to bias the estimated coefficients but there is little to be done because this is the best financial data available for researchers. Several nonprofits in the sample report expenses exceeding their incomes, giving rise to a mean operating balance of $ -3.49. Finally, in 42 percent of the observations nonprofits receive more than half of their funding from donations, thereby categorizing them as donative organizations. The second panel provides the descriptive statistics for the geographic control variables used in

the analysis.

2.3.3 Model Specification

The relationship between revenue diversification strategy and nonprofit competition is examined using a model that specifies the level of diversification in relation to the extent of competition in a market and sets of market and organization specific control variables suggested by prior research. The full model is:

$$\begin{aligned} RD_{imt} &= \beta_0 + \beta_1 Conc_{mt} + \beta_2 Org_{imt} + \beta_3 Fin_{imt} + \beta_4 Size_{imt} + \beta_5 D_{imt} \\ &+ \beta_6 Sector_{mt} + \beta_7 State_{imt} + \beta_8 X_{imt} + \beta_9 T_t + \beta_{10} t + \epsilon_{imt} \end{aligned} \tag{2.3}$$

where $RD_{imt}, Comp_m t, Org_{imt}, Fin_{imt}$ represent revenue diversification, competition index, organizational efficiency and financial health of a nonprofit i in market m at time t. To control for nonprofit level differences, $Size_{imt}$ and Age_{imt} are added to the list of explanatory variables. D_{imt} is a dummy that indicates whether the organization is donative or commercial in nature. The model also includes a series of dummy variables for each sector to serve as a proxy for the activity type of the nonprofit organizations.

X_{mt} is a vector of geographic level socio-economic and political variables. These variables are per capita income, population and unemployment rate in a MSA in addition to share of the population over the age of 65, political affiliation of the governor and the share of US Congressional and Senate representatives for the state. Moreover, variation in tax laws, economic conditions and cultures of civic engagement are also likely affect the strategies of nonprofit organizations to raise funds. To account for effects that vary among the US states but are relatively constant over time, a series of dummy variables to serve as state fixed effects is incorporated in the model. The model is augmented by a set of time dummy variables, one for each year, to capture variation over time in each dependent variable. Including the time dummy variables enables us to test for model stability over time. Finally, a single time variable is also included to account for the changing trend over the six years.

It is reasonable to assume that a simultaneous relationship exists for the dependent and independent variables. For example, high administrative costs can impact revenue

diversification and the adoption of a diversified income portfolio might increase the costs at the same time. To overcome this potential endogeneity, lagged values of the endogenous variables as regressors in the econometric model. It is realistic for there to be a delay in revenue strategy changes resulting from the endogenous independent variables (Carroll and Stater, 2009). The problems arising from the use of lagged values of the endogeneous explanatory variable as proxies are discussed in Section 2.5.

2.4 Estimates and Results

The empirical investigation is conducted using a panel dataset of U.S. nonprofits from 1998 to 2003 that includes nonprofits with and without revenue diversification. This is done to fully understand the choice of diversification by an organization and to limit potential sample selection bias. 9-15 percent of the observations in the dataset have a zero level of diversification.

OLS estimates are the starting point for any regression analysis. However, in a model where the dependent variable is bounded by zero and one, standard linear estimators do not guarantee that the predicted values of the dependent variable are restricted to the unit interval. Because the revenue diversification indices are fractions, OLS estimates will not be sensible.

OLS estimates with clustered standard errors are computed for the sample with three different indices of revenue diversification. The estimates are provided in Table B.5. The estimated coefficients for geographic controls and other dummies are excluded here and in subsequent tables for brevity. Concentration index has a statistically significant effect on the broader definitions of diversification - RD3 and RD4. This does not hold when using the most comprehensive revenue diversification measure. The estimates of concentration index in Columns (1) and (2) are positive, implying that a unit increase in competition decreases revenue diversification. Yet, the small magnitude of the estimates fail to support the hypothesis of this chapter. The OLS estimations also show that administrative slack, equity balance, operating balance, age and type of nonprofit have significant positive effects on the level of diversification, irrespective of the index used.

The traditional solution of using the log-odds transformation also fails because there are

some nonprofits with zero values of the dependent that require ad hoc adjustments to the values (e.g., the index equals 0.0001 if there is no revenue diversification). The estimation technique typically used in such cases is the Tobit procedure. This procedure takes proper statistical account of the limit value observations and, using the maximum likelihood principle, it results in parameter estimates that are consistent and asymptotically efficient. Under the Tobit model, the coefficient estimates are not partial effects that represent the relevant effects of the censored explanatory variables. Instead, the APEs are computed using the parameter estimates to allow comparison with the OLS estimates. The APE estimates are given in Table B.6. Standard errors for the APEs are obtained by the delta method. The directions of the effects are the same as those for the parameter estimates and the size of the effects increases by 11-16 percent.

The estimated coefficients of the Tobit model tell the same story about the impact of the explanatory variables on revenue diversification as the OLS model. Nonprofit competition has significant negative effect on RD3 and RD4 but is too small to be economically important. Moreover, the difference between the two estimate of the OLS and Tobit models are marginal, perhaps because of the low percentage of zeros for revenue diversification indices. In cases where little difference exists between OLS and Tobit estimates, OLS may be operationally acceptable.

However, some researchers (e.g., Papke and Wooldridge (1996)) argue that the Tobit model, a censored regression technique, is not applicable where values beyond the censoring point are infeasible. The motivation for Tobit is the presence of an underlying latent variable that is observed only in a limited range. Since any observation at the boundaries of the revenue diversification index is a natural consequence of nonprofit choices and not the result of censoring, the latent variable interpretation does not hold. Instead, researchers have proposed fractional regression models that take into account the specific characteristics of fractional response variables.

In their seminal paper, Papke and Wooldridge (1996) propose a fractional response model that extends the generalized linear model (GLM) literature from statistics. The authors introduce a quasi-maximum likelihood estimator (QLME) to obtain a robust method for estimating fractional response models without an ad hoc transformation of the boundary

values. A GLM with a binomial distribution (i.e., a distribution in the exponential family) specifying the conditional distribution of the dependent variables along with a logistic function which transforms the expectation of the dependent variable to the linear predictors have since been applied in numerous empirical cross-sectional studies.

Table B.7 provides the APE for the QMLE to allow for comparison with the linear model estimates. The results Columns (1), (2) and (3) fail to support the hypothesis that nonprofit competition has a significant negative effect on all three measures of revenue diversification. Despite the statistically significant effect of the one period lagged concentration index on RD3 and RD4, the magnitude of the estimated coefficient is negligible. The lagged concentration index does not have a significant effect on RD9 even at the 10 percent level of significance. Similar to the OLS and Tobit estimation, the QML model indicates that nonprofit competition does not have a substantial effect of revenue diversification. This is opposite to the relationship predicted by theory. Overall, the findings suggest that revenue diversification is not a strategy that is relied upon by nonprofit organization as a way to deal with the surge in the number of rivals.

As in the earlier tables, an increase in the share of administrative costs, equality balance and operating balance increase the levels of revenue diversification. The result for administrative slack is contrary to the hypothesis of Tuckman and Chang (1994) in that greater administrative inefficiency in the past creates a pressing need for monetary backing, triggering diversified income portfolios. There is support for the idea that financially strong nonprofits find it easier to practice revenue diversification in the following fiscal years. This notion is corroborated by the positive effects of age and size of nonprofits on revenue diversification. Smaller, weaker and newer nonprofit organization are at a disadvantage in terms of generating income to sustain their activities. The evidence also shows that donative nonprofit organizations are also associated with greater levels of revenue diversification.

The descriptive statistics in Section 2.3.2 show noteworthy variation in the revenue diversification indices across the activity types of nonprofit organizations. The average effects of a unit increase of lagged competition on RD3 and RD4 over the 16 sectors is given in Table B.8. Despite the small estimates, there are differences in the extent of diversification depending on the activities of the organizations. Nonprofits in sectors like museums and

performing arts, with higher averages of revenue diversification in Table B.2, are more responsive to competition. If the activities of nonprofit do not allow for income from multiple sources, then increase in competition has a smaller effect in reducing diversification.

2.5 Robustness Tests

None of the above specifications take into account the potential nonprofit-level unobserved effects present due to the repeated observation on the organizations. Ignoring such unobserved heterogeneity will lead the estimates to be inconsistent due to omitted variable bias. An extension of the GLM model, the generalized estimating equation (GEE) (Liang and Zeger, 1986), is widely employed with correlated data to allow the computation of valid standard errors. The GEE specifies how the average of dependent variable of a subject changes with covariates while allowing for the correlation between repeated measurements on the same subject over time (Cui, 2007). The implementation of the GEE requires the specification of the mean and variance of the response variable, usually specified by one of the distribution functions in the exponential family, and a working correlation structure to take account of the correlation over subjects. Similar to the GLM estimation, a binomial distribution and the logit link function is used in this chapter.

Contrary to expectation, an independent correlation structure was identified better than the exchangeable correlation pattern by relying on the quasi-likelihood under the independence model criterion test (QIC) (Pan, 2001). The independent structure treats the correlated responses as if they were independent while the exchangeable correlation pattern considers standardized errors with a constant correlation. This is perhaps because of the unbalanced panel used in this chapter makes exchangeable correlation more inefficient and biased relative to the independent GEE. As Liang and Zeger (1986) point out, when the mean response function is correctly specified, the misspecification of the correlation structure will not affect the marginal parameter estimates but does affect the standard error estimates. Therefore, a robust variance estimator was also used in the analysis to account for the uncertainty about the correlation structure.

Table B.9 reports the estimates for the GEE using an independent as well as an exchangeable working correlation matrix. When assuming the independence of correlated

responses of the nonprofits, the estimated competition effect on RD4 loses it statistical significance. For most of the explanatory variables, the exchangeable correlation structure generates smaller coefficients but the direction of the effects on the RDs are unchanged. It also makes the estimates of total expense significant across the revenue diversification indices. Overall, controlling for unobserved heterogeneity does not change the conclusions of the previous section.

Suspecting potential criticism of the use of lagged variables as proxies for the endogenous independent variable, the model is also estimated by using the lagged variables as instruments in the GLM model. Using lagged values of the endogeneous explanatory variable as instruments can provide an effective estimation strategy if the lagged values do not themselves belong in the respective estimating equation, and they are sufficiently correlated with the simultaneously determined explanatory variable (Reed, 2015). After including the instrumental variables regression in the GLM estimation and adjusting the variance estimate to take account of both, the estimates obtained are reported in Table B.10 (Hardin, 2002). Again, the results are similar.

To ensure that the results obtained in Section 2.4 are not artifacts of the measure of nonprofit competition used, the regressions are re-run using a different concentration ratio. The CR4 index (the concentration ratio for the top 4 firms) had been the most widespread index before the HHI (Naldi and Flamini, 2014). It is given by the sum of the market shares of the largest 4 firms in the market. Table B.11 provides the QMLE using CR4. The estimates for CR4 become significant in RD4 and RD9, but a more significant difference between this model and the previous specification is in the size of the coefficient estimates. However, all of the coefficient estimates maintain the same signs. The same results are observed when unobserved heterogeneity and endogenous nature of the explanatory variables are accounted for.

Looking at the larger implications of the model, it is clear that the competition among the top few nonprofits has a significant effect on the levels of revenue diversification, even considering the more comprehensive indices. Changes in the overall level of diversification among donative, earned and investment income (that is, RD3) now becomes irrelevant. Columns (2) and (3) show that an increase in competition decreases the reliance on income

from multiple sources. Thus, what appeared to have no support for the hypothesis of the chapter in the previous models now has convincing evidence.

2.6 Conclusion

Despite the growth in the number of nonprofit organizations, and the constant struggle by their managers to obtain funds, the question about the effectiveness of revenue diversification as a strategy to deal with the increasing competition has been largely overlooked. While a broad-based income portfolio is often anecdotally mentioned as the way forward for nonprofits, no formal empirical analysis of its consequences has yet been made.

This study begins by articulating a framework for understanding why and how a nonprofit would be expected to alter its diversification strategy in the face of growing competition. The theoretical argument was that competition generates increased complexity and uncertainty for the nonprofit. In turn, the dearth of managerial resources implied that these changes would increase the internal costs of handling a diversified portfolio. It was then predicted that a nonprofit would be expected to respond to a higher cost of maintaining scarce managerial attention in non-mission related activities by shifting this resource away from such activities and thereby reduce the extent of diversification.

These theoretical predictions are examined empirically using a unique panel dataset of U.S. nonprofit covering the period 1998-2003. For statistical reasons, estimation of our model of the extent of diversification required the use of the non-linear quasi maximum likelihood procedure. The empirical findings fail to find a strong response by a nonprofit to increased competition, as measured by the sum of squared market share of each nonprofit.

However, when using the revenue share of the top four nonprofits in a market as a measure of competition, nonprofits react to increased competition by reducing the diversity of their income portfolio. This provides strong support for the hypothesis of this chapter. It is possible that the dominant nonprofits choose to diversify more, setting the trend for the other smaller players in the market. It becomes important to test whether the direct responses to competition are moderated by characteristics of the organizations, such as size, activity and financial status.

There is a marked difference among the results of RD3, RD4 and RD9. Changes in the

broader level of diversification cannot explain the changes in the composition of the income portfolio. Of more practical interest, is the level of diversification among the finer categories of revenue including private contributions, government grants and program service revenue. This calls for further inquiry into the measurement and sensitivity of revenue concentration indices. Another extension of this research is to examine the changes in the nature of a nonprofit's diversification due to competition, in addition to the extent of diversification. It is likely that the nature of a nonprofit's diversification strategy, in terms of the interrelationships among the various sources of revenue, will be impacted by changes in competitive condition.

The econometric methods chosen in this chapter follow the approaches of most authors dealing with fractional response models. A logistic form for the conditional mean of the dependent variable and the robust QML method are used without assessing whether alternative functional forms and/or other estimation techniques are more appropriate. However, in both cases, a number of alternatives along with various simple test procedures to assess their adequacy are being developed, especially for panel data (Ramalho and Ramalho, 2015). It will be instructive to see whether the results of this study change when using the newer empirical methods and theoretical arguments in subsequent analysis of the issue of revenue diversification.

This chapter shows that nonprofits do not use revenue diversification as a way to deal with the uncertainties and complexities arising from competition. Keeping in mind the results of Chapter 1 and the fact that nonprofits are constrained in their ability to diversify their income because of concerns about their mission-output, in Chapter 3 I go back to focusing on charitable donations. Specifically, I look at a fundraising mechanism that nonprofits can use to generate greater donations.

Chapter 3

PROVISION OF THRESHOLD PUBLIC GOODS

3.1 Introduction

In recent years, crowdfunding has become an important source of private provision of public goods and services. It is an open call, mostly through the Internet, for financial resources to support the production of goods and services. The global crowdfunding market, that includes platforms like Kickstarter, Indiegogo, Fundable, Donors Choose, raised $16.2 billion in 2014 for everything from businesses to social causes (Massolutions, 2015). Though there is variability in the goal of the crowdfunded projects, many of them provide goods and services that are public in nature. Crowdfunding projects can directly produce public goods such as planting of trees in Manchester's Stevenson Square or research on the treatment of the rare Sanfilippo syndrome.[1] They can also yield public goods as secondary benefits in the projects. A school lunch project in Nepal is an example where the public good, education is an ancillary output.[2] Since public goods are those that can be enjoyed by anyone irrespective of their payment (non-excludability) and without reducing the supply to other members in the community (non-rivalry), they are financed through a donation-based model. In such a crowdfunding model, funders have no expectations of direct private returns from their contributions. In essence, the success of crowdfunding is based on attracting voluntary contributions from a large number of diverse individuals for the provision of public goods and services.

Public goods have been traditionally financed through voluntary contributions of individuals. However, the incentive to free-ride undermines this fundraising mechanism. To

[1]Stevenson Square Green Makeover on Spacehive, UK (https://spacehive.com/stevensonsquaregreenmakeover) (Spacehive, 2014); Jonahs Just Begun-Foundation on Crowdrise (https://www.crowdrise.com/jonnyleemiller50miler) Crowdrise (2014)

[2]Project Sapana on Indiegogo (https://www.indiegogo.com/projects/project-sapana-a-school-lunch-program)(Indiegogo, 2015).

overcome this problem, crowdfunding websites require a concrete fundraising goal for each project. The goal is a monetary amount that the creator of a project must specify at the beginning of the campaign and represents the minimum amount of aggregate contributions required to produce the good. In the event of insufficient funds, the contributions are refunded to the funders and the good is not provided.

Such monetary thresholds have been frequently used as institutional features in designing mechanisms to ensure a desirable public good production outcome. A fundraiser can opt to set a minimum threshold, allowing donors to pledge contributions conditional on the threshold being covered, instead of letting the total contributions determine the quantity and quality of the public good. Besides, most public goods by their nature cannot be produced in small fractions, making it necessary to ensure that there is enough capital available to meet the threshold cost before the start of production. Such goods are known as the threshold public goods. For example, it would be impractical to construct half of a road link to help in the extraction of wood. Equally useless would be to have a building for a medical facility but no equipment due to the shortage of funds. Thresholds create a situation where, for a pivotal contributor, the cost of reducing contribution by a small amount becomes very large (Bagnoli and Lipman, 1989). This incentivizes individuals to contribute for the provision of the good, unlike in the voluntary contribution mechanism (VCM) where the threat of non-provision of the good is minimal.

Despite their goal-oriented design, the failure of beneficial donation-based projects on crowdfunding platforms is concerning.[3] Moreover, experimental studies in economics show that the presence of a threshold along with the guarantee of refund of contributions, known as the provision point mechanism (PPM), does not completely prevent individuals from contributing nothing for the public good. While the threshold motivates individuals to contribute, the need for more than one donor to meet the threshold gives rise to a lack of coordination. The absence of assurance of other contributors can prevent the threshold public good from being provided (Isaac et al., 1989).

Another line of experimental research in economics demonstrates the use of lotteries

[3] 30-60% of projects on various crowdfunding websites go unfunded.

as a means of funding public goods. The introduction of lotteries lessens free-riding by adding private benefits from positive contributions. When an individual purchases a lottery ticket it reduces the expected payoff of others and serves to counteract the incentive of zero contribution. Though the strength of a lottery is in bridging the gap between private and social incentives, it does not completely eliminate free-riding by the individuals. Lotteries with larger prizes are more effective (Morgan and Sefton, 2000) but high value prizes are often too expensive an option for crowdfunding websites. Therefore, lotteries are not the perfect solution to the PPM and vice versa.

Interestingly, the literature on public goods advocates the use of the lottery and the PPM as superior alternatives to the VCM. This presents interesting questions for the provision of threshold public goods. Can lotteries be used in combination with provision points (LPP) to increase the success of crowdfunding the threshold public good? The answer to this question is not obvious because the solution to the game-theoretic model includes a set of inefficient Nash equilibria in which the threshold is not met and the public good not provided. Therefore, this study seeks to behaviorally examine the performance of the LPP and the PPM by conducting an experimental simulation of a crowdfunding site. Since both mechanisms serve to lessen zero contributions, for the LPP to be beneficial it must incrementally shrink free-riding tendencies. If the LPP can increase the amount of individual contributions and the frequency of reaching the threshold, then it will have an advantage over the PPM as a means of providing threshold public goods.

We conduct a laboratory experiment to compare the PPM and the LPP treatments. The experiment considers three designs of the LPP mechanism. First, the fixed-prize of the lottery is exogenously provided by the fundraiser. Second, an endogenous prize of fixed value is paid out of the total contributions because of the appeal of self-financing or provisional lotteries in the field. Third, is a lottery that is applicable in multiple public good settings. This design exploits the differences in individual preference over various public good and was created to deal with the problem of coordination among the potential donors and to prevent the diversions of contributions for the lottery prize.

The results show that the LPP out-performs the PPM with regards to the number of subjects free-riding, the success of crossing the threshold level, the amount of individual

contribution and the overall provision of the public good, given the values of the parameters in the experiment. Together, these results suggest that the LPP is an effective fundraising mechanism for the private provision of threshold public goods and should be given serious consideration by the crowdfunding platforms.

The remainder of the paper is structured as follows: Section 3.2 presents a brief overview of threshold public goods literature and highlights the progress of experimental studies in devising an ideal fundraising mechanism. In Section 3.3 we explain the lottery with provision point (LPP) mechanism by linking lotteries to threshold public goods. Section 3.4 outlines the design of our laboratory experiment adopted to analyze the fundraising mechanisms. The results from the experiment are reported and discussed in Section 3.5. In Section 3.6 we present the extension of the lottery design to multiple public goods, along with data from the experiment conducted to test its efficacy. Section 3.7 provides some concluding remarks. Appendix C.1 contains all tables and figures to which this chapter refers.

3.2 Theory of Threshold Public Goods

The problem of suboptimal provision of public goods in the VCM has given rise to a constant search for effective mechanisms to finance the goods. One of the solutions proposed by the economics literature is the use of a threshold or provision point. In the standard PPM, individuals impacted by the public good commit to contributing a fraction of the cost of production. The public good is provided in amounts increasing with the aggregate contribution levels beyond the provision point. Moreover, the contributions are refunded if the aggregate does not meet the minimum threshold cost of production.

In a simple experimental framework, N individuals are provided with identical endowments, e_i. Each must simultaneously decide how much of the endowment to contribute for the provision of a public good, g_i. The part of the endowment not contributed for the public good is retained for private consumption, $e_i - gi$. If the sum of individual contributions for the public good is greater than or equal to some threshold level, T, then each individual receives a return of $\beta \sum g_i$. The benefit an individual enjoys from an additional unit of public good is captured by β, the marginal per capita return (MPCR). It is assumed that $\beta < 1$ but high enough such that the provision of the public good is socially efficient, that

is, $n\beta > 1$. Amount in excess of the threshold is utilized to increase the quantity or quality of the good. On the other hand, the good is not produced if there is a shortage of funds and the contributions are refunded. In such a setup, individual i's utility is:

$$U_i = \begin{cases} (e_i - g_i) + \beta(\sum_{i=1}^{N} g_i) & \text{if } \sum_{i=1}^{N} g_i \geq T \\ e_i & \text{otherwise} \end{cases} \tag{3.1}$$

The theoretical properties of the PPM were first examined by Bagnoli and Lipman (1989). They show that under complete information there are many possible equilibria. Each individual contributing zero is a pure strategy Nash equilibrium because contribution of a larger amount is suboptimal if an individual believes that nobody else will pitch in. A second pure strategy Nash equilibrium results in a collective contribution just enough to meet the threshold requirement. While contributing less will forgo the benefit from the public good, contributing more involves a negative net marginal return. There are also an infinite number of mixed strategy equilibria. The primary contribution of the authors was the application of the undominated perfect Nash equilibrium concept to prove that a continuum of efficient Nash equilibria in which the provision point is exactly met will alone survive the refinement.

For more than two decades by now, numerous experimental studies have been conducted to test the efficacy of the PPM and its different features in providing threshold public goods. The presence of a threshold itself increase the contributions over the levels observed in voluntary contribution games (Isaac et al., 1989; Suleiman and Rapoport, 1992). It, however, does not overcome strong free-riding and additional features are required to encourage contributions by individuals. While in the initial discrete public good experiments, individuals could contribute all or nothing of their endowments, many authors have shown that allowing contributions of continuous amounts improves the amount and frequency of provision of the public good (M.Dawes et al., 1986; Suleiman and Rapoport, 1992; Cadsby and Maynes, 1999). A money-back guarantee in cases where the threshold cannot be met also act as an incentive for individuals and significant increases in contributions have been reported in experiments with refunds (Rapoport and Eshed-Levy, 1989; Isaac et al., 1989; Bagnoli and McKee, 1991; Cadsby and Maynes, 1999).

With the objective of confirming that the PPM was equally effective when implemented outside a laboratory, Rondeau et al. (1999) performed an experiment with constraints like one-shot contributions, large groups of heterogeneous individuals and incomplete information encountered in the field. Their results suggest that a PPM with continuous contributions and money-back guarantee can be successfully replicated under field conditions. This was supported by a study by Rose et al. (2002) where GreenUp, a renewable energy program contrived by the Niagara Mohawk Power Corporation in New York was used to evaluate the PPM.

Another feature that has received substantial attention is the rebate rule that specifies what happens to the contributions in excess of the provision point. In their formal proof, Bagnoli and Lipman (1989) assume that contributions is excess of the threshold are refunded to the contributors (proportional rebate) or appropriated by the collector (no rebate). However in the PPM, contributions generated over the threshold can be utilized to provide more of the same or similar public good (utilization rebate). For example, the Niagara Mohawk Power Corporation proposed that the contributions in excess of the amount needed to implement the renewable energy program would be used to plant additional trees or service additional homes by the renewable energy facility.

Though the Nash equilibrium outcomes remain unchanged under the three rebate rules, the utilization rebate rule leads to an increase in social welfare since the excess contributions are used to benefit the group. In most of the above mentioned experiments the surplus contributions were wasted, with the notable exceptions of Isaac et al. (1989) who had a utilization rebate setting and Rondeau et al. (1999) with their proportional rebate rule. Marks and Croson (1998) find significantly higher contributions under the utilization rebate rule, without the frequency of public good provision being significantly different between the three rules.

Although the PPM yields some improvements over the contributions obtained with the VCM, it is possible for socially desirable threshold public goods to go unfunded. Isaac et.al. (1989) report that the public good is provided in 43 percent of the games with money back guarantee and utilization rebate. In a comparable treatment in Marks and Croson (1999),

the provision point is met 69 percent of the times.[4] Their results showed that standard PPM has its shortcoming in the form of multiple equilibria with lower levels. This indicates that the theoretical refinement suggested by Bagnoli and Lipman (1989) to rule out the inefficient Nash equilibria may not be a robust representation of individual behavior.

Individuals do in fact have trouble coordinating to ensure that the provision point is collectively reached. There is experimental evidence that highlights this problem under different situations. Bagnoli and McKee (1991) observe that groups with more individuals are slower to converge to an equilibrium. A similar problem is reported by Bagnoli, Ben-David and McKee (1992) in their experiment designed to test the provision-point mechanism for the multiple unit case. Mysker, Olsen and Williams (1996) find that the ability of individuals to track their earnings in a PPM intensifies free-riding by drawing attention to the private costs of contribution. Using a logit quantal response equilibrium model of noisy decision making, Saunders (2012) shows that larger group sizes and incomplete information in small groups reduces the provision of threshold public goods.

Crowdfunding websites are characterized by features similar to the PPM. The projects typically have a well-defined, numeric fundraising goal to which individuals can contribute any amount of money within a deadline. Some crowdfunding sites have an all-or-nothing rule in which the contributions are refunded when the threshold is not met. If a project on Donors Choose or Kickstarter, for instance, does not receive the stipulated amount usually within 6 months after project posting, then donations are refunded to an account that the donor can divert to other projects (Wash, 2013). While some crowdfunding sites stop accepting donations when the provision point is achieved, others like Donors Choose and Indiegogo allow the projects to receive more money than they requested. However, these platforms too have a variable funding rate. Public good projects on Catarse have a success rate of 33 percent (Davies, 2014); 68 percent projects on Goteo were fully financed (Davies, 2014); 37-47 percent of Kickstarter projects were funded (Mollick, 2014; Kickstarter, 2015), 43.5 percent of projects on Spot.us received complete funding (Jian and Usher, 2014); the

[4]Marks and Croson = PP is 45 percent of the group endowment, Isaac et al. = PP is 43 percent of the group endowment. Heterogeneous parameterization - Difference in group size and mpcr - does not allow for exact comparisons.

threshold was exceeded in 69.85 percent of projects on Donors Choose (Wash, 2013).

Herein lies the motivation of finding an alternative to the PPM that increases the provision of public good. Moreover, from the social welfare perspective, a mechanism that generates greater amount of aggregate contribution over the provision point is preferred, if the extra contributions are used to provide the public good. Following the suggestion of several papers to use some reward-based mechanism, this current paper relies on the probability of winning a reward by participating in a lottery as a mean to induce contributions. While lotteries have been established to be more efficient than the VCM and has been resorted to by many charities and state governments, they have never been applied in conjunction with provision points. There has also not been any laboratory or field experiments comparing of the lottery and provision point mechanism. The goal of this paper is to experimentally explore the feasibility of using lotteries in combination with provision points to finance threshold public goods.

3.3 Linking Lotteries and Threshold Public Goods

The advantages of lotteries to raise funds for the supply of public goods was first discussed by Morgan (2000) who theoretically proved that a fixed prize lottery has a unique equilibrium where more of a public good is provided, relative to a VCM. This occurs because the purchase of a ticket by an individual reduces the probability of winning of others that negates the unaccounted positive externality from public goods. Moreover, the negative externality created by the introduction of competition is large enough to ensure that a socially desirable public good is always provided. Several experiments provide evidence of the superiority of the lottery over the VCM under heterogeneous parameterization (Morgan and Sefton, 2000; Lange et al., 2007; Orzen, 2008; Corazzini et al., 2010; Landry et al., 2010).

In this sub-section we apply the lottery design to threshold public goods. Under the LPP mechanism each player stands a chance to win a prize, V, depending on their level of contribution relative to that of the group. One winner receives the prize, given the threshold has been collectively met. In addition to the consumption financed by the fraction of the endowment not contributed and the returns from the public good if the threshold is met,

there is an expected private consumption from the lottery winnings. The contributions are refunded if the aggregate group contributions are insufficient to fund the public good. If the fixed prize is exogenously provided by the fundraiser, the utility of individual i is:

$$U_i = \begin{cases} (e_i - g_i) + \beta(\sum_{i=1}^{N} g_i) + \frac{g_i}{\sum_{i=1}^{N} g_i} V & \text{if } \sum_{i=1}^{N} g_i \geq T \\ e_i & \text{otherwise} \end{cases} \tag{3.2}$$

The features of the PPM that positively impacted the provision of the threshold public good are maintained in the lottery setup. The individuals can contribute any continuous amount of their endowment and are not restricted by discrete lottery ticket prices. There is money-back guarantee in the event of the aggregate level of contributions being less than the threshold. Any amount in excess of the threshold is utilized to provide the public good (utilization rebate).

Most lotteries in the field make the prize provisional on the aggregate levels of contributions because of the effort and additional expense of procuring the prize. Unless the prize is a charitable donation, its cost can result in a negative net revenue for the fundraiser. Thus, self-financing fixed-prizes are attractive as they are risk-free as compared with exogenous fixed-prizes. In the endogenous case where individuals have to finance the fixed prize of the lottery, the probability of winning becomes conditional on the prize being provided in the first place. The public good is provided only if the sum of the contributions is greater than the threshold and the value of the fixed prize. When the fixed prize is made self-financing, the utility of individual i changes to:

$$U_i = \begin{cases} (e_i - g_i) + \beta(\sum_{i=1}^{N} g_i - V) + \frac{g_i}{\sum_{i=1}^{N} g_i} V & \text{if } \sum_{i=1}^{N} g_i \geq (T + V) \\ e_i & \text{otherwise} \end{cases} \tag{3.3}$$

The traditional lottery game, with an exogenous or endogenous fixed prize, has a single symmetric equilibrium in which each individual contributes $g_i^l = \frac{(V(n-1))}{(n^2(1-\beta))}$ (see Morgan, 2000, Appendix C.2). Any deviation from this point adversely affects the net expected payoff, given the contributions of the other individual. Therefore, there is positive provision

of the public good when it is socially desirable (i.e., $n\beta > 1$), $G^l = \frac{(V(n-1))}{(n(1-\beta))}$. We will refer to this as the *lottery equilibrium.* This expression also explains that to achieve efficiency the prize, V, has to be high when the β is low in public good lotteries.

Since G^l is increasing in V, it is likely that a prize of insubstantial value will only raise the aggregate levels of contributions below the provision point. In such an event, individuals will contribute exactly enough to achieve the provision point (i.e., $G^l = T$) and provide the public good. Specifically, if the value of V is less than $\frac{Tn(1-\beta)}{(n-1)}$, the lottery equilibrium is replaced by a *threshold equilibrium* in which the public good is exactly provided .

However, the existence of multiple Nash equilibria continues to be a problem with the LPP. Along with the lottery equilibrium, there is also another symmetric pure strategy equilibrium where each individual contributes zero. This is the *free-riding equilibrium.* Individual do not have an incentive to contribute more than zero if they believe that no one else will make positive contributions because neither the prize nor the public good is available without at least the threshold level of contributions.

The theory of Nash equilibrium predicts in both the PPM and LPP there exists a continuum of Nash equilibria - an inefficient one where there is zero contribution and an efficient one in which the players contribute exactly enough to achieve the provision point. Furthermore, the efficient equilibrium in the LPP can provide a public good of greater value than the PPM, if at all, by offering a fixed-prize of sufficiently large value. Intuitively, an incremental contribution by an individual creates a positive externality by providing the public good. It also adds to the positive externality by increasing the pot and the chances of the threshold being met. These two effects can be counteracted by a negative externality caused by the reduced chances of winning the lottery prize, only if it is sufficiently large in value.

In terms of social welfare, an exogenous lottery represents a transfer of wealth among individuals and will not have any negative welfare implications but an endogenous lottery diverts funds from the production of the public good and can lessen the welfare. The social surplus will be lower in the endogenous LPP by some percentage of the value of the fixed prize if the same equilibrium is attained with the LPP and PPM. In other words, the LPP

will be socially desirable over the PPM only if it can generate greater levels of contribution.[5]

The main theoretical reason, therefore, for choosing a LLP over a PPM to fund a threshold public good is if the lottery equilibrium dominates the free-riding equilibrium. In which case, the LPP will be more successful at meeting the threshold and increasing the aggregate contribution. Although LPP with are larger prizes are more effective, the prize in our analysis is purposefully kept small. This is done to replicate the realities of a donation-based crowdfunding campaign, where it is impractical to promise large prizes that divert funds away from the public good production. Project creators have to pay a fixed percentage of their total fund collection as user fees to the crowdfunding platform, a mechanism that requires a prize of a large value would not be very popular. Additionally, state lotteries are operated as monopolies by the governments (Cook and Clotfelter, 1990) and there are several restrictions placed on the games of chance conducted by private organizations.

Therefore, the set of symmetric equilibria in both the PPM and LPP treatments involve each individual allocating nothing (free-riding equilibrium) or an aggregate amount equal to the threshold (threshold equilibrium) for the provision of the public good. Given these similarities, why will a fundraiser prefer the LPP over the PPM? The answer is behavioral. There is ample empirical evidence on the prevalence of gambling. In the Survey of American Gambling Attitudes and Behavior, 61 percent of adults were estimated to have engaged in some form of betting (Kallick-Kaufmann, 1976). A similar percentage of the adults in lottery states have been reported to play at least once in a year (Cook and Clotfelter, 1990). A study on college students found 60 percent of the sample participated in a variety of gambling activities, with lottery or scratch ticket purchases being the most common (Ginley et al., 2013). The recent acquisition of Double Down Interactive, a startup that creates cashless online casino games, for $500 million by International Game Technology is an indication of popularity of gambling among people (Sivitz, Larry, 2012).

There is an extensive literature in economics and cognitive psychology that seeks to explain why people play lotteries. One possible reason is that spending small amounts on the

[5]It will be possible to get closer to the first best levels of public good with greater levels of contribution. This follows from the utilization rebate rule under which the set of Pareto efficient outcomes are those which involve full contribution (though, not an equilibrium). Making excess contributions make the group as a whole better off, albeit at the expense of the contributor.

tickets yields smaller disutility than one would expect if one assumed diminishing marginal utility (Markowitz, 1952b). When the lottery prizes are small, people prefer fair gambles to small certain gains. Another possible reason is the overweighting of the probabilities of the uncertain event of winning the prize (Kahneman and Tversky, 1979). The ease with which visualizations of the victory can be brought to mind causes misconceptions about the lottery odds and increases the appeal of the game. Psychologists mention various biases and irrational thinking patterns that characterize lotteries, including a belief in hot and cold numbers, unrealistic optimism, a belief in personal luck, superstitious thinking, the illusion of control and the erroneous perception of near misses (Rogers, 1998). Given the link between the provision of public goods and the lottery proceeds, people may perceive a disproportionate benefit to a prize in the form of elevated social standing and may increase their contributions. There can also be consumption benefits from gambling. Though largely ignored, the utility of gambling is also lately being modeled to understand the empirical observations on gambling (Conlisk, 1993; Menestrel, 2001; Diecidue et al., 2004). The inclusion of the utility of gambling in the utility maximization framework can explain small payoff gambles and other risky behavior of risk averse individuals.

3.4 Experimental Design

A total of 116 undergraduate and graduate students from various academic fields took part in an experiment, which was conducted at the University of Washington, Seattle. The process was carried out in an on-campus computer lab with the help of the computer program, Z-tree (Fischbacher, 2007). Subjects were randomly seated at computer terminals on their arrival. At the beginning of each round the subjects were anonymously and randomly assigned to groups of four. The subjects were randomly rematched into new groups in every round to avoid repeated game eects. These groups constitute our statistically independent units of observation. During a session participants could earn experimental monetary units (EMUs) and their earnings were later converted to cash using an exchange rate of 25 cent per EMUs. No verbal or other form of communication was permitted (Appendix C.3).

Each subject participated in two sets of experiments - Design 1 and Design 2. Both designs consisted of two parts corresponding to the PPM and the LPP. Each part started

off with two practice rounds followed by ten binding rounds. In each round the subjects were homogenously endowed with 20 EMUs. Their task was to allocate their endowment between a private account and a group account. An EMU in the private account generated a return one EMU for the individual, and an EMU allocated to the group account generated a return of 0.5 EMU for each of the four group members, that is, the MPCR from the public good was 0.5 EMU. However, any return from the group account was permissible only if the total EMUs in the group account at the end of a round was at least as much as the threshold of 40 EMUs. Any EMUs in excess of the threshold in the group account was also returned at the rate of 0.5 per EMU.

In addition, in the LPP treatments, 15 EMUs was available as prize to the winner of the lottery. A subject's chance of winning a lottery was equal to the EMUs personally contributed to the group account divided by the total contributions in the group account. In case of a tie, a winner was chosen at random. While the 15 EMUs was put into the group account exogenously in Design 1, the subjects had to contribute enough to the group account in Design 2 to finance the prize as well as the public good. The threshold in this case was lowered to 25 EMUs to ensure that the subjects were not merely responding to a higher threshold cost relative to the PPM. Without an overall contribution of 40 EMU in the group account the lottery is recalled in both designs.

The order of the PPM and LPP in each design was randomly chosen to minimize order effects. In other words, a within-subject design was implemented where the subjects participated in both the PPM and LPP treatments. While the PPM was identical in both designs, the LPP in Design 1 involved an exogenous prize of fixed value while the prize of the same value had to be endogenously provided by the subjects in the LPP in Design 2. The LPP resembled a draw lottery where the role of the player is limited to buying a ticket.

After subjects had submitted their choices, the computer calculated the outcomes according to the rules of the relevant treatment. At the end of the experiment, two non-practice rounds was chosen at random to determine earnings . Throughout the experiment subjects had complete information about the group size, homogenous endowments of the subjects, MPCR, value of the prize and number of rounds. After each round they were also notified of the individual earnings, total contributions of the group, whether the threshold

had been crossed and if he/she was a winner in the lottery treatment.

Given our primary interest in the comparison of the PPM and LPP for providing threshold public goods, several model parameters were fixed throughout the sessions in order to draw appropriate conclusions. The MPCR is less than one in all the experiment sets so that each individual's opportunity cost of investing in the public good is less than the marginal return from it. However, the public good is socially desirable since the sum of the MPCR over the subjects in a group is greater than 1. At the same time, $e_i < T$ so that it is not possible for the threshold to be reached based solely upon the contribution of one person. The value of V is chosen to an amount lesser than the required level to allow the lottery equilibrium to exist.

3.5 Results

With identical multiple equilibria in the PPM and LPP treatments, it will not be useful to restrict our attention to whether the Nash equilibria outcome is obtained. Instead, our hypotheses considers which of the two mechanisms has lesser free-riding, greater amount of contributions and higher frequency of threshold public good provision.

3.5.1 Individual Contributions

The first problem with the provision of threshold public goods is that zero levels of individual contribution is one of the many possible equilibria. To examine free-riding in the PPM and LPP treatments, we count the number of subjects that contributed 0 in a period. Table C.1 displays the percentage of free-riders. Neither treatment leads to a complete elimination of free-riding. Nonetheless, there are fewer percentage of free-riders under the LPP than the PPM. If there is a small chance of the other subjects making positive contributions in an attempt to meet the provision point, zero will not be a 'refinement' (Bagnoli and Lipman, 1989) choice for an individual. There are gains from moving away from zero contribution in both treatments but it is greater with the lottery due to the private nature of the prize. However, the difference in the percentage of free-riders is not significant when the lottery prize is endogenously provided in Design 2. This can be attributed to the lower threshold of 25 EMUs (compared to 40 EMUs) in Design 2. The expected payoff from the lottery

prizes, if provided, is the same in both designs but the lower threshold reduces the return from the exact provision of the public good.

Observation 1: There is lesser free-riding in the LPP with an exogenous prize than in the PPM. A significant difference in free-riding between the PPM and LPP with endogenous prize is absent.

Since the number of free-riders is not extremely large, our subsequent concern is the amount of individual contributions to the public good. Table C.1 provides the summary statistics for mean contribution levels for each of our treatments. The mean individual contribution in the LPP treatments are significantly greater than those in the PPM. Irrespective of how the prize was provided, the mean individual contribution in the LPP treatments is 1.4 EMUs greater than in the PPM treatments, a difference that is statistically significant using the t-test.

The null hypothesis predicted by Nash equilibrium theory is that the fundraising mechanisms - PPM and LPP with a fixed-prize of 15 EMUs - will have no effect on the individual contribution levels and the public good will be exactly provided. For both the exogenous and endogenous LPP cases, this hypothesis is rejected in favor of the alternative that individuals contribute more on average with the lottery. This is consistent with the idea that tying the lottery prize with the public good narrows the gap between private and group incentives. The negative externality generated when a subject buys a lottery ticket compensates for the positive externality associated with the provision of public goods, boosting contributions in the LPP treatments.

Observation 2: Average individual contributions are significantly higher in the LPP treatment than in the PPM treatment.

Mean individual contributions are consistently higher than the symmetric threshold equilibrium in which each of the four members of the group allocates 10 tokens to the group account. Figure C.1 illustrates whether individuals converge toward the threshold equilibrium during the experimental session. The slopes of all the four trend lines is negative and not significantly different from each other. The lack of convergence can be attributed to two reasons. First, the ten rounds of the experiment are too low to allow the subjects the opportunity to learn about the game and the strategies of other players. Second, cooperative

outcomes are Pareto-improving here, similar to the case of repeated prisoners' dilemma games where cooperation can be sustained over time. In fact, based on the estimated slopes of the trend lines we can predict that in the LPP treatment of Design 1 the Nash equilibrium contribution of 10 EMU per individual will be reached after 20 more periods. Such a difference is absent in Design 2. Since our focus is on comparing the LPP and the PPM, we did not attempt to extend the period of play to see if the subjects converge to an equilibrium because donating to a project on a crowdfunding website is usually a one-shot game. However, future experiments with greater number of period of play could help in understanding further the dynamics of the game.

3.5.2 Group Contributions

This subsection provides an analysis of group contributions to the public good. Table C.2 addresses the question of whether there are differences between the LPP and PPM in terms of the group contribution. Indeed, the proportion of successful provision is significantly higher under the LPP than the PPM, using the chi-square test. The proportions of provision in the PPM treatment is 82 and 80 percent in the two designs whereas in the exogenous LLP treatment it is 93 and in the endogenous LPP treatment it is 87 percent. The threshold serves as a focal point for individual decision in both treatments but there is higher coordination among the subjects in a group under the LPP. In both designs the prize is tied to the provision of the public good. In this case, the focal point characteristics of the threshold becomes more compelling because it determines the payout of the lottery prize.

Observation 3: The frequency with which the public good is provided is significantly higher with the LPP treatment.

Mean group contributions are significantly higher under the LPP than under the PPM at the $p < 0.01$ level of significance using a t-test. Table C.2. reports almost a 6 EMUs difference between the mean group contributions in the two treatments. For contributions beyond the provision point, small departures by other subjects can impose large penalties upon those contributing enough to obtain high provision of the public good with the PPM. Since a small reduction in contribution by other increases a subject's probability of winning

the prize, the penalties imposed are lower in magnitude with the LPP. Thus, the PPM brings forth less contribution.

A further insight is that the groups in both treatments across the two designs do not play the efficient Nash equilibrium. The mean group contribution is significantly higher than the provision point level. Recall that in the LPP in Design 2 the endogenous prize amount was 15 EMUs that must be subtracted from the aggregate contribution in each group. This lowers the mean group contribution for the LPP to 38 EMUs (SE = 0.34), significantly lower than the PPM in Design 2.

Observation 4: Average group contributions are significantly higher in the LPP treatment than in the PPM treatment.

Finally, we consider which treatment maximizes social surplus by taking into account the cost of providing the lottery prize of fixed value along with the benefit obtained from the aggregate contributions. Even if a mechanism has a high rate of provision of the public good, the fundraiser should balance the expected benefit from the successful provision of the good with the costs involved. Table C.2 summarizes the social surplus under the different treatments. The social surplus is significantly higher in the LPP treatments than the PPM. The additional contributions in excess of the threshold make the group as a whole better off, albeit at the expense of the contributor. The LLP outcome, with a greater deviation of the mean group contribution from the threshold, is closer to the socially efficient outcome of full contribution under the UR rule. The difference in surplus is much lower in Design 2 because the contributions that are being transferred to one person as the lottery prize are prevented from yielding double the return from the public good provision.

Observation 5: Social surplus is significantly higher in the LPP than in the PPM treatments.

In summary, when compared with a PPM, a lottery along with a provision point appears to have some interesting results. Not only does it increase the frequency of provision, it also increases the amount of funds available for the public good.

3.6 Modification of the LPP

Crowdfunding websites lists several projects under diverse categories that are simultaneously open for donations. The broad categories range from environmental issues, to fine arts, to community development. In August 2013, there were 3,957 active projects on Kickstarter and 4,348 projects on Indiegogo (Lau, 2013). These numbers continues to surge, providing potential donors a wide selection of projects under each category. This raises concerns over the lack of coordination among the donors. A crowdfunding project requires contributions from multiple donors. With more than one option to choose from, it is likely that a donor contributes to a project that does not receive the support of others and fails. The conflict between donor preference for a project and the riskiness of it not being funded can lead to an inefficient distribution of donations across projects and act as a deterrent to giving in the first place. In laboratory simulations of crowdfunding websites, Wash and Solomon (2014) find evidence of tension between the amounts of contributions and the percentage of projects funded whereas Corazzini et. al. (2015) find that overall contributions decrease as the total number of projects competing for funding increases.

As a solution to this problem, we suggest an extension of the LPP mechanism - Design 3 - to a situation where multiple threshold public goods exist. This incentive design is built on the assumption that individuals have well-behaved preferences over the various projects open for funding at the same time on a crowdfunding platform. Although most of the projects are similar in terms of their purpose, there are significant differences among them on the basis of demographic characteristics of the beneficiaries, information provided and status of the nonprofit seeking donations. For example, a donor might prefer to fund the housing costs of Mary, a widow with five children in Kenya over the housing costs on John in Bangladesh. Design 3 of the LPP exploits the distinct preference rankings of individuals over the multiple projects.

From the practical standpoint, the new design is also advantageous because it does not involve monetary payouts from the pockets of the project creators. There is no wastage of the aggregate contributions in the form of lottery prize payment and the entire amount can be used in the production of the public good. Since projects are often judged by potential

donors on the basis of their final impact, such a feature can prove attractive. This design also helps bypass the complex web of federal and state laws and regulations that govern whether or how charitable lotteries may be conducted.

We report here the details of the experiment in which this design of the lottery is tested. The 116 subjects in Design 1 and 2 underwent a third experimental session. Again, a within subjects design was used to compare the PPM and the LPP. The key feature of this design is the presence of several threshold public goods. Since a greater number of public goods magnifies the coordination problems, we chose to provide three goods. The public goods are differentiated by the varying preferences of the subjects. To induce this heterogeneity, each subject was privately and randomly assigned MPCRs for the three projects. The MPCRs were drawn from the vector {0.3, 0.5, 0.7} that was known to all the subjects. We chose the preference parameters such that subjects will prefer the project with the highest rate of return on its completion. To closely replicate the crowdfunding websites, the projects are also differentiated by their provision points. The threshold levels of the three projects were set at 30, 40 and 50 EMUs and needed contributions from more than one donor to be matched.

The PPM with multiple projects in Design 3 required subjects to voluntarily contribute to the group account. At the end of a round, the public good to be provided was determined by the threshold that could be covered by the aggregate level of contribution. Consider a crowdfunding platform with 3 projects - X, Y, Z, with increasing threshold levels and 3 subjects - A, B, C, each with an endowment of 20 EMUs. If the group amassed a total contribution of 45 EMUs, then project Y was implemented. Any amounts collected in excess of the relevant threshold was used to provide the same public good. If the aggregate contribution is less than the lowest threshold, the contributions are refunded to the individuals.

Under the LPP setting, the basic format of the lottery remained unchanged in that individuals buy tickets for the chance to win a prize and the proceeds from the ticket sale is used to finance a public good. However, the winner achieved the right to choose which of the three project gets provided. Instead of a monetary prize, this mechanism incentivizes individuals with the chance to select his or her most preferred project for implementation.

Assume the donors have the following preferences over the projects: A = {0.3, 0.5, 0.7}; B = {0.7, 0.3, 0.5} and C = {0.5, 0.7, 0.3}. If C won the lottery, then project Y will be implemented, provided the aggregate level of contributions meets its threshold. Even if enough funds were collected for project Z, all of it will go towards project Y. If the funds were insufficient to provide the winner's best project, the next project was funded or the contributions are refunded when none of the thresholds are reached.

The success of this mechanism depends on the compensating externality generated by making the return from the public good contingent on the lottery outcome. An additional unit of contribution to the group account by a subject creates a positive externality by increasing the social marginal benefit from the aggregate contribution. It simultaneously reduces the expected marginal rate of return from the public good of the other subjects by chances of winning the lottery. This negative externality counterbalances the positive externality leading to increased individual contributions. Furthermore, this mechanism also addresses the problem of coordination by allowing contributions to the group account to be pooled together. Since contributions are not earmarked by subjects, subjects do not have to worry about choosing a popular project. Coordination among the subjects will be eased by diluting the risk of failure. At the same time the LPP enables subjects to exert their preference for a project by winning the lottery. This will increase the aggregate contributions and the possibility of the threshold of a project being surpassed.

The results of the experiment are shown in Table C.3. The LPP in Design 3 out-performs the PPM in all aspects. Firstly, there are significantly fewer free-riders in the LPP. The mean contributions of the individuals who contribute is higher in the LPP. Unlike the previous results, this increase in contributions does not come at the cost of number of projects financed. The frequency of any one of the three projects threshold being fully funded is also greater in the LPP than in the PPM. Consequently, this kind of lottery raises about 19 percent more contributions in aggregate than the PPM.

We also observe that with both the PPM and lottery treatments, the project with the lowest threshold gets provided the most. This can be explained by the funding risk introduced by higher levels of threshold. Individuals tend to contribute more for projects with higher marginal per capita returns but if those goods have high thresholds the incentive

decreases. The lower probability of collection of enough aggregate contributions will discourage the allocation of funds to projects that have a high minimum cost of production. If we take the costs of production into account, the LPP yields a significantly higher social surplus than the PPM. Furthermore, the socially desirable public good - the one with the highest aggregate rates of return - is more frequently provided in the LPP than the PPM. This deals with the concern that the lottery can fund the relatively less efficient public good (Moir, 2004).

Observation 6: Allowing the LPP to determine the implementation of the project improves the provision of public goods over the PPM in the presence of multiple threshold public goods.

3.7 Conclusion

The motivation of this experimental study was to analyze a fundraising mechanism that can increase the success of crowdfunding platforms in providing threshold public goods. While many reward and refund based ideas have been considered in the literature, we wanted a mechanism that was not only incentive compatible but also a practical option that can be easily executed. Lotteries have a long history and are extremely popular. The development of virtual games of chance on Facebook and online casinos hint at their mass appeal. Yet, the basic structure of lotteries has remain unchanged in theory and practice. In this paper, we test the extent to which lotteries can be combined with provision points to raise funds for the private provision of threshold public goods.

Given the experimental setup, we find that the lottery in combination with the provision point performs better than the provision point mechanism in terms of frequency of provision, individual behavior and total levels of contribution for the public good. We also test and find promising results for an innovative version of the lottery that converts the return from public good into a lottery prize. If people care about projects adequately, then this mechanism will be fruitful.

This should not be mistaken for the small gifts such as thank you cards or photographs of the project given for contributions above a certain level by the project creators on crowdfunding websites. These rewards are different from lotteries because their receipt is not de-

pendent on the probability of individual contribution relative to the aggregate contribution. As a result there is no compensating negative externality created to alleviate free-riding.

Our basic experiment was designed to replicate environments of perfect information. The real-time updates on the projects available on the crowdfunding websites do not make our assumption completely unrealistic. One such information is the amount of funds a project has received. This acts like seed money providing an estimation of the funding risk of the project. Given the simultaneous nature of contributions in our experiment, this signal was not offered to the subjects. We also did not test the outcome of the LPP for an investor who would like to control the project implementation. Such investors may be discouraged from participating in the lottery despite the large amount of contribution they are willing to make. However, crowdfunding platforms are typically more attractive to contributors with smaller donations who wish to make a real difference.

The superiority of the lottery can largely be explained the behavioral responses of individuals. Despite the positive results in favor of the lottery with provision points, it is important to remember that lotteries can damage the distributional efficiency in the society as poorer people end up contributing a greater fraction of their incomes. There are also other social costs associated with gambling that need to be kept in mind.

Appendix A

APPENDIX TO CHAPTER 1

A.1 Tables and Figures

Figure A.1: Comparison of average HHI and average number of nonprofits from 1998-2003

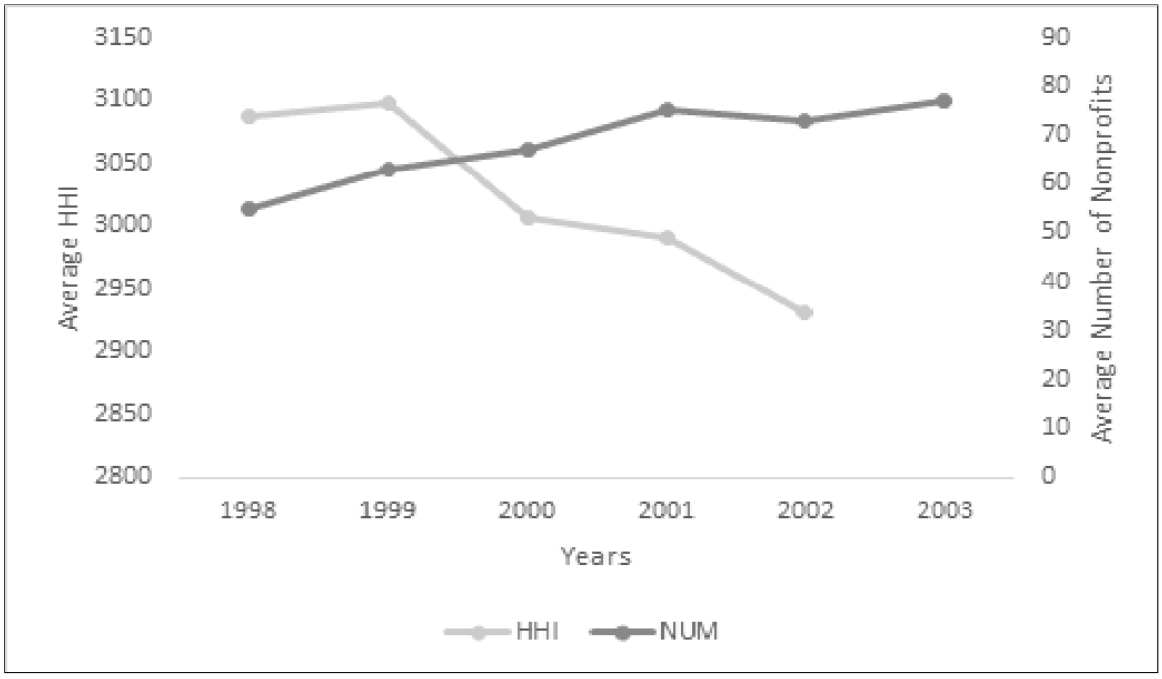

Table A.1: Average Number of Nonprofits and Markets by Sector

Sector	Description	NTEE Code	Mean Number of nonprofits	Mean Number of markets
1	Museums	A50-57	9650	259
2	Performing arts	A62-6C	29991	271
3	Community health treatment	E30-42	10446	250
4	Abuse prevention	I70-73	3375	190
5	Employment and vocational training	J20-33	10238	250
6	Nursing, home health care	E90-92	9127	214
7	Substance abuse prevention and treatment	F20-22	9637	237
8	Hotlines and crisis prevention	F40-42	1498	135
9	Crime prevention and rehabilitation	I20-44	4211	199
10	Food pantries and programs	K30-36	4927	229
11	Public housing and rehabilitation	L21-25	13653	243
12	Homeless shelters	L40-41, P85	5657	203
13	Community centers	P28	4736	198
14	Family counselling	P46	2777	170
15	Senior center	P81	7267	235
16	Residential care and group homes	P73	3977	177
	Total		131167	3460

[1] Sector descriptions are based on Thornton, 2006.

Table A.2: Summary Statistics of HHI by Sector

Sector	Description	Mean HHI	Standard error
1	Museums	3621	24
2	Performing arts	2041	9
3	Community health treatment	3722	25
4	Abuse prevention	4376	49
5	Employment and vocational training	3047	26
6	Nursing, home health care	2048	26
7	Substance abuse prevention and treatment	2795	27
8	Hotlines and crisis prevention	6009	85
9	Crime prevention and rehabilitation	4171	44
10	Food pantries and programs	5729	40
11	Public housing and rehabilitation	1923	19
12	Homeless shelters	3121	37
13	Community centers	3753	45
14	Family counselling	4663	61
15	Senior center	3906	33
16	Residential care and group homes	3836	49

[1] Sector descriptions are based on Thornton, 2006.

Table A.3: Summary Statistics

	Mean	Standard error
Nonprofit level variables		
Public support	465	3590
Government grants	438	2420
Program service revenue	1832	19700
Dues	21	777
Other revenues	159	1985
Fundraising expenses	37	250
Assets	3566	10500
Liabilities	1505	10500
Age	19	15
Geographic level variables		
MSA population (1000s)	3414	5578
MSA per-capita income	31	5
MSA unemploment rate (%)	4.67	1.43
Share of state population $>$ 65 years	0.12	0.02
Share of Democrats in state Senate	1.2	0.88
Share of Democrats in state Congress	0.5	0.21
Share of States with a Democrat governmor	0.5	0.5

[1] All dollar values are in 1000s; [2] All dollar values are real (2000 base year).

Table A.4: First-state Regression Results

	Average HHI across other markets	Liabilities	Transfers
Instrument for	HHI	Fundraising expenes	Government grants
Coefficient	0.472***	0.134***	-0.10***
R-squared	0.497	0.164	0.145
F statistics in	10358***	757***	1431***
F statistics in	2134***	-	91***

[1] *** p<0.01, ** p<0.05, * p<0.1; [2] Logarithm of variables have been used;

[3] Standard errors are heteroskedastic robust auto-correlation consistent and are clustered at the annual level.

Table A.5: Nonprofit level Regression Results

	Public Support		Fundraising Expenses	
	(1)	(2)	(3)	(4)
	Eq.1.2 OLS	Eq.1.2 2SLS	Eq.1.3 OLS	Eq.1.3 2SLS
HHI	0.0030	0.108***	-0.145***	-0.212***
	(0.004)	(0.018)	(0.018)	(0.033)
Fundraising expenses	0.239***	0.830***		
	(0.003)	(0.066)		
Price	-1.371***	-1.270***		
	(0.005)	(0.005)		
Government grants	0.0190***	-0.107***	0.0988***	-0.515***
	(0.001)	(0.019)	(0.003)	(0.035)
Program service revenue	-0.0124***	-0.0283***	-0.00795**	-0.0847***
	(0.001)	(0.002)	(0.002)	(0.006)
Other revenue	0.0291***	-0.0617***	0.166***	0.187***
	(0.001)	(0.011)	(0.016)	(0.022)
Dues	-0.0196***	-0.0135***	-0.0321***	-0.0972***
	(0.002)	(0.002)	(0.006)	(0.006)
Assets	0.123***	0.0110	0.203***	0.324***
	(0.007)	(0.020)	(0.011)	(0.010)
Age	0.0106***	0.00285***	0.0197***	0.0358***
	(0.001)	(0.001)	(0.001)	(0.001)
Liabilities		0.111***	0.347***	
		(0.006)	(0.013)	
Constant	9.032***		0.437	
	(0.054)		(0.253)	
R-squared	0.908	0.644	0.235	0.375
Observations	116717	116221	116224	116224

[1] *** p<0.01, ** p<0.05, * p<0.1; [2] Logarithm of variables have been used;

[3] Standard errors are heteroskedastic robust auto-correlation consistent and are clustered at the annual level.

Table A.6: Market level Regression Results

	Public Support	Fundraising Expenses
	(1)	(2)
	Eq.1.5 OLS	Eq.1.6 OLS
HHI	-0.674***	-2.774***
	(0.010)	(0.021)
Aggregate fundraising expenses	0.365***	
	(0.006)	
Constant	15.49***	30.84***
	(0.179)	(0.355)
R-squared	0.717	0.589
Observations	120112	120112

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Logarithm of variables have been used; [3] Standard errors are heteroskedastic robust auto-correlation consistent and are clustered at the annual level.

Table A.7: Total Effect Computation

	(1)	(2)	(3)
	Coefficient	Nonprofit level	Market level
Fundraising effect	$\beta_f \gamma_1$	0.4504	-1.01
Non-fundraising expenses	β_1	0.1084	-0.67
Total effect	$\beta_f \gamma_1 + \beta_1$	0.5590	-1.68

Table A.8: Robustness Checks - Nonprofit level Regression Results for Eq.1.2

	(1)	(2)	(3)	(4)
HHI	0.127***	0.116***	0.0510***	1.033***
	(0.017)	(0.022)	(0.007)	(0.316)
Fundraising expenses	0.845***	0.872***	0.74***	
	(0.082)	(0.090)	(0.048)	
Price	-1.272***	-1.261***	-1.271	
	(0.007)	(0.009)	(0.007)	
Government grants	-0.108***	-0.119***	-0.0870***	0.0687***
	(0.024)	(0.026)	(0.015)	(0.020)
Program service revenue	-0.0276***	-0.0296***	-0.0276**	-0.0261***
	(0.002)	(0.003)	(0.002)	(0.009)
Other revenue	-0.0623***	-0.0655***	0.0454***	0.0328***
	(0.013)	(0.013)	(0.009)	(0.005)
Dues	-0.0152***	-0.0137***	-0.0144***	-0.0617***
	(0.002)	(0.002)	(0.001)	(0.008)
Assets	0.00378	0.0113	0.0147	0.146***
	(0.023)	(0.021)	(0.015)	(0.025)
Age	0.00326***	0.00380***	0.00333***	0.0148***
	(0.001)	(0.001)	(0.001)	(0.002)
R-squared	0.628	0.602	0.748	0.109
Observations	95002	114439	134221	1253

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Logarithm of variables have been used; [3] Standard errors are heteroskedastic robust auto-correlation consistent and are clustered at the annual level;

[4] The 2SLS estimates for Eq.1.2 are reported. In column (1) a time variable is included, in columns (2) organizations with top 1% of charitable donations ad fundraising expenses are eliminated, in column (3) all nonprofits with no reporting errors are included and in column (4) markets with nonprofits with no fundraising expenses are retained.

Table A.9: Robustness Checks - Nonprofit level Regression Results for Eq.1.3

	(1)	(2)	(3)
HHI	-0.228***	-0.204***	-0.0746**
	(0.032)	(0.029)	(0.036)
Government grants	-0.516***	-0.313***	-0.714***
	(0.042)	(0.029)	(0.041)
Program service revenue	-0.0867***	-0.0637***	-0.139***
	(0.006)	(0.004)	(0.008)
Other revenue	(0.180***	0.172***	0.185***
	(0.024)	(0.021)	(0.021)
Dues	-0.0922***	-0.0860***	-0.136***
	(0.006)	(0.008)	(0.005)
Assets	0.323***	0.0251***	0.341***
	(0.012)	(0.006)	(0.012)
Age	0.0358***	0.0278***	0.0431***
	(0.001)	(0.001)	(0.002)
Liabilities	0.345***	0.261***	0.421***
	(0.016)	(0.0014)	(0.014)
R-squared	-0.382	-0.108	0.903
Observations	95004	114442	134224

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Logarithm of variables have been used; [3] Standard errors are heteroskedastic robust auto-correlation consistent and are clustered at the annual level; [4] The 2SLS estimates for Eq.1.3 are reported. In column (1) a time variable is included, in columns (2) organizations with top 1% of charitable donations ad fundraising expenses are eliminated and in column (3) all nonprofits with no reporting errors are included.

Appendix B

APPENDIX TO CHAPTER 2

B.1 Tables and Figures

Figure B.1: Median RD3 across states, 1998-2003

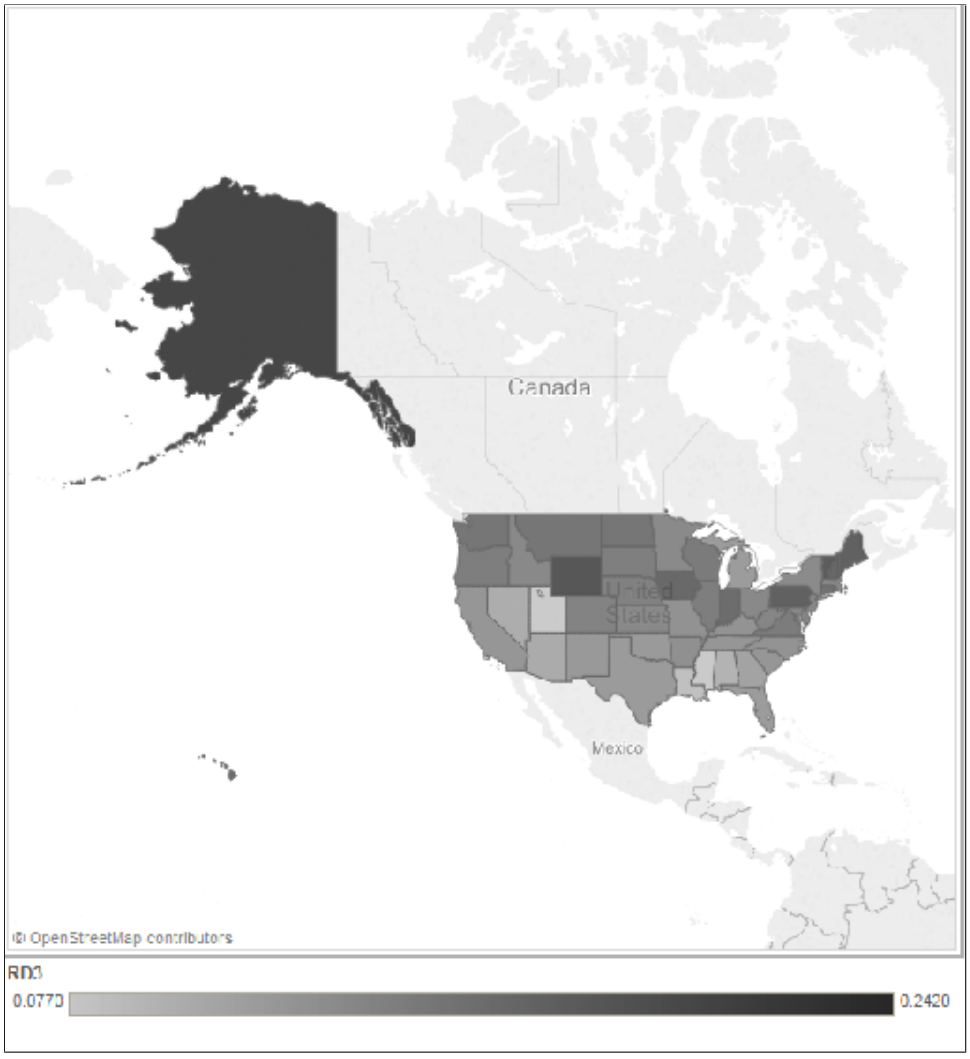

Figure B.2: Median RD4 across states, 1998-2003

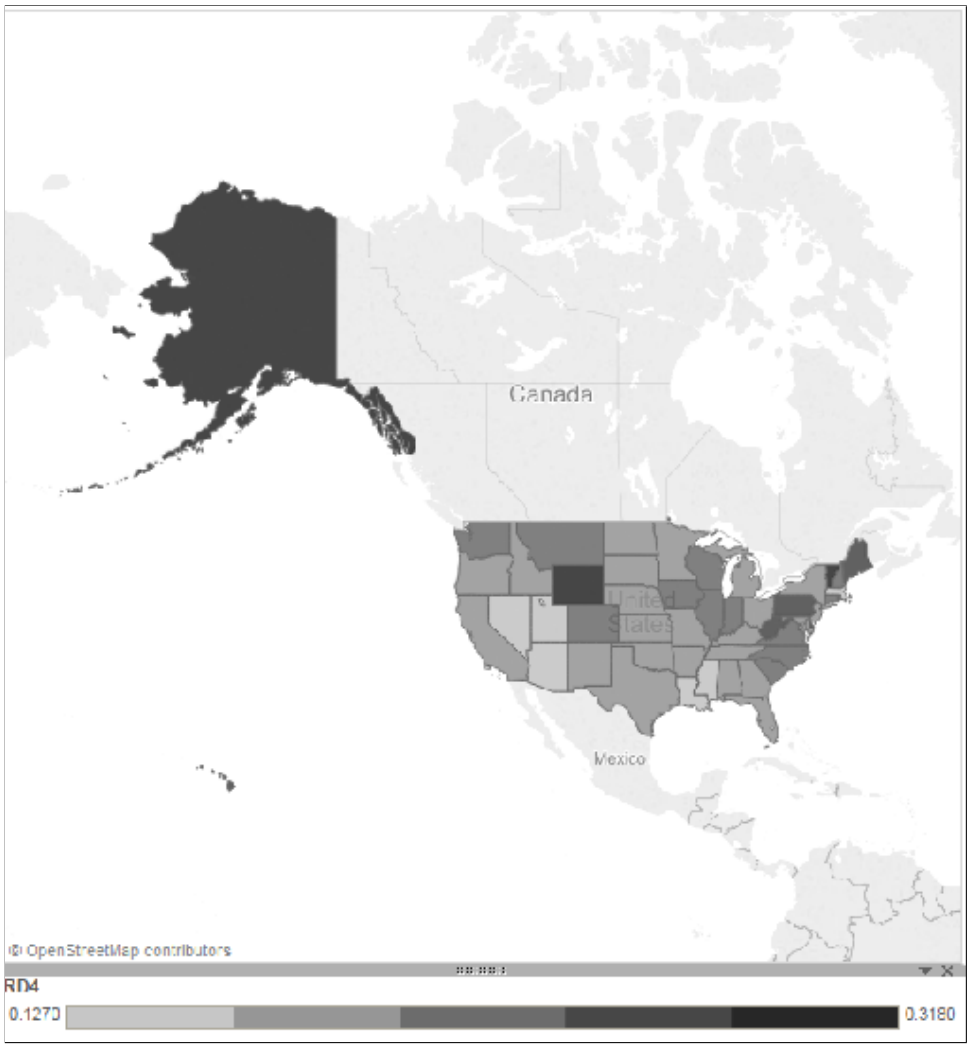

Figure B.3: Median RD9 across states, 1998-2003

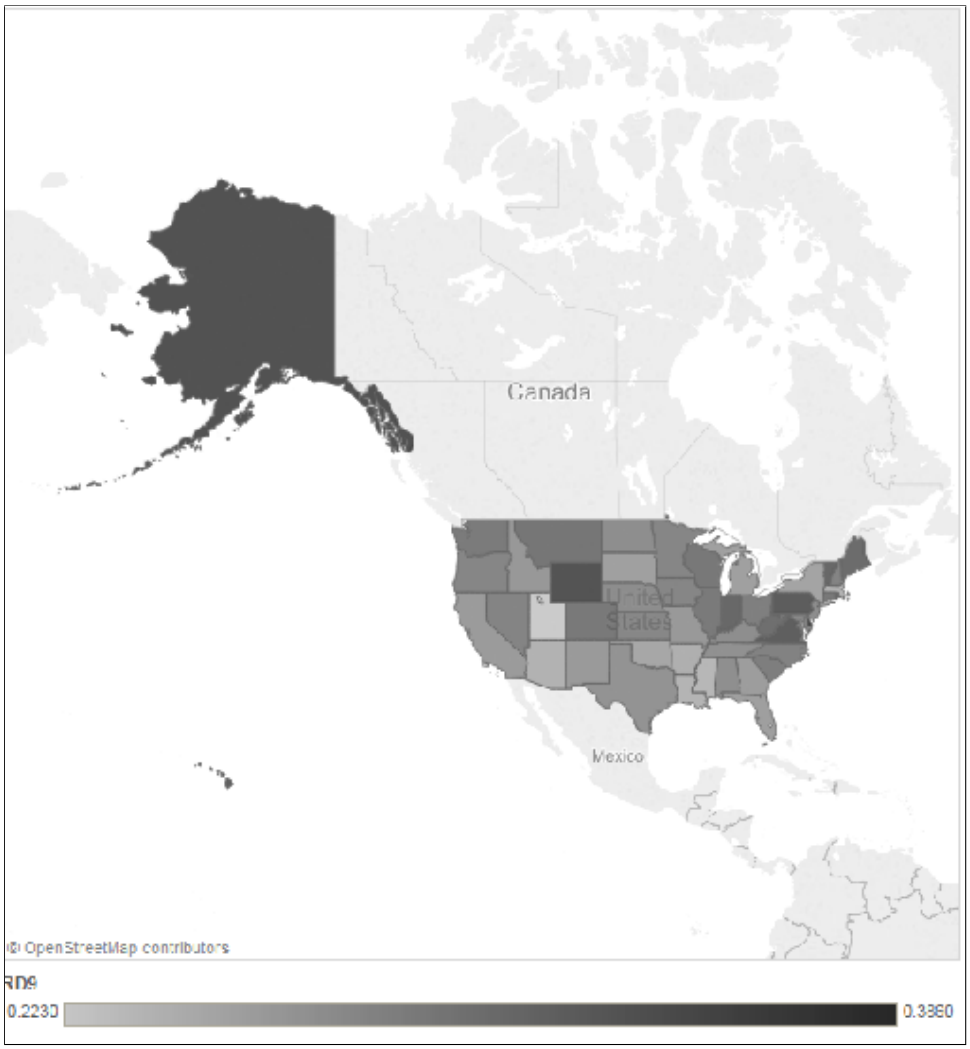

Table B.1: Average Revenue Diversification over Time

Year	RD3	RD4	RD9	Number of nonprofits
1998	0.169	0.220	0.319	182208
1999	0.157	0.204	0.307	208606
2000	0.160	0.207	0.307	218430
2001	0.152	0.200	0.292	231361
2002	0.130	0.179	0.269	231380
2003	0.124	0.176	0.270	240098
Total	0.148	0.197	0.293	319486

Table B.2: Average Revenue Diversification across Sector

NTEE Classification	RD3	RD4	RD9
A. Arts, Culture and Humanities	0.365	0.411	0.482
B. Educational Institutions and Related Activities	0.188	0.197	0.270
C. Environmental Quality, Protection and Beautification	0.182	0.279	0.365
D. Animal Related	0.363	0.370	0.450
E. Health: General and Rehabilitation	0.105	0.111	0.178
F. Health: Mental Health and Crisis Intervention	0.171	0.262	0.296
G Health: Diseases and Disorders Support and Service Organisations	0.112	0.190	0.371
H. Health: Diseases and Disorders Research	0.143	0.172	0.299
I. Public Protection: Crime Prevention, Legal Administration/Services	0.060	0.214	0.277
J. Employment/Jobs	0.104	0.127	0.176
K. Food, Nutrition, Agriculture	0.109	0.229	0.299
L. Housing/Shelter	0.106	0.140	0.176
M. Public Safety, Disaster Preparedness/Relief	0.176	0.367	0.426
N. Recreation, Leisure, Sports, Athletics	0.193	0.192	0.372
O. Youth Development	0.210	0.355	0.494
P. Multipurpose Human Service	0.138	0.232	0.270
Q. International/Foreign Affairs and National Security	0.038	0.049	0.-84
R. Civil Rights, Social Action, Advocacy	0.072	0.183	0.272
S. Community Improvement/Capacity Building	0.150	0.259	0.339
T. Philanthropy and Volunteerism	0.051	0.052	0.191
U. Science and Technology Research Institutes/Service	0.182	0.200	0.391
V. Social Science	0.148	0.174	0.310
W. Public/Society Benefit	0.119	0.139	0.264
X. Religion Related/Spiritual Development	0.036	0.038	0.092
Y. Mutual/Membership Benefit Organisations	0.161	0.152	0.280
Z. Other	0.003	0.004	0.029

Table B.3: Average Number of Nonprofits and Markets by Sector

Sector	Description	NTEE Code	Mean Number of nonprofits	Mean Number markets
1	Museums	A50-57	2560	265
2	Performing arts	A62-6C	8404	275
3	Community health treatment	E30-42	2992	260
4	Abuse prevention	I70-73	895	204
5	Employment and vocational training	J20-33	32985	258
6	Nursing, home health care	E90-92	2461	224
7	Substance abuse prevention and treatment	F20-22	2549	242
8	Hotlines and crisis prevention	F 40-42	319	144
9	Crime prevention and rehabilitation	I20-44	1321	210
10	Food pantries and programs	K30-36	1291	237
11	Public housing and rehabilitation	L21-25	5620	264
12	Homeless shelters	L40-41, P85	1429	212
13	Community centers	P28	1160	207
14	Family counselling	P46	663	171
15	Senior center	P81	1828	246
16	Residential care and group homes	P73	1171	203
	Total		37616	3622

[1] Sector descriptions are based on Thornton, 2006.

Table B.4: Summary Statistics

	Mean	Standard error
Nonprofit level variables		
RD3	0.29	0.30
RD4	0.32	0.30
RD9	0.33	0.27
Concentration Index	2719	2553
Administrative cost share	0.17	0.18
Fundraising cost share	0.02	0.07
Equity balance	2.89	0.07
Operating margin	-3.49	5.00
Total expense (1000s)	3585	100000
Donative	0.42	0.49
Age	18.37	14.44
Geographic level variables		
MSA population (1000s)	3428	5590
MSA per-capita income	31	5
MSA unemployment rate (%)	4.68	1.42
Share of state population > 65	0.12	0.02
Share of Democrats in state's Senate	1.20	0.88
Share of Democrats in state's Congress	0.50	0.21
Share of State with a Democrat governor	0.49	0.50

[1] All dollar values are in 1000s;

[2] All dollar values are real (2000 base year).

Table B.5: OLS Regression Results

	(1)	(2)	(3)
	RD3	RD4	RD9
Concentration index	2.08E-06**	1.29E-06*	5.41E-7
	(8.04E-7)	(6.97E-7)	(5.93E-7)
Administrative cost share	0.0724***	0.0578***	0.0663***
	(0.00843)	(0.0578)	(0.0663)
Fundraising cost share	0.0171	-0.0402	0.0285
	(0.0219)	(0.0252)	(0.0239)
Equity balance	0.00424***	0.00316***	0.00298***
	(0.000342)	(0.000278)	(0.000273)
Operating balance	0.00103***	0.00127***	0.00105***
	(0.000329)	(0.000259)	(0.000243)
Total expense	0.00706***	0.00920***	-0.000145
	(0.00185)	(0.00181)	(0.00168)
Age	0.00333***	0.00316***	0.00323***
	(0.000169)	(0.000124)	(0.000152)
Donative	0.0386***	0.151***	0.115***
	(0.00600)	(0.00455)	(0.00403)
Constant	1.882	1.151	1.035
	(1.395)	(1.529)	(1.419)
R-squared	0.226	0.283	0.308
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level.

Table B.6: Tobit Regression Results

	(1)	(2)	(3)
	RD3	RD4	RD9
Concentration index	2.09e-06 ***	1.40e-06 **	5.66E-07
	(7.19E-07)	(6.77E-07)	(5.39E-07)
Administrative cost share	0.062172 ***	0.0503241 ***	0.0592003 ***
	(0.00766)	(0.00593)	(0.00652)
Fundraising cost share	0.0213548	-0.0357792	0.0263981
	(0.02018)	(0.02408)	(0.02306)
Equity balance	0.0037086 ***	0.0028553 ***	0.0027332 ***
	(0.0003)	(0.00025)	(0.00026)
Operating balance	0.0010098 ***	0.0012207 ***	0.0009886 ***
	(0.0003)	(0.00025)	(0.00023)
Total expense	0.008592 ***	0.0102467 ***	0.001209
	(0.00172)	(0.00171)	(0.00158)
Age	0.0031 ***	0.003007 ***	0.0030409 ***
	(0.00015)	(0.00012)	(0.00014)
Donative	0.0359698 ***	0.1394154 ***	0.1061545 ***
	(0.00522)	(0.00404)	(0.00371)
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level.

Table B.7: QMLE Regression Results

	(1)	(2)	(3)
	RD3	RD4	RD9
Concentration index	2.10E-06***	1.22E-06*	4.93E-7
	(7.89E-7)	(6.84E-7)	(5.88E-7)
Administrative cost share	0.0671***	0.0548***	0.0625***
	(0.00817)	(0.00645)	(0.00684)
Fundraising cost share	0.0159	-0.0392*	0.0241
	(0.0209)	(0.0236)	(0.0217)
Equity balance	0.00417***	0.00328***	0.00308***
	(0.000362)	(0.000315)	(0.000310)
Operating balance	0.00115***	0.00139***	0.00116***
	(0.000342)	(0.000281)	(0.000262)
Total expense	0.00683***	0.00869***	-0.000651
	(0.00184)	(0.00181)	(0.00163)
Age	0.00320***	0.00315***	0.00321***
	(0.000142)	(0.000121)	(0.000132)
Donative	0.0376***	0.145***	0.111***
	(0.00576)	(0.00422)	(0.00366)
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level.

Table B.8: Sector-wise QMLE Regression Results for Concentration Index

	(1)	(2)	(3)
	RD3	RD4	RD9
Museums	2.52E-06 ***	1.38E-06 *	5.64E-7
Performing arts	2.56e-06 ***	1.41E-06 *	5.77E-7
Community health treatment	2.22E-06 ***	1.26E-06 *	5.10E-7
Abuse prevention	1.70e-06 ***	1.42E-06 *	5.80E-7
Employment and vocational training	1.90E-06 ***	1.11E-06 *	4.60E-7
Nursing, home health care	1.43E-06 ***	7.60E-07 *	3.11E-7
Substance abuse prevention and treatment	2.29E-06 ***	1.32E-06 *	5.31E-7
Hotlines and crisis prevention	1.53E-06 ***	1.45E-06 *	5.90E-7
Crime prevention and rehabilitation	1.61E-06 ***	1.15E-06 *	4.7E-7
Food pantries and programs	2.0E-06 ***	1.34E-06 *	5.47E-7
Public housing and rehabilitation	1.91E-06 ***	1.02E-06 *	3.98E-7
Homeless shelters	1.85e-06 ***	1.39E-06 *	5.61E-7
Community centers	2.32E-06 ***	1.41E-06 *	5.78E-7
Family counseling	2.45e-06 ***	1.36E-06 *	5.55E-7
Senior centers	2.40E-06 ***	1.43E-06 *	5.82E-7
Residential care and group homes	1.72E-06 ***	9.53E-07 *	3.75E-7
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level;

[4] SE removed for easy comparison.

Table B.9: QMLE Regression Results with Unobserved Heterogeneity

	Ind.	Exch.	Ind.	Exch.	Ind	Exch.
Concen. index	2.10E-06***	1.19E-06**	1.22E-6	1.31E-06**	4.95E-7	8.19E-7
	(8.02E-07)	(5.99E-07)	(7.59E-07)	(5.71E-07)	(6.91E-07)	(5.23E-07)
Admin share	0.0671***	0.0296***	0.0548***	0.0211***	0.063***	0.0190***
	(0.0082)	(0.00654)	(0.00809)	(0.00625)	(0.00743)	(0.00557)
Fundraising share	0.0159	-0.00243	-0.0392*	-0.0138	0.0241	-0.00652
	(0.0203)	(0.0152)	(0.0209)	(0.0151)	(0.0196)	(0.0144)
Equity balance	0.00417***	0.00151***	0.0033***	0.00118***	0.0031***	0.00112***
	(0.000186)	(0.000139)	(0.000176)	(0.000134)	(0.000158)	(0.00012)
Operating balance	0.00115***	0.00046***	0.0014***	0.00050***	0.0012***	0.00033***
	(0.000212)	(0.000107)	(0.0002)	(0.000101)	(0.000181)	(0.00009)
Total expense	0.00683***	0.00711***	0.0087***	0.00970***	-6.52E-4	0.00252***
	(0.00104)	(0.00101)	(0.00102)	(0.000971)	(0.000923)	(0.00088)
Age	0.00320***	0.00343***	0.0032***	0.00337***	0.0032***	0.00334***
	(0.000109)	(0.000105)	(0.000107)	(0.000103)	(0.000097)	(0.0001)
Donative	0.0377***	0.00844***	0.145***	0.0764***	0.111***	0.052***
	(0.00339)	(0.00323)	(0.00301)	(0.00285)	(0.00276)	(0.00247)
Observation	106205	106205	106205	106205	106195	106195

[1] *** p<0.01, ** p<0.05, * p<0.1; [2] Although not shown, fixed effects were included for sector, year and state; [3] Robust standard errors in parentheses, clustered at the state level. [4] Ind. indicates independent correlation structure, Exch. indicates exchangeable correlation structure.

Table B.10: QMLE Regression Results with Endogenous Explanatory Variables

	(1)	(2)	(3)
	RD3	RD4	RD9
Concentration index	2.11E-06**	1.10E-6	3.37E-7
	(8.66E-07)	(7.62E-07)	(6.47E-07)
Administrative cost share	0.0788***	0.0637***	0.0756***
	(0.0105)	(0.0082)	(0.00845)
Fundraising cost share	0.000598	-0.0729**	0.0156
	(0.0289)	(0.0322)	(0.0295)
Equity balance	0.00497***	0.00389***	0.00364***
	(0.000437)	(0.000378)	(0.00037)
Operating balance	0.00170	0.00293***	0.00269***
	(0.00125)	(0.00102)	(0.000919)
Total expense	0.00853***	0.0102***	0.000336
	(0.00199)	(0.00192)	(0.00174)
Age	0.00314***	0.00309***	0.00315***
	(0.000143)	(0.000119)	(0.000132)
Donative	0.0379***	0.145***	0.110***
	(0.00595)	(0.00425)	(0.00365)
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level.

Table B.11: QMLE Regression Results with CR4

	(1)	(2)	(3)
	RD3	RD4	RD9
CR4 index	0.00908	0.0115**	0.0105**
	(0.00586)	(0.00540)	(0.00503)
Administrative cost share	0.0673***	0.0551***	0.0628***
	(0.00822)	(0.00643)	(0.00681)
Fundraising cost share	0.0156	-0.0392*	0.0243
	(0.0209)	(0.0236)	(0.0218)
Equity balance	0.00418***	0.00328***	0.00308***
	(0.000363)	(0.000315)	(0.000310)
Operating balance	0.00116***	0.00139***	0.00115***
	(0.000343)	(0.000282)	(0.000263)
Total expense	0.00684***	0.00870***	-0.000649
	(0.00185)	(0.00182)	(0.00163)
Age	0.00320***	0.00315***	0.00321***
	(0.000142)	(0.000121)	(0.000131)
Donative	0.0376***	0.145***	0.111***
	(0.00579)	(0.00425)	(0.00368)
Observations	106221	106221	106221

[1] *** p<0.01, ** p<0.05, * p<0.1;

[2] Although not shown, fixed effects were included for sector, year and state;

[3] Robust standard errors in parentheses, clustered at the state level.

Table B.12: Description of Sources of Revenue

Item	Description	Line number in Form 990
Direct public support	Contributions, gifts, grants, and bequests received directly from the public. Includes amounts received from individuals trusts, corporations, estates, foundations, public charities, or raised by an outside professional fundraiser.	1a
Indirect public support	Contributions received indirectly from the public through solicitation campaigns conducted by federated fundraising agencies or organizations such as the United Way; from a parent or subordinate organization.	1b
Government grants	Payments from the government to a nonprofit to further the organization's public programs.	1c
Program service revenue	Fees and other monies received by an organization for services rendered. These services must relate directly to the purpose for which the organization received its tax-exempt status.	2
Membership dues	Members' and affiliates' dues or fees that are not contributions.	3
Interests	Interest on savings and temporary cash investments	4
Dividend	Dividends and interest from securities	5
Other investments		7
Net rental income	Rental income earned from all non-program related property, less costs.	6c
Net sale of assets	Securities, real estate, royalty interest, partnership interest, all other non-inventory assets, less costs, depreciation, and selling expenses.	8d
Special fundraising	Income earned from all special fundraising events and activities, less costs.	9c
Others	Inventories for sale or use.	10c + 11
Total revenue	Money that the organization has received from all sources.	12

[1] Descriptions were obtained from the Guidestar Glossary; [2] The line numbers are based on Form 990, 2000.

Appendix C

APPENDIX TO CHAPTER 3

C.1 Tables and Figures

Figure C.1: Comparison of average individual contributions in PPM and LPP

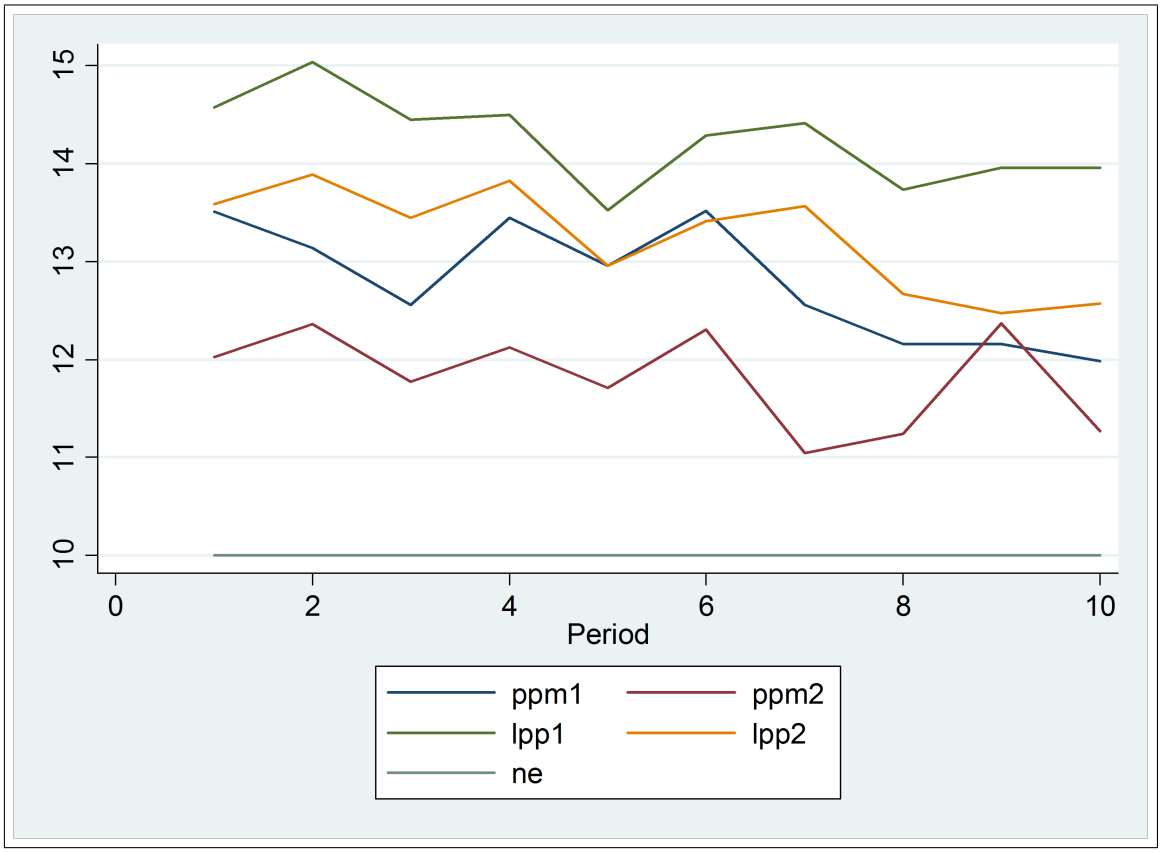

Table C.1: Comparison of PPM and LPP at the Individual Level

Design	PPM	LPP	Difference of Means	Statistical Significance
		Percentage of Free-riders		
1	4.91	3.02	-	**
2	6.03	5.26	-	
		Mean Individual Contribution		
1	12.78	14.24	-1.45	***
	(0.09)	(0.09)	(0.13)	
2	11.82	13.24	-1.42	***
	(0.09)	(0.09)	(0.12)	

[1] Standard errors in parentheses.

Table C.2: Comparison of PPM and LPP at the Individual Level

Design	PPM	LPP	Difference of Means	Statistical Significance
		Percentage of Success of Project		
1	81.95	93.31	-	***
2	79.70	87.27	-	***
		Mean Group Contribution		
1	51.19	56.97	-5.78	***
	(0.37)	(0.35)	(0.51)	
2	47.29	52.96	-5.66	***
	(0.34)	(0.34)	(0.49)	***
		Social Surplus		
1	59.09	76.44	-17.36	***
	(0.37)	(0.09)	(0.13)	
2	58.29	62.36	-4.07	***
	(0.39)	(0.31)	(0.50)	

[1] Standard errors in parentheses.

Table C.3: Comparison of PPM and LPP (Design 3) for Multiple Public Goods

	LPP	PPM	Difference of Means	Statistical Significance
Free-riding	12.41	16.21		***
Mean individual contribution	10.62	8.93	18.91	***
	(0.11)	(0.10)	(0.15)	
Frequency of provision	81.34	69.62	18.59	***
	(0.01)	(0.01)	(0.02)	
Mean group contribution	42.49	35.73	18.91	***
	(0.43)	(0.40)	(0.59)	
Social surplus	67.10	62.44	7.46	***
	(0.59)	(0.56)	(0.81)	
Frequency of socially efficient project	63.56	56.78		**

[1] Standard errors in parentheses.

C.2 Mathematical Proof

N individuals are provided with identical endowments, e_i. Each must simultaneously decide how much of the endowment to contribute for the provision of a public good, $g_i =$. The part of the endowment not contributed for the public good is retained for private consumption, $e_i - gi$. If the sum of individual contributions for the public good is greater than or equal to some threshold level, T then each individual receives a return of $\beta \sum g_i$. The benefit an individual enjoys from an additional unit of public good is captured by β, the marginal per capita return (MPCR). It is assumed that $\beta < 1$ but high enough such that the provision of the public good is socially efficient, that is, $n\beta > 1$. Amount in excess of the threshold is utilized to increase the quantity or quality of the good. On the other hand, the good is not produced if there is a shortage of funds and the contributions are refunded. In such a setup, individual i's utility is:

$$U_i = \begin{cases} (e_i - g_i) + \beta(\sum_{i=1}^{N} g_i) & \text{if } \sum_{i=1}^{N} g_i \geq T \\ e_i & \text{otherwise} \end{cases} \tag{C.1}$$

Bagnoli and Lipman (1989) were the first to theoretically prove that there exists a continuum of efficient and inefficient equilibria in this game. The efficient equilibrium consists of all possible vectors of allocations such that:

$$\sum_{i=1}^{N} g_i = T \tag{C.2}$$

$$n\beta \geq 1 \tag{C.3}$$

Assuming symmetric equilibrium, Eq.C.2 ensures that the public good is exactly provided: $g^*_{vc} = \frac{T}{n}$ or $G^*_{vc} = T$ and Eq.C.3 states that no individual contributes more to the public good than his individual return.

Given the chosen values of $n = 4$ and $\beta = 0.5$ satisfy Eq.C.3, the optimal individual contribution should be 10 units and the sum of contributions should be 40 units.

An organization can introduce lotteries to link contributions to the public good with the chance of winning a prize in a lottery. Let each player i contribute to the public good by purchasing g_i lottery tickets (assuming price of tickets is normalized to 1). The probability player i wins the prize of value, V, depends on contribution levels, $\frac{g_i}{\sum_{i=1}^{N} g_i}$. We can extend Morgan's theory (2000) to show that the lotteries with threshold costs and refundable contributions can lead to efficient solutions.

The individual is now faced with the following utility maximization problem:

$$U_i = \begin{cases} (e_i - g_i) + \beta(\sum_{i=1}^{N} g_i - V) + \frac{g_i}{\sum_{i=1}^{N} g_i} V & \text{if } \sum_{i=1}^{N} g_i \geq (T+V) \\ e_i & \text{otherwise} \end{cases} \tag{C.4}$$

Differentiating the utility function with respect to g_i, we get the following first order conditions:

$$\beta - 1 + \frac{V}{\sum_{i=1}^{N} g_i} - \frac{V g_i}{(\sum_{i=1}^{N} g_i)^2} = 0 \tag{C.5}$$

$$\beta - 1 + \frac{G_{-i}}{(\sum_{i=1}^{N} G_i)^2} = 0 \tag{C.6}$$

Assuming symmetric equilibrium, $g_l^* = min\{\frac{V(n-1)}{n^2(\beta-1)}, e\}$

Given the possibility of refund in case the threshold condition is not satisfied, we have:

$$ng_l^* = \begin{cases} min\{\frac{V(n-1)}{n^2(\beta-1)}, e\} \\ min\{\frac{V(n-1}{n(\beta-1)}, ne\} \end{cases} \tag{C.7}$$

This results in two conditions:

$z \geq \frac{T}{n}$ for the public good to be provided and
$\frac{V(n-1)}{n(1-beta)} \geq T$ or $\frac{V(n-1)}{n} \geq (1-\beta)T$ for efficiency if the public good is provided.

In the lottery case, the total amount of public good generated will be $G_l^* = ng_l^* = \frac{V(n-1)}{n(1-\beta)} \geq T = G_{vc}^*$.

C.3 Experimental Instructions

Thank you for agreeing to take part in this experiment conducted by University of Washington researchers. This project provides an opportunity to earn considerable amount of money, but only if you are careful to follow directions and make good decisions. Therefore, it is important for you (and for our research!) that you take your time to understand the instructions.

When instructed please move to Room 261 and sit at any computer workstation. It is important that you follow your own instructions for the duration of the experiment. Please do not communicate with the other participants once you are in the room. If you have any questions, please raise your hand. Instructions will be provided on the projector by the supervisor. You will make your decisions using the computer workstation, which will also provide you with feedback about the outcomes of those decisions.

Throughout the experiment we will use experimental money units (EMUs) rather than U.S. dollars. At the end of the experiment your EMU earnings will be converted to U.S. dollars at an exchange rate of 1 EMU = 0.25 U.S. dollars (25 cents).

Today's experiment is divided into three Sessions (1, 2 and 3) each consisting of two Parts - A and B. Each part will in turn comprise of multiple rounds. Which part you will play first will be randomly chosen. You will receive instructions for each part of the experiment prior to its beginning. In each round, you participate in a simple decision-making game that is described below.

At the beginning of each Round you will be matched with three other people, randomly selected from the participants in your room. You and the people you are matched will form a Group. Your earnings will depend on your decisions and on the decisions of the other members of your group. Because the composition of groups is randomly determined at the beginning of each round, the identity of the people you are matched with will change from round to round. Otherwise, each set of rounds is identical.

At the beginning of each round you will receive 20 EMUs. We will refer to that amount as your "endowment". Your EMUs do not carry over between rounds; that is, you will always start off with an endowment of 20 EMUs in every round. At the end of the experiment the

computer will randomly choose 2 out the multiple rounds in each part and you will be paid EMUs * 0.25 dollars based on your earnings in those two rounds. Therefore, you should seek to maximize your EMUs in each round.

C.3.1 Session 1

The Game: Part A

Your task is to decide how many EMUs from the endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put into the Group Account?* In the input box, type in the number of EMUs you want to transfer, any number between 0 and 20, inclusive. You can change your mind any time prior to clicking the OK button. When you are satisfied with your choice, click the OK and the Continue to Next Round buttons. You have 30 seconds to make a decision. Any EMUs you do not place in the Group Account are placed in your Private Account.

The number of EMUs in your Private Account belong solely to you whereas the number of EMUs in the Group Account will be shared by all the group members. However, for anyone to get any EMU from the Group Account, the total number of EMUs in the account at the end of the round has to be at least as much as a specified threshold level. In this session the threshold is 40 EMUs.

After all participants have clicked the OK button, the computer program will calculate the total number of EMUs that all members of your group have in the Group Account. Let us call this number X.

If $X < 40$, then there is no payment from the Group Account and each group member gets back the EMUs that they had allocated. Earnings for the round will be 20 EMUs for each subject. If $X \geq 40$, then the amount X EMUs will be placed in the Group Account. All 4 members of your group, even those who did not put in any EMUs in the Group Account

will earn additional EMUs based on the total EMUs in the group account. Specifically, if $X \geq 40$, each member of your 4-person group will earn $(0.5 * X)$ EMUs.

Your total earnings for each round are the sum of two items:

1. The number of EMUs that remain in your private account: If $X < 40$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if $X \geq 40$, the number of EMUs in your private account is $20 - c$, where c is the number of EMUs that you allocated to the Group Account.

2. The earnings from the group account: If $X \geq 40$, you and every other member of your group earns an additional $(0.5 * X)$ EMUs; that is, for each EMU that is allocated to the Group Account (by you or by any of the other members of your group) every group member receives 0.5 EMU.

There will be 10 rounds of this Part.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward the Group Account

2. The total number of EMUs submitted by all members of your group including you

3. Whether the threshold (=40 EMU) was covered or not

4. The profit (in EMUs) you earned in the round

Are there any questions before we proceed?

The Game: Part B

Your task is to decide how many EMUs from the endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put in to the Group Account?* In the input box, type in the number of EMUs you want to pitch in, any number between 0 and 20, inclusive. When you are satisfied with your choice, click the OK and Continue to Next Round buttons. You have 30 seconds to take a decision.

For the Group Account to generate any returns or for the prize to be awarded the total EMUs (X) in the account must be at least 40 EMUs. Any EMU that you put into the Group Account will give you a chance of winning a prize of 15 EMUs. While the computer program randomly selects one member of your group contributing more than zero EMUs as the prize winner, your chance of winning the 30 EMUs prize in this random selection is equal to the number of EMUs you allocated toward winning the prize divided by the total number of EMUs contributed by all members of your group including you, X. That is, if c is the number of EMUs you allocated to the Group Account, your chance of winning is $\frac{c}{X}$ (providing that X is at least 40). The more EMUs you contribute relative to the total X, the greater is your chance of winning the 15 EMUs prize.

If $X < 40$, then there is no payment from the Group Account and the 15 EMU prize is not awarded to any member of your group. Earnings for the round are 20 EMUs for each subject. If $X \geq 40$, then the amount X EMUs will be placed in the Group Account. All 4 members of your group, even those who did not put in any EMUs in the Group Account will earn additional EMUs based on the total EMUs in the group account. Specifically, if $X \geq 40$, each member of your 4-person group will earn $(0.5 * X)$ EMUs. The 15 EMU prize is randomly awarded to one (and only one) member of your group who contributed more than zero EMUs toward winning the prize.

Your total earnings for each round are the sum of three items:

1. The number of EMUs that remain in your private account: If $X < 40$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if$X \geq 40$, the number of EMUs in your private account is $20 - c$, where c is the number of EMUs that you contributed toward winning the 15 EMU prize.

2. The earnings from the group account: If $X \geq 40$, you and every other member of your

group earns an additional $(0.5 * X)$ EMUs.

3. Prize: If $X \geq 40$, AND you are the prize winner, then you receive an additional 15 EMU prize for that round.

There will be 10 Rounds of this Part.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward winning the prize
2. The total number of EMUs submitted by all members of your group including you
3. Whether the threshold (=40 EMU) was covered or not
4. If $X \geq 40$, whether you won or lost the 15 EMU prize
5. The profit (in EMUs) you earned in the round.

Are there any questions before we proceed?

C.3.2 Session 2

The Game: Part A

Your task is to decide how many EMUs from the endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put into the Group Account?* In the input box, type in the number of EMUs you want to transfer, any number between 0 and 20, inclusive. You can change your mind any time prior to clicking the OK button. When you are satisfied with your choice, click the OK and the Continue to Next Round buttons. You have 30 seconds to make a decision. Any EMUs you do not place in the Group Account are placed in your Private Account.

The number of EMUs in your Private Account belong solely to you whereas the number of EMUs in the Group Account will be shared by all the group members. However, for anyone to get any EMU from the Group Account, the total number of EMUs in the account at the end of the round has to be at least as much as a specified threshold level. In this session the threshold is 40 EMUs.

After all participants have clicked the OK button, the computer program will calculate the total number of EMUs that all members of your group have in the Group Account. Let us call this number X.

If $X < 40$, then there is no payment from the Group Account and each group member gets back the EMUs that they had allocated. Earnings for the round will be 20 EMUs for each subject. If $X \geq 40$, then the X EMUs will be placed in the Group Account. All 4 members of your group, even those who did not put in any EMUs in the Group Account will earn additional EMUs based on the total EMUs in the group account. Specifically, if $X \geq 40$, each member of your 4-person group will earn $(0.5 * X)$ EMUs.

Your total earnings for each round are the sum of two items:

1. The number of EMUs that remain in your private account: If $X < 40$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if $X \geq 40$, the number of EMUs in your private account is $20 - c$, where c is the number of EMUs that you allocated to the Group Account.

2. The earnings from the group account: If $X \geq 40$, you and every other member of your group earns an additional $(0.5 * X)$ EMUs; that is, for each EMU that is allocated to the Group Account (by you or by any of the other members of your group) every group member receives 0.5 EMU.

There will be 10 rounds of this Part.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward the Group Account

2. The total number of EMUs submitted by all members of your group including you

3. Whether the threshold (=40 EMU) was covered or not

4. The profit (in EMUs) you earned in the round

Are there any questions before we proceed?

The Game: Part B

Your task is to decide how many EMUs from your endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put in to the Group Account?* In the input box, type in the number of EMUs you want to pitch in, any number between 0 and 20, inclusive. When you are satisfied with your choice, click the OK button. You get 30 seconds to make a decision.

Any EMU that you put into the Group Account will give you a chance of winning a prize of 15 EMUs. While the computer program randomly selects one member of your group contributing more than zero EMUs as the prize winner, your chance of winning the 15 EMU prize in this random selection is equal to the number of EMUs you allocated toward winning the prize divided by the total number of EMUs contributed by all members of your group including you, X. The more EMUs you contribute relative to the total X, the greater is your chance of winning the 15 EMU prize.

The threshold level in this part is 25 EMU. However, for the Group Account to generate any returns the total EMUs (X) in the account must be at least 40 EMUs, as the Group Account must also have the 15 EMUs that will be handed out as prize. Essentially the prize is provided out of the amount of EMU collected in the Group Account. Therefore, in this part of the experiment the effective threshold is 40 EMUs.

If $X < 40$, then there is no payment from the Group Account and the 15 EMU prize is not awarded to any member of your group. Earnings for the round are 20 EMUs for each subject. If $X \geq 40$, then the amount X EMUs will be placed in the Group Account. All

4 members of your group, even those who did not put in any EMUs in the Group Account will earn additional EMUs based on the total EMUs in the group account. Specifically, if $X \geq 40$, each member of your 4 person group will earn $(0.5 * X)$ EMUs. The 15 EMU prize is randomly awarded to one (and only one) member of your group who contributed more than zero EMUs toward winning the prize.

Your total earnings for each round are the sum of three items:

1. The number of EMUs that remain in your private account: If $X < 40$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if $X \geq 40$, the number of EMUs in your private account is $20 - c$, where c is the number of EMUs that you contributed toward winning the 15 EMU prize.

2. The earnings from the group account: If $X \geq 40$, you and every other member of your group earns an additional $(0.5 * X)$ EMUs based on the number of EMUs X in the group account.

3. Prize: If $X \geq 40$, AND you are the prize winner, then you receive an additional 15 EMU prize for that round.

There will be 10 rounds of this Part.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward winning the prize

2. The total number of EMUs submitted by all members of your group including you

3. Whether the threshold (=40 EMU) was covered or not

4. If $X \geq 40$, whether you won or lost the 30 EMU prize

5. The profit (in EMUs) you earned in the round.

Are there any questions before we proceed?

C.3.3 Session 3

There are 3 projects available for you and the other members of the group - Project 1, Project 2 and Project 3. Each project has a different threshold level which are 30, 40 and 50 EMUs respectively. If the total sum of EMUs to finance a Project exceeds the project threshold cost, then each member will earn EMU returns according to the project. Basically, each project generates monetary returns for the members of the group. However, the rate of return varies among the 4 members. The higher your rate of return from a particular project, more will be your earnings from that project. For example, if your rate of return from the three Projects are 0.3, 0.7, 0.5, you will get greatest returns from Project 2, given a certain amount of EMUs in the Group Account. The computer will randomly assign rates of return for you for each of the three projects prior to the start of the experiment. These rates are private information and should not be shared with anyone.

The Game: Part A

Your task is to decide how many EMUs from endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put into the Group Account?* In the input box, type in the number of EMUs you want to transfer, any number between 0 and 20, inclusive. You can change your mind any time prior to clicking the OK button. When you are satisfied with your choice, click the OK and the Continue to Next Round button. You have 30 seconds to take a decision. Any EMUs you do not place in the Group Account are placed in your Private Account.

The number of EMUs in your Private Account belong solely to you whereas the number of EMUs in the Group Account finances one of the 3 projects and will be shared by all the group members. After all participants have clicked the OK button, the computer program will calculate the total number of EMUs that all members of your group has in its Group

Account. Let us call this number X.

The project with the threshold EMU closest to X (let's say T) will be implemented. The amount X EMUs will be placed in the Group Account. All 4 members of your group, even those who did not put in any EMUs in the Group Account will earn additional EMUs based on the total EMUs in the group account. Specifically, each member of your 4 person group will earn $(rateofreturn * X)$ EMUs, where the rate of return varies from member to member.

If $X < 30$, the minimum threshold (of Project 1), then there is no payment from the Group Account and each group member gets back the EMUs that they had allocated. Earnings for the round will be 20 EMUS for each subject. If $30 \leq X < 40$, then Project 1 will get implemented and the earnings of each member will depend on his/her rate of return from Project 1. If $40 \leq X < 50$, then Project 2 will get implemented and the earnings of each member will depend on his/her rate of return from Project 2. If $50 \leq X$, then Project 3 will get implemented and the earnings of each member will depend on his/her rate of return from Project 3.

Your total earnings for each round are the sum of two items:

1. The number of EMUs that remain in your private account: If $X < 20$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if X, the number of EMUs in your private account is $20 - c$, where c is the number of EMUs that you allocated toward Group Account.

2. The earnings from the group account: If X, you and every other member of your group earns an additional $(rateofreturn * X)$ EMUs; that is, for each EMU that is allocated to the Group Account (by you or by any of the other members of your group) each group member receives his/her rate of return, depending on which Project gets implemented, that in turn depends on which threshold is covered by X EMU.

There will 50 rounds in this Part with only the outcome of every 5th round being binding. In the first 4 rounds your group will remain the same to help you get an idea of

the outcomes. Your decision in the 5th round will matter. The groups will be re-matched after every 5th round.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward the Group Account
2. The total number of EMUs submitted by all members of your group including you
3. The project to be implemented
4. The profit you earned in the round.

Are there any questions before we proceed?

The Game: Part B

Your task is to decide how many EMUs from endowment you would like to allocate to a Private Account and how many to the Group Account. Your decision is made anonymously; no participant can associate you with your decision. Likewise, the other three group members can allocate EMUs to their Private Accounts and to the Group Account.

Specifically, on the decision screen for each round you are asked: *How many of your 20 EMUs would you like to put in to the Group Account?* In the input box, type in the number of EMUs you want to pitch in, any number between 0 and 20, inclusive. When you are satisfied with your choice, click the OK button. You have 30 seconds to take a decision.

Any EMU that you put into the Group Account will give you a chance of winning a prize. Unlike in the previous treatments, there is no monetary prize that can be won. However, being the winner will allow you to control which Project gets implemented out of the Group Account. We implicitly assume that everyone likes more income and given the choice will choose that Project for which his/her rate of return is maximum. Thus, if you are the winner of the lottery in a round then the rate at which you get returns from the Group Account is the one that is the maximum for you. The other members of the group will get returns from this project too at their individual rates of return. While the computer program randomly selects one member of your group contributing more than zero EMUs

as the prize winner, your chance of winning the prize in this random selection is equal to the number of EMUs you allocated toward winning the prize divided by the total number of EMUs contributed by all members of your group including you, X. The more EMUs you contribute relative to the total X, the greater is your chance of winning.

For the Group Account to generate any returns the total EMUs (X) in the account must be cover the threshold level of the project. As an example, let us assume that the winner had the following rates of return from the 3 projects - 0.5, 0.7 and 0.3. As the winner she will choose to have Project 2 implemented because for every 1 EMU she will earn 0.7 EMUs from Project 2, more than from the other two projects.

If $X < 40$ then Project 2 cannot be put into effect. However, $X > 30$, the threshold of Project 1 is exceeded and so every member will earn some share of X EMUs in the Group Account, based on their individual rates of return from Project 1. If $X < 30$ the number of EMUs in your private account will be set equal to your endowment of 20 EMUs and each group member gets back the EMUs that were allocated. Earnings for the round are 20 EMUS for each subject. If $X \geq 40$, then the amount X EMUs will be placed in the Group Account. All 4 members of your group, even those who did not put in any EMUs in the Group Account will earn additional EMUs based on the total EMUs in the group account depending on their individual rates of return.

Your total earnings for each round are the sum of three items.

1. The number of EMUs that remain in your private account: If $X < 30$, the number of EMUs in your private account will be set equal to your endowment of 20 EMUs. Otherwise, if $X \geq 30$, the number of tokens in your private account is $20 - c$, where c is the number of EMUs that you put into the group account.

2. If $X \geq T$ you and every other member of your group earns an additional $(rateofreturn * X)$ EMUs based on the individual rates of return, depending on the individual rates of return from the Project that maximizes the rate of return of the winner of the lottery.

There will 50 rounds in this Part with only the outcome of every 5th round being

binding. In the first 4 rounds your group will remain the same to help you get an idea of the outcomes. Your decision in the 5th round will matter. The groups will be re-matched after every 5th round.

At the end of each round your computer screen will report back to you:

1. The number of EMUs you offered toward winning the prize
2. The total number of EMUs submitted by all members of your group including you
3. Whether you were the winner or not
4. The project to be implemented and whether the threshold was covered or not
5. The profit you earned in the round.

Are there any questions before we proceed?

We will begin the experiment shortly.

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Research Experience

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Teaching Experience

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Fellowships & Awards

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