AN ABSTRACT OF THE THESIS OF

Jehan Jabareen for the degree of Master of Science in Applied Economics presented on December 29, 2017.

Title: What Accounts for the Variation and Growth in Nonprofits: A National Empirical Study of Watershed Groups in the US.

Abstract approved:

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Studies that have examined watershed groups have lacked the analysis of an empirical national data set to account for the factors that affect watershed groups growth and variation. This has made it difficult to assume any particular relationship between the presence of watershed groups and any environmental, social or political factors. Most of the work that has been done to measure watershed groups' presence relies on regional cases and survey data. This study takes a step further and uses a large panel of data for 1,570 watersheds in the US to establish a framework of all the environmental, social and political factors that may have an impact on watershed groups' presence. Building on a methodological framework and using longitude data on a watershed level, the model uses two-stage least square estimation with endogenous water quality. The results suggest that watershed groups presence is positively correlated with waterbodies listed for impairment, number of endangered species, proportions of rural areas, population density, and percentage of population with college degree. Yet, other factors that are also accounted for this study have negative impact on watershed groups presence.

What Accounts for the Variation and Growth in Nonprofits: A National Empirical Study of Watershed Groups in the US

by
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A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented December 29, 2017
Commencement June 2018

Master of Science thesis of Jehan Jabareen presented on December 29, 2017

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Jehan Jabareen, Author

ACKNOWLEDGEMENTS

This work would not have come to its end without the help and the support of my major advisor, Professor Christian Langpap. I truly appreciate all of his academic advising and his patience in supporting me through this learning process. A full expression of gratitude goes to all of my committee members. Thank you to Professor David Lewis for his great advice, intuition, and his encouragements along the way. Thank you to Professor Ivan Arismendi, who also helped me to understand my research from different angles and perspectives outside my department. This journey would not have been possible at all without the help and the support of my husband, Mousa Diabat, and the inspiration of my two sons, Aseel and Bashir Diabat. I have a lot more people to be thankful for, many from the OSU and Corvallis community, but I cannot end this acknowledgement without a huge thanks to my family overseas, and particularly to my parents, Tyseer and Yasmeen Jabareen. You both have taught me to seek learning and love life, and you both are my source of dreams for a new journey to begin.

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1. Introduction

The role of watershed groups in the US economy offers a wide variety of public goods and conservation benefits, including water quality, water management, and restoration benefits of the watershed. Public awareness of environmental quality problems and changes in the US environmental policies are major factors in the increase of the potential function of watershed groups. The early seventies marked the initiation of key environmental control laws and legislations, in addition to the formation of the US Environmental Protection Agency (EPA) on 1970. The EPA operates as the federal agency to research, monitor and enforce activities to ensure environmental protection. Following the EPA formation, the Clean Water Act (CWA) was passed on 1972, and the Endangered Species Act (ESA) on 1973. To the present day, the provision of environmental quality standards and watershed managements are guided by these acts. A number of empirical studies suggest that in the early stages of country's economic development, environmental degradation is inevitable. The relationship between economic growth and environmental degradation is explained by an inverted U-shaped curve called Environmental Kuznets Curve (EKC), which suggests that pollution levels increase in the early stages of development and decrease as income rises beyond a certain point. Although the relationship between the increase in income and environmental degradation may be obvious, the relationship between income increase and environmental quality improvement is still ambiguous. The potential role of watershed groups might be the mechanism by which increase in income can become a driver for decrease in pollution and improved environmental quality (Breckenridge, 1999), as more affluent populations demand for cleaner environments and richer biodiversity, yet this topic is still underdeveloped.

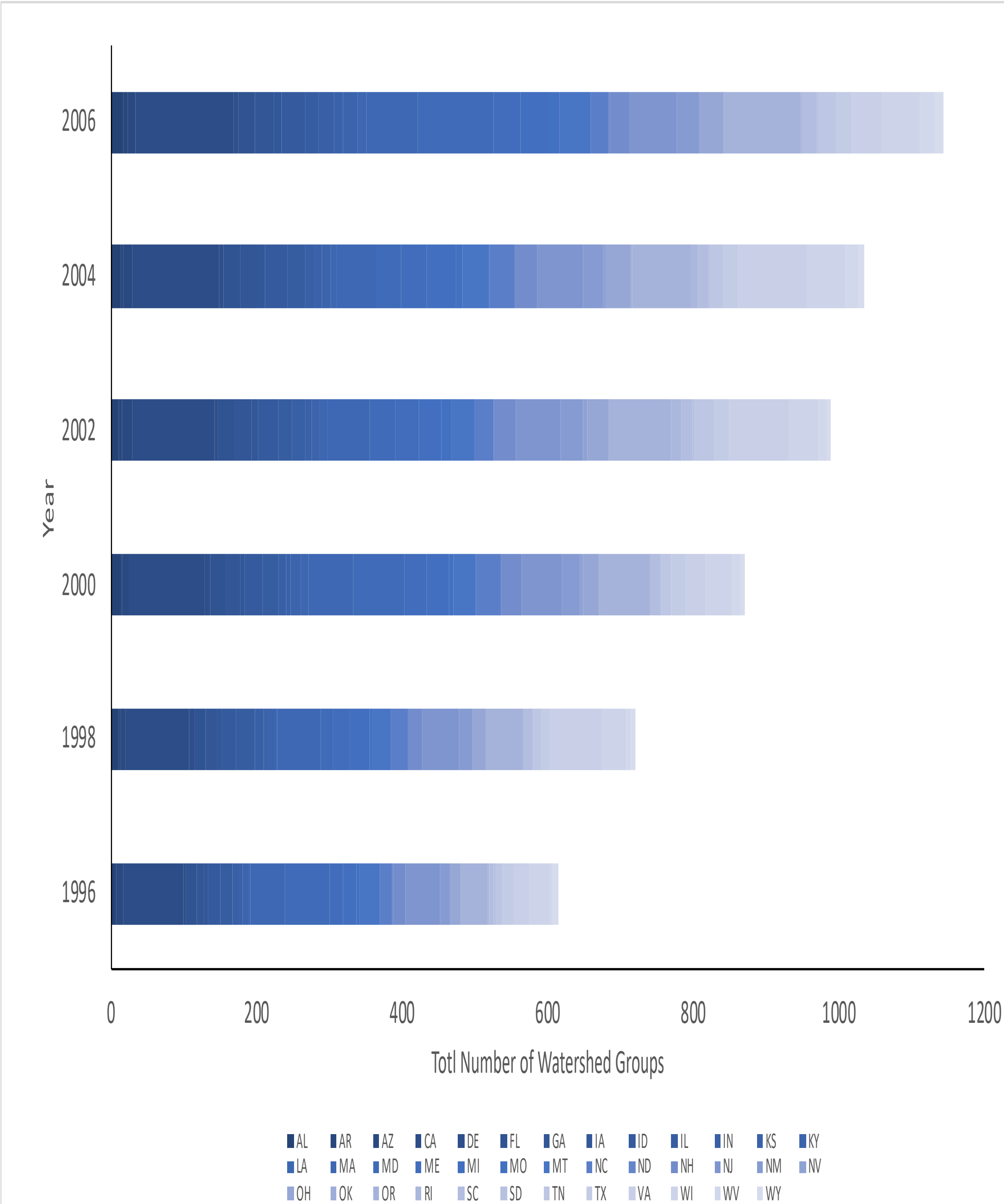
Even though water quality has improved proceeding the CWA (Keiser & Shapiro, 2017), persistent water problems remain unresolved, and particularly those caused by non-point sources of pollution. These findings have been documented by the EPA in 1997, which reported that nontraditional sources of pollution, such as runoff from agricultural fields and urban areas, are clearly the leading causes for impairment in surface waters (Novotny, 1999). Watershed management has since taken a shift into a more comprehensive approach, in which the watershed is considered a full ecological system with prioritization on actions that restore the integrity of the watershed and its waterbodies in accordance with the visions and goals of the CWA and the ESA as well.

Besides the failure in meeting environmental quality standards and goals, controversies have increased public awareness of environmental problems and public concerns of the regulations that enforce environmental protection at the same time. Local citizens have argued that environmental regulations are seldom enforced against corporate violators, while businesses have claimed that these regulations impact their productivity and their ability to compete internationally (Cable & Benson, 1993). Another political controversy is associated with the costs and benefits of these acts. Some argue that the benefits of increasing environmental quality may not exceed the costs, resulting in an insufficient use of national sources and funds (Keiser & Shapiro, 2017). The historical milestones and the controversies in public opinion have given watershed groups a significant role in watershed management. The function of watershed groups evolves from public involvement and stakeholders' participation; however, other environmental and political factors impact their growth as well.

Watershed groups receive their funding from private donors and governmental grants. They operate with the purpose to restore watersheds, advise stakeholders on watershed managements and assist in drafting and implementing plans that meet the regulatory requirements and guidelines. Despite the significant role of watershed groups in the provision of watershed management, they operate in a competitive environment. Like other nonprofits, watershed groups compete for public funds and political resources (Economides & Rose-Ackerman, 1993; Lakdawalla & Philipson, 2006; Twombly, 2003). Competition for funds and scarce resources are key factors in understanding the forces that determine the entry and exit of watershed groups in the industry. Additionally, demand factors can also lead to new entries when demand is increasing.

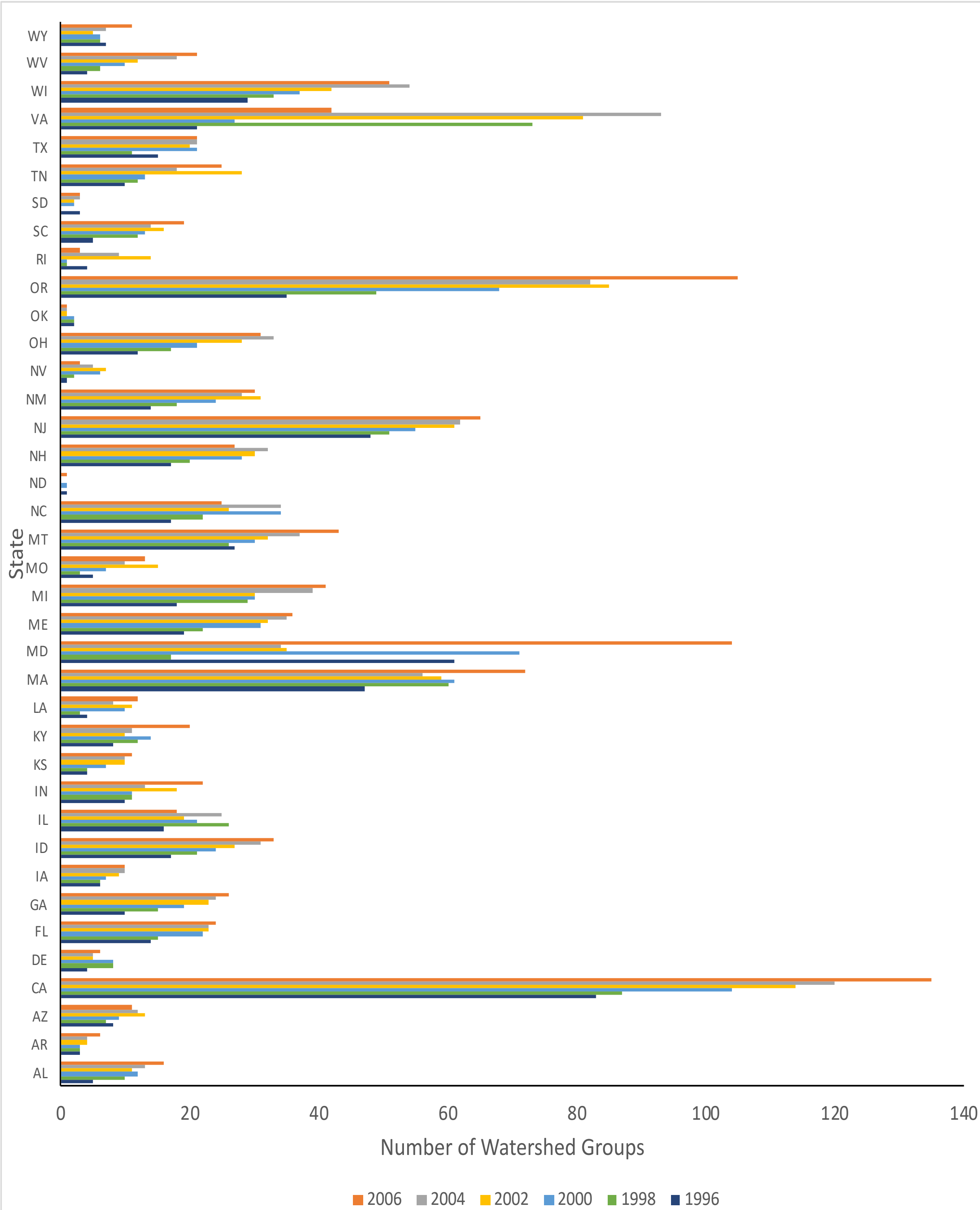
Both the increase in the number of watershed groups in the past decades and the high variation among watersheds and states have brought up some questions about the factors that can increase their presence in specific watersheds versus others. Using the data from this research, Figure 1 presents the trend of an increase in the number of watershed groups in the US between the years 1996-2006, and Figure 2 illuminates the high variation in the number of watershed groups among the states in each year between 1996-2006. Despite these figures in trend and variation, and despite the potentially important role of watershed groups, little is known about the structure of this industry, what determines the entry and exit of watershed groups into the market, and how competitive these groups can be, all which can contribute to fundamental implications for the efficiency of watershed groups operation. Chikoto and Halicki (2013) suggest that nonprofit organizations emerge through social and political contextual complexities, and studies should account for these factors in defining their emergence and formation. This research takes an initial step towards understanding watershed groups industry, by examining environmental, social and political factors that have impact on the number of watershed groups. An empirical model is designed to find the correlation between these factors and the number of watershed groups in each watershed and in each year.

Figure 1: The total number of watershed groups in each year in the US[1]



[1] States are omitted due to insufficient 303(d) data: UT, VT, PA, NY, NE, MS, MN, HI, CT, CO, AK, WA. Data also dropped from California pre-1998, and New Hampshire pre-2000 due to poor data quality.

Figure 2: Number of watershed groups in each state between the years 1996-2006[2]



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[2] States are omitted due to insufficient 303(d) data: UT, VT, PA, NY, NE, MS, MN, HI, CT, CO, AK, WA. Data also dropped from California pre-1998, and New Hampshire pre-2000 due to poor data quality.

Most of the literature on watershed groups' presence analyzes survey data and interviews with stakeholders and the community. This study adds to the existing economic literature by analyzing a large empirical panel data and offers suggestions of the factors that have impact on watershed groups presence. Alongside the scholarly contribution, this research may have important policy implications and suggestions. The results of this research offer basic tools for policymakers that would contribute to designing more effective policies in addressing watershed problems. Examining the environmental, social and political forces at work in watershed management and social engagement can assist governments in mitigating the outcomes of environmental and water quality problems.

2. Literature Review

Productive accounting for watershed groups' presence, and examining of the factors that impact their numbers in different watersheds demands a clear understanding of the nature of both their institutional operation and the services that they provide. Therefore, this review of literature aims at a comprehensive outlook on watershed groups' presence. Watershed groups are nonprofit institutions and private organizations that provide a variety of public benefits and services. In the first section of this chapter, literature describing nonprofits is discussed, and in the second section, some insights from the literature on private provision of benefits to the public is examined. The third section discusses watershed management and watershed restoration to provide a deeper understanding of the nature of the service that watershed groups provide for the public.

2.1 Nonprofit Organizations and Basic Theories

Nonprofit organizations operate in an important niche in the US economy. They mostly operate in service industries and often coexist with for profit and government organizations. Nonprofits function in various industries in the market, and they provide services in healthcare, education and training, social services, art and culture, housing and community development, environmental organizations, international assistant, religious congregation, civic participation and advocacy, infrastructure organizations, foundations and corporation philanthropy, and individual giving and volunteering (Salamon, 2012). These facts may suggest that nonprofits' existence and their role depend on the industry output, industrial organization characteristics, economics, and demographic and political attributes altogether (Ben-Ner & Hoomissen, 1991). Economic literature has made many attempts to explain and understand the role of nonprofits in the economy, and how they are different from for-profits and government organizations (H. B. Hansmann, 1980; Rose-Ackerman, 1996; Weisbrod, 1988). Yet, these models are still short of offering a conceptual framework of the appropriate factors that may have influence on nonprofit formation in the different industries. Recent economic literature revisits the basic theories of nonprofit formation and offers few additions to the theoretical framework (Aligica, 2015, 2016; Ben-Ner & Hoomissen, 1991; Kingma, 1997; Valentinov & Iliopoulos, 2013; West, 1989).

A number of important studies has attempted at understanding the role of nonprofits in the economy and nonprofit formation. The devoted research towards nonprofits is also driven by the high growth in number of nonprofit organizations, and by the different markets in which they operate (Harrison & Laincz, 2008). Weisbrod (1972) was first to establish an economic scenery to describe nonprofit existence. Literature after that build on Weisbrod (1972) work, and while some of these studies complement each other, others are offer competing views (Marcuello, 1998). The first contribution of the literature by Weisbrod (1972) explains the existence of nonprofits through government failure, which creates unsatisfied demand created by an under-provided public service. This unsatisfied demand often occurs because government makes political decisions regarding its activities, and these decisions are made to only satisfy the median voter (Kingma, 1997). Those who have higher demand for the specific public good are willing to contribute to nonprofit formation through donations of money or volunteering time in order to satisfy their demand.

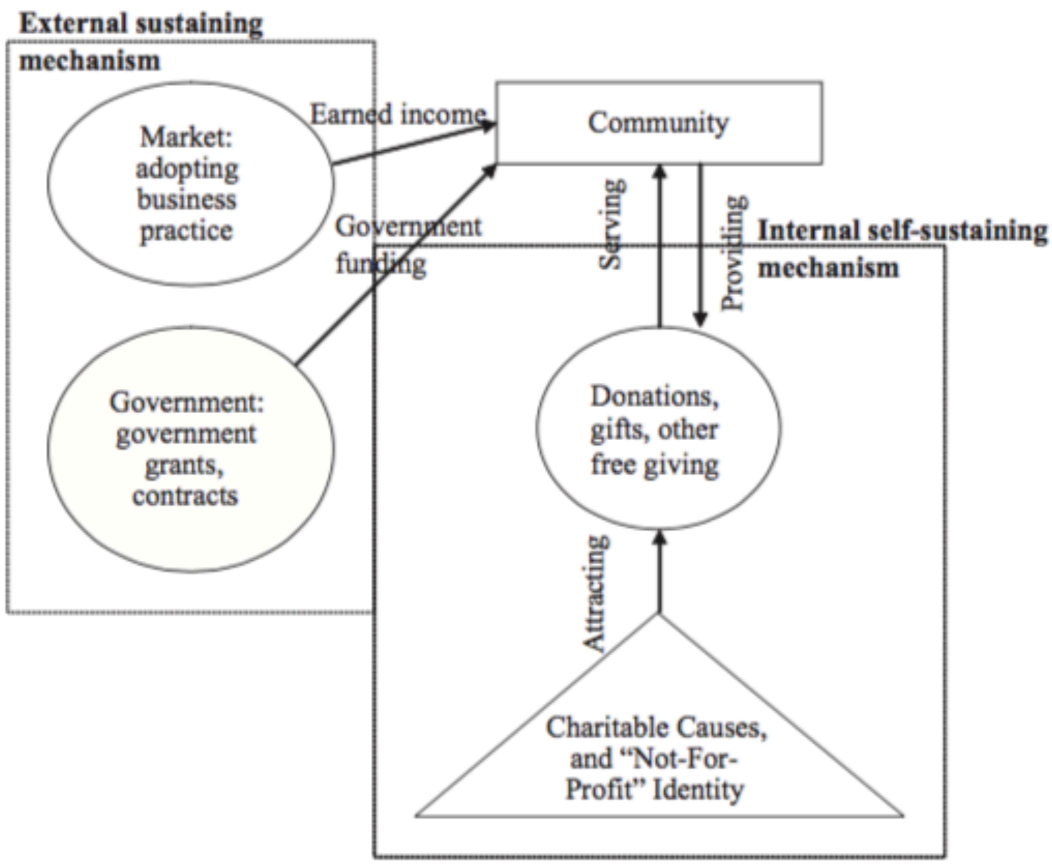
However, government failure seems to be an insufficient understanding of nonprofits' formation, as other forms of market failure also lead to nonprofits' existence. Consumers are willing to contribute to nonprofits' formation when information about the product or the service is asymmetric, or when (at no cost) they have the tools to evaluate the quality or the quantity of their consumption (Ben-Ner, 1994; Easley & O'Hara, 1983; H. B. Hansmann, 1980). This may occur when purchasers and recipients are separate from each other, such as when donating money to help others in need, or when evaluating the quality of services is not accessible like in child and health care. Consumers in these cases may trust an entity that has no profit incentives for its operation. The contract failure model is another type of market failure that is different from government failure. The model assumes that asymmetric information and lack of the ability to evaluate the quality or the quantity of the product increase the necessity of nonprofit formation. The contract failure model is an addition to the literature because it explains why nonprofits can coexist with for-profits and how they are different from them. Therefore, the literature today agrees that nonprofits are a third sector in the economy that operates beside for-profit firms and government organizations.

It may seem that watershed groups arise from government failure, when environmental quality and water pollution control do not meet the provisions of the public. However, the rise of watershed groups can also be explained through contract failure. Citizens are incapable of evaluating the quality and quantity of providing environmental improvement, and they trust nonprofit entities to provide them with these services, particularly because these entities do not have profit incentives like for-profits.

Recent studies advance the theories of nonprofit operation by elaborating on the demand and supply side of nonprofits. Even with the existence of demand for nonprofits as an alternative to for-profits or government provision, this demand is not sufficient to explain their existence. A nonprofit organization will form only if there is a group of stakeholders that value the benefits of self-run organization, are willing to contribute to the organization, rather than to free, ride and are able to form controlled activities through nonprofit organizations. Direct control of stakeholders is guarded by the absence of ownership shares, the non-distribution of profit constraint, and the open book policy (Ben-Ner, 1994; Mcdougle & Handy, 2014). Other non-control demanders can still purchase the product or service provided by the nonprofit through donations or through its non-rival attributes. These theories show greater connection between demand and supply factors, and reveal some factors contributing to nonprofit formation that act from both the demand and supply sides, such as demographic and political inclinations in specific regions or in specific communities. Studies that have examined the organization-donor relationship also suggest that this relationship is a key factor for nonprofits' longevity (Waters, 2011), Figure 3 illustrates the operational model of a self-sustaining nonprofit, with a strong relationship between donors and control stakeholders.

A number of studies have examined nonprofit formation through the agency of intellectual collective action and public choice for public goods and services (Aligica, 2016; Ostrom, 2010), instead of reasoning it to market failure. These studies, however, have also determined a simultaneous relationship between demand and supply, and in the presence of heterogeneous demand, a desire for self-governance institutions arises. The concept of collective action becomes very common in the literature on watershed managements, as it demonstrates the capacity of local communities to provide their own mechanism to overcome environmental problems in a dynamic process of institution-building, and it identifies these community problem-solving practices as collective action (Rydin & Pennington, 2000)

Figure 3: The relationship between demand and supply side as a self-sustaining mechanism for nonprofits, (Knutsen, 2012)



Despite these attempts to explain theories of nonprofits through a simultaneous relationship between the demand and supply, a distinction between these factors can still be applied. This section goes on to elaborate more on donations as a demand factor and on control as a supply factor.

It is mostly agreed that nonprofits form due to unsatisfied demand that arises from market failure. According to these models, only those who are willing to pay more to receive more of the under-provided service may contribute to nonprofits to achieve higher provision of the service.

However, contributions are made voluntarily through donation, and because services provided by nonprofits are commonly non-rival, more studies are done to understand individual's motives for donations than their utility in supplying the under-provided good or how individuals may overcome the free-ride problems and achieve non-excludable and non-rival services. Some features of the charitable sector in the American economy suggests that the pure public good approach to altruism is limited (Andreoni, 1988), and giving is motivated by characters that are more than altruism. In the US, there is a vast participation in donations for charities, with large aggregate and individual contributions. Besides, empirical studies show that government participation incompletely crowds out private donations (Andreoni, 1988; Antoci et al., 2008; Kondo & Glazer, 2016; Okten & Weisbrod, 2000; Ribar & Wilhelm, 2002), and economic studies show that an increase in government contribution to the charitable activity is associated with a marginal decrease in private donations (Andreoni, 1988). Several studies suggest that giving is also motivated by sympathy, ethics, desire for recognition, taste for fairness and other factors (Andreoni, 1990; Harbaugh, 1998; Lilley & Slonim, 2014). However, other studies find that giving is also limited by the size of the economy, and it becomes smaller when the size of the economy gets larger, making the free-ride problem a dominant factor to limit donations (Andreoni, 1988; Isac & Walker, 1988).

On the supply side, theories explain that nonprofits' supply is generated by entrepreneurship. Some individuals with ideological motivation and strong beliefs about the proper way to provide a particular service take the role of control stakeholders to manage and operate the nonprofit, and it is a self-sustaining mechanism that allows nonprofits to thrive (Knutsen, 2012; Wallis, 2006). Control stakeholders are legally bounded by the non-distribution constraints, and accordingly, they are bounded from distributing any generated profit. However, stakeholders are also entitled with tax exemptions on sales, properties and income (H. Hansmann, 1993; Lakdawalla & Philipson, 2006). Even though nonprofits are bounded by the non-distribution constraint, they can still earn a surplus which may be reinvested in the organization, kept as endowment, or used for other charitable purposes. These control policies ensure that nonprofits are efficiently perusing the objectives of consumers, sponsors and donors (Ben-Ner, 1994; Fishman, 1987). However, Hansmann (1996) explains that nonprofits can continue to operate as long as their rate of returns on their capital is at least equal to real economic depreciation, and therefore, nonprofit organizations have no pressure to strive for profit, and this can be the reason to why nonprofits do not react rapidly to market signals, and have a sluggish demand response (Edwards, 2013).

2.2 Private Provision of Public Good through Nonprofits

The several studies that discuss nonprofit performance are particularly concerned in the efficiency of nonprofits in providing public good provision. A number of literature concludes that even in the face of government provision of public good, some private provision of public good will occur (Albers & Ando, 2003). The United States relies on nonprofit organizations to provide public goods of all kinds, including conservation benefits and watershed management. The law regarding nonprofits, including tax exemptions, encourages the formation of nonprofits in response to failure of lawmaker's policies and gives nonprofit advantages to profit-seeking entities (Breckenridge, 1999). The neoclassical economists have long believed that private provision of public good will be inefficient due to the free-ride problem. Recently, however, studies argue that models of altruism may mitigate the free-ride problem, and private provision of public good can be achieved (Bagnoli & Lipman, 1992). Grant and Langpap (2017) discuss the private provision of public good through watershed groups that provide water quality benefits to the public, and others scholars present models incorporating the individual's utility function from donation to show that (at least under certain circumstances) privately-provided public good can be efficient (Bagnoli & Lipman, 1992; Bagnoli & Mckee, 1991; Hollander, 1990; Kim, 2009; Lahiri, 2013; Preston, 1988; Sun, 2012; Xu et al., 2013).

Nonprofits are private suppliers of collective good. They are entitled with legal support that gives them advantages over for-profits, and public support over government organizations (Preston, 1988). Private donors are willing to provide funds to the collective good, and their desire to consume the public good is revealed by their contribution (Okten & Weisbrod, 2000). However, economic models of altruism and warm glow argue that donors receive benefits or utility from the act of donation, even without accounting for the supply of the good that is provided for them (Kingma, 1997). Donations, however, can be limited by other factors. Many studies attempt to identify the factors that have impact on aggregate donations to potentially analyze the likelihood that the collective good will be provided at the socially optimal level.

A number of factors appears to influence donations, and in addition to market size of the economy (Andreoni, 1988; Antoci et al., 2008; Isac & Walker, 1988; Morrison, 1978), which diminishes individuals' contributions when it gets larger, Ostrom (2010) presents structural variables that affect the likelihood of collective action. Among these variables are the heterogeneity of participants, communication between participants, voluntariness of participation, and information about previous actions. The limits of altruism create competitive nonprofits in the industry (Glazer, 2016) and generates new mechanisms for fundraising, such as the provision-point mechanism (Rondeau et al., 2005; Rose et al., 2002), the cost-sharing rule (Xu et al., 2013), and the green tariff mechanism for green electricity programs (Kotchen & Moore, 2007). The private provision of public good through nonprofits still captures the interest of recent studies, which attempt to explain nonprofits role in particular industries.

In environmental services, nonprofit organizations have served three key functions: they advocate for environmental and local interests through participation in legal and administrative proceeding; they own protected parks, preserves and conservation easements; and they perform scientific research and publicized scientific information (Breckenridge, 1999). Substantial empirical literature examines the private provision of environmental public goods and services. Some examples from the green electricity programs reveal that individuals derive utility from the characteristics of the good rather than from goods themselves, additionally, household characteristics and attitudes related to environmental quality, affect their participation in green markets (Jacobsen et al., 2012; Kotchen, 2006; Kotchen & Moore, 2007). Similar observations are made in studying the private provision of public good through nonprofits in watersheds. These studies suggest that watershed groups provide public good through improving water quality (Grant & Langpap, 2017), and through providing river riparian benefits (Hone et al., 2011).

2.3 Watershed Groups and Watershed Management

Over the past years, the goal of watershed groups has been developed from protecting and restoring streams and rivers into adopting a distinctive watershed approach for their work. Historically, water pollution has been addressed at point source, and despite federal and state regulations that address water pollution, water quality problems remain evident in the United States. Recently and to confront persistent water pollution problems, especially those created by non-point sources, federal and state governments have begun to promote the watershed approach. This approach focuses on all source of water pollution as a whole rather than on individual types of sources, and on the integrity of the whole ecosystem of the watershed.

The main elements used to protect and restore water quality are problem identification, stakeholder's involvement and integrated actions and plans (Cline & Collins, 2003). Public involvement in managing watersheds begun early in the twentieth century, but it was not until 1960's and 1970's that federal agencies were forced by law into formally involving the public (Griffin, 1999). These efforts also came after environmental regulatory processes failed to protect citizens from corporate pollutions (Cable & Benson, 1993). The emergence of public involvement in the law and in watershed management have contributed to the surge of community-based associations and watershed groups. Collaborative partnerships that consist of diverse stakeholders are forming increasingly to address environmental problems in watersheds, and they are assisting in addressing the complex issues of water problems and pollution control through managing conflicts in water resource. Policymakers at the state and federal level have initiated advanced policies and collaborative programs supporting the watershed approach, and, besides caring for the provision of local communities, these policies assist in financing programs of environmental pollution control. This combination of government authority, and local knowledge and support yields water quality improvement in many areas and assists in addressing water quality problems financially, technically and socially.

The structure of watershed groups can vary considerably. Some are stand-alone groups, while others have a multi-stakeholder structure which is known as a "watershed council" that it usually includes representatives from local, state and federal agencies. Studies that examine groups' membership suggest that the structure of nonprofit groups has impact on groups' activity and accomplishment in different ways (Moore and Koontz 2003). Groups with government member participation enjoy more financial, technical and human resource support from the government, while citizen-centered groups have more freedom to approach local watershed management activities (Hardy, 2010). Koontz and Johnson (2004) suggest that besides the internal structure of watershed groups, the size of the group has impact on its level of accomplishment. Groups with large size of memberships and balanced of public versus private stakeholders are more likely to report plan development and restoration accomplishment (Koontz & Johnson, 2004). Other studies have also found that collaborative partnership between local government and local nonprofit organizations can achieve improvement in water quality, making nonprofit organization involvement a key to success in achieving environmental outcomes (Morris et al., 2014). Some other studies suggest that there is no consensus on what makes watershed partnership work (Leach & Pelkey, 2001), and partnerships are too highly heterogeneous to identify any pattern or correlation behind their successes.

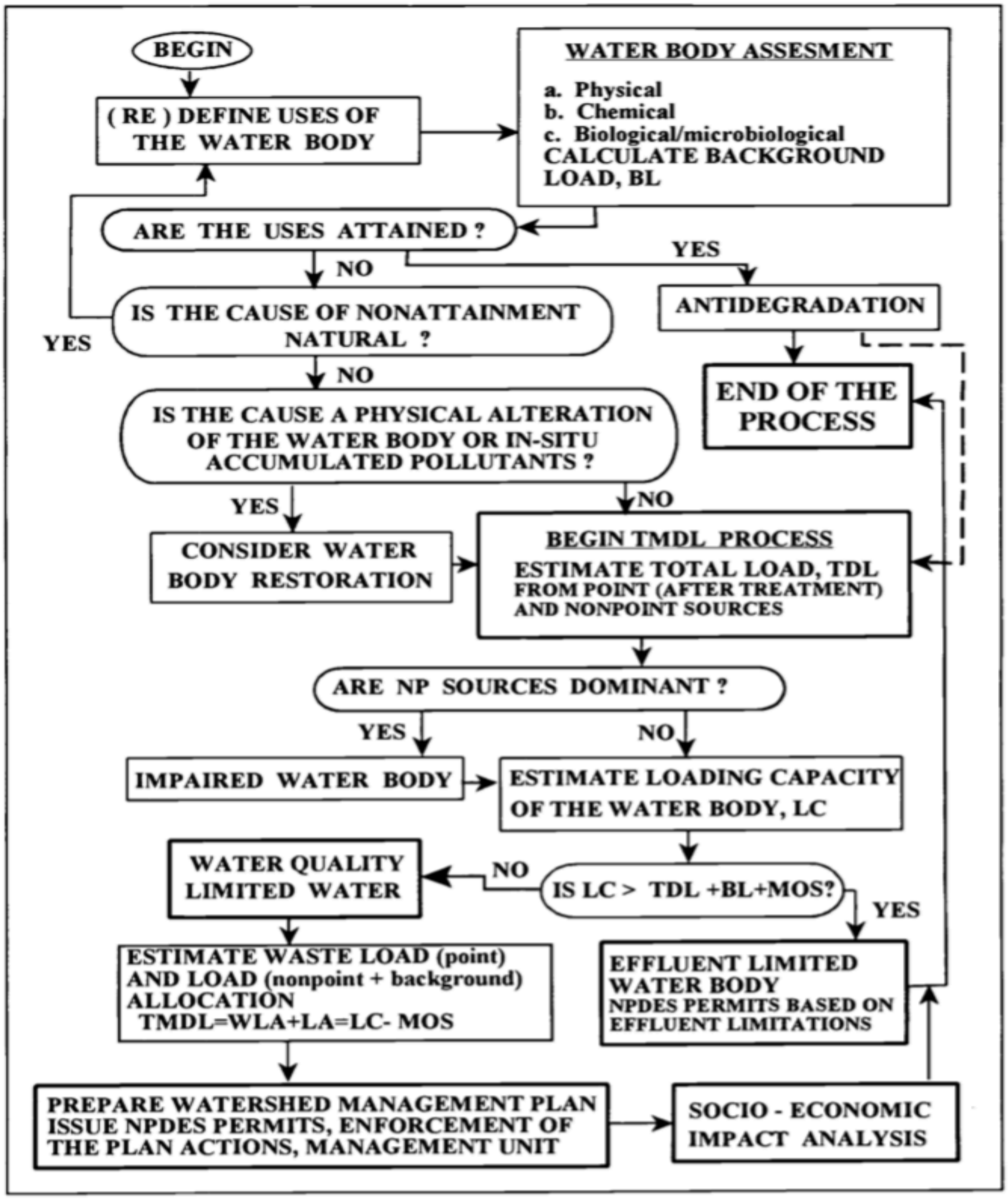
The development of water policies in the US and the contribution of academic research may indicate that collaborative consensus between local citizens and the regulator is the best model to deal with water problems, with a priority on dealing with these problems on the watershed scale. Yet, the challenges become more complex when integrating socio-economic factors, human activities and community preferences into the watershed management. Morton and Padgitt (2005) suggest that understanding the socio-economic metrics of the watershed and the availability of data to analyze these conditions is for scientists, managers and watershed citizens who want to address watershed problems. Within their theoretical framework, these socio-economic factors include social sanctions, sense of place, civic structures and cultural differences. Other studies also conclude that some socio-ecological conditions can positively affect the adoption of optimized watershed plans and conservation practices (Piemonti et al., 2013). The shifts in watershed management through public involvement and the watershed comprehensive approach also bring challenges for institutional formation, particularly in watershed groups establishment. Most of the

States lack the political power and the local representation that is needed to manage watershed problems. The lack of representation from all parties involved in watershed management can lead to challenges in identifying the environmental problems of the watershed and in implementing plans to deal with these problems (Lant, 2003). Despite these challenges in watershed management, there are some successful stories reported through the literature. Chaffin et al. (2012) examined watershed groups and the perceived success through their members in the three states of the Pacific North West. They reported that there is a significant and positive correlation between the perceived watershed groups' success and watershed group funding activities, numbers of participants, motivation of the members, leadership, mission and the availability of necessary watershed data.

Landscape factors are a critical challenge in watershed management. They include present ecological challenges that occur due to water quality degradation and are the result of human activities as the constituent of socio-economic factors (Chu et al., 2013; Cline & Collins, 2003; Hardy, 2010; Novotny, 1999; White & Ford, 1995). Land use factors incorporate water quality problems that are caused by diffuse pollution produced by human activities, land use changes and meteorological events. Therefore, land use factors can affect water quality by the alterations of the chemical, physical and the biological integrity of the water body (Novotny, 1999). In addition to ecological challenges, land use factors contribute to the social challenges in the objectives of watershed management. Some studies show that watershed management goals are perceived differently in rural and urban areas. Populations in rural areas prioritize conservation of critical habitat and they pressure against development plans, while population in urban areas focus on reducing storm water runoffs and compliance with federal policies (Hardy, 2010).

In the past, the term "water management" has been used to describe the primary focus of providing water in adequate quantities to the various users, and, typically, it refers to the action of storing water during hydrological excesses and supplementing it during shortages. Today, water pollution problems and challenges require new definitions for water management, and the term refers to the capability of the water body to receive a certain amount of pollution without impairing the beneficial uses of the body or the integrity of the watershed (Novotny, 1999). Watershed planning and management to control for all sources of pollution has been included in the CWA, sections 208, 303, and 305, and the ESA addresses the recovery of endangered species as it pertains to watershed planning provisions. The objective of watershed management is to achieve water quality standards that meet CWA requirements, to address pollution problems from all sources through Total Maximum Daily Load (TMDL) plans, and to restore the integrity of the watershed ecosystem to meet the ESA visions and goals. Much of the research that aims at understanding water and watershed managements problems refers to it as a "wicked" problem (Morris et al., 2014). A blend of social, technical and scientific considerations is needed to address these problems (See Figure 4), and watershed groups are challenged by these factors in their actions and plans for watershed management. Therefore, in order to understand the variation and growth of watershed groups, a blend of social, environmental and political factors should be integrated to comprehend the impact of these factors on watershed groups' presence.

Figure 4: Water Management, and Waterbodies Restoration, (Novotny, 1999)



3. Research Setting

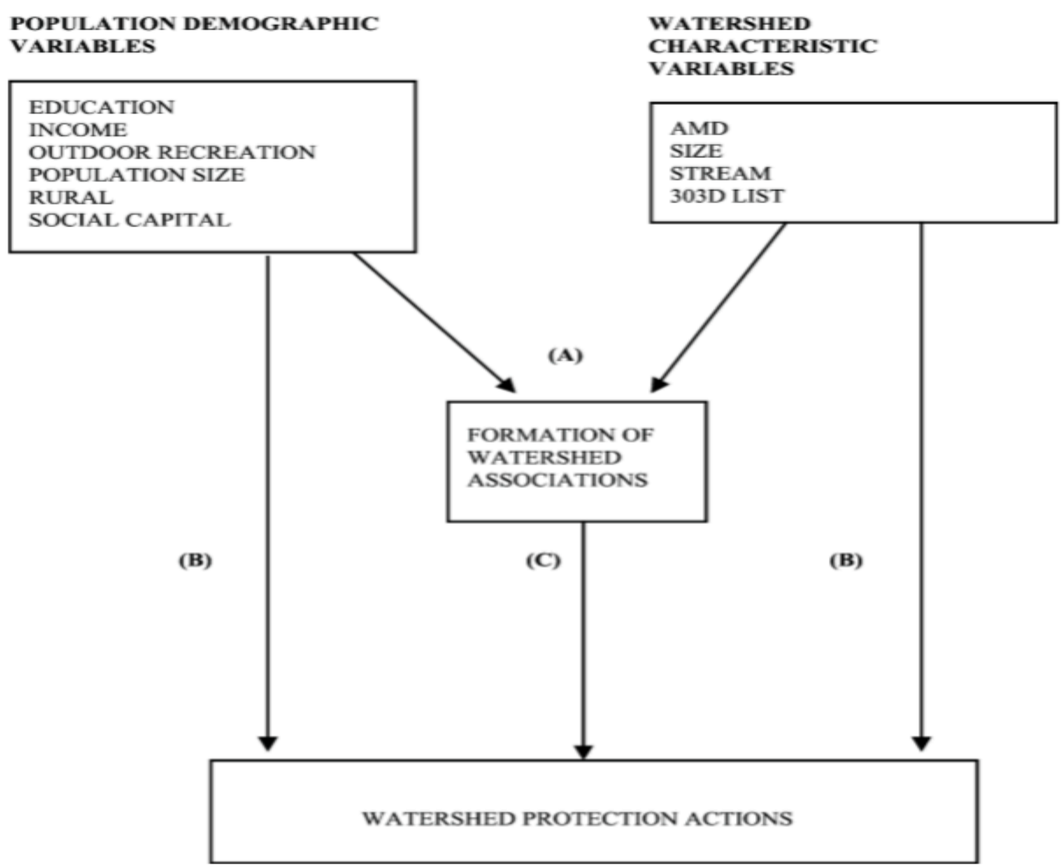
3.1 Methodology:

The objective of this section is to establish a conceptual framework for an empirical analysis of the factors that determine the number of watershed groups in a watershed. Through analyzing factors that would contribute to an increase in the demand for watershed group services and factors that have the potential to increase the benefits of an individual group operating in specific area, a set of independent variables was identified. These variables are included in an empirical model to measure their impact on the number of watershed groups. All the independent variables were motivated by a review of the previous literature on watershed management and conservation, as well as the literature on theories of nonprofit formation and the potential of these nonprofits to provide private provision for public good. However, some of the empirical studies have particularly examined the number of watershed groups, the number of nonprofits in providing conservation benefits, and the number of nonprofits in the market.

Cline and Collins (2003) studied the effectiveness of watershed protection action in West Virginia. As it is described in Figure 5, they have implied that both "Watershed Protection Actions" and the "Formation of Watershed Associations" are a function of population demographics and watershed characteristics.

Lubell et al. (2002) in their study analyzed the factors that contribute to the emergence of collective action institutions in the case of watersheds. They assumed that when environmental problems become severe, the benefits from entering partnership increase. Following this assumption, they identified five variables that measure environmental problem severity and that contribute to the emergence of collective action institutions. The first variable measures the quality of the ecosystem in the watershed[3]. The next two variables reflect on the potential of damage to water quality that originates from urban and rural runoffs. And the final two represent watershed characteristics and are associated with the overexploitation of the water resource. They measure these last two variables through population growth pressure and the number of facilities permitted to directly discharge into the water. Another study, by Albers and Ando (2003), empirically analyzed the variables that have an impact on the number of land trusts, and they also identified variables that are directly related to the characteristics and ecological conditions of the protected land and variables from population demographics.

Figure 5: The "Formation of Watershed Associations" as a function of watershed characteristic and population demographhics (Cline & Collins, 2003)



[3] Using a composite index created by EPA to measure the objectives of environmental conditions in a watershed.

Van Puyvelde and Brown (2016) have examined the density of the nonprofit sector in Texas at the county level. In their study, they took the stakeholder approach to test for the factors that may influence the supply and demand for nonprofits. Included in their study were socio economics characteristics such as income, education, demand heterogeneity and social cohesion, which are all factors that have impact on nonprofit density.

Based on the literature discussed in this section and the literature reviewed in the previous section, a set of independent variables were identified to explain the presence of watershed groups which is defined by the total number of watershed groups in each watershed. These variables can be organized into three areas of impact that have relationships with watershed groups' presence. Accordingly, the number of watershed groups is identified as a function of watershed characteristics, watershed ecological conditions, and population demographics.

The first factor that was identified and assumed to have a direct impact on the number of watershed groups is water quality. For the purposes of this research, the number of waterbodies listed as "impaired" in each watershed is used as a measure of degradation in water quality. Under section 303(d) of the CWA, every other year, states are required to evaluate and identify all waterbodies that do not meet water quality standards and list them as "impaired", and those who meet water quality standards but may be below the standards in the next reporting cycle and list them as "threatened". States are also required to develop a Total Maximum Daily Loads (TDML) plan for these waterbodies and for every pollutant in order to meet water quality standards. States report their listings to the EPA during even-numbered years, and waterbodies listed for impairment remain in this category until the state submits a TDML plan for its recovery. Due to the distinctive function of watershed groups as advisors for water managements and restoration projects and the assistants in drafting and implementing a TDML plan, states and local governments that face these regulatory pressures and requirements desire to cooperate with watershed groups and create a demand for their services (Breckenridge, 1999). In addition, poor water quality increases demand for watershed groups by local citizens, who are willing to contribute to watershed groups through donations and volunteering to mitigate water quality problems (Grant & Langpap, 2017). Hence, the model assumes that the number of waterbodies listed for impairment is positively correlated with the number of watershed groups.

The total number of endangered species in the watershed was also included in the empirical model. This variable has implications for the compliance with the ESA and watershed management, and it reflects the environmental conditions and the health of the whole ecosystem of the watershed. Following Lubell et al. (2002), presence of endangered species is another variable that measures the quality of the ecosystem in the watershed. Some may argue that, when considering the demand for watershed groups, only species with freshwater habitats matter. However, even with watershed restoration projects targeting riparian restoration or aquatic habitats, a self-sustaining existence of a watershed relies on the linkages between terrestrial, riparian and aquatic ecosystems (Kauffmanetl., 1997; Kershner, 1997). Conversely, a healthy watershed or impaired watershed is a function of the ecological status and the whole capacity of the ecosystem at the watershed scale. The total number of endangered species is expected to increase the demand for watershed groups' services that aim at advising and implementing plans to manage and restore the watershed.

A third factor included in the model, which is expected to increase the demand for watershed groups, is industrial non-compliance with the CWA (Cable & Benson, 1993). The literature argues that regulatory involvement in environmental compliance through enforcement decisions, inspections and rulings on violations is a factor that contributes to better environmental outcomes, higher returns on investments in restoration projects, and higher compliance rates (Metzenbaum, 2015; Shimshack, 2014). The demand for watershed groups increases with higher levels of violations of the CWA (Heyes & Rickman, 1999), as it is more likely that these violations contribute to the degradation in water quality. Therefore, this variable is assumed to have the positive correlation with the number of environmental groups.

Variables that describe characteristics of the watershed should be included in the model as well. One potentially important characteristic is watershed size. The model assumes a positive relationship between watershed size and the number of watershed groups. A simple rationale would support this assumption; however, the model also relies on previous studies that include watershed size in the relationship with watershed group activities. Cline and Collins (2003) found a significant relationship between watershed size and the number of watershed associations in the case for West Virginia, and some other studies have also found a significant relationship between watershed size and the effectiveness of watershed groups (Cline and Collins 2003; Draeger 2001; Wu and Boggess 1999). The model described by Wu and Boggess (1999) emphasizes that allocating funds for large scale watersheds is more efficient than dispersing these funds along many smaller watersheds. Therefore, based on the above literature, the model assumes a positive correlation between the number of watershed groups and watershed size.

Land use is an additional factor included in the model, and this factor has been discussed in various literature on the effectiveness of watershed groups (King et al., 2005). Rural and urban uses are leading causes for diminishing water quality and also increase in the demand for watershed restorations and managements. Urban areas contribute to the increase in pollutant loads and surface runoff of contaminants and sediments as well as large variation in stream flow and temperature (Tang et al, 2005). Rural areas, on the other hand, cause impairment of surface water through agriculture run off (Baker, 1992). Literature that analyzes the effectiveness of watershed groups emphasizes the importance of these two variables. In particular, nonpoint-source pollution remains an important source of water quality problems. The model assumes a positive correlation with these variables, as they increase demand for watershed groups by increasing the potential damage on water quality.

A set of demographic variables and population characteristics was included in this model as well. These variables appear in the literature that discusses watershed groups (Cline & Collins, 2003; Grant & Langpap, 2017; Griffin, 1999; Jacobsen et al., 2012; Morton & Padgitt, 2005; Piemonti et al., 2013; Scot & Willits, 1994), literature that studies conservation (Albers & Ando, 2003; Klineberg et al., 1998), and literature that analyses theories on nonprofit formation (Ben-Ner & Hoomissen, 1991; Hooghe & Botterman, 2012; Rose-Ackerman, 1996; Smith et al., 1995; Van Puyvelde & Brown, 2016; Weerawardena et al., 2010). While all demographic factors can have a positive impact on the number of watershed groups, some were identified as factors that increase the demand for watershed groups' services and others were identified as variables that increase the benefits to the individual groups through the increase in the potential for donations. The empirical model controls for employment, population, population density, income, social capital, education, and age, gender and race classifications. Watersheds with comparatively high employment and income have the potential to increase contributions for the watershed groups and a potential to increase the demand for environmental quality (Scot & Willits, 1994), and, therefore, it is anticipated that these variables would have a positive correlation with the number of watershed groups. Population and population density are likely to be a leading cause for an increase in contributions or a source for decreasing water quality in the watershed, and, consequently, these are also associated with an increase in demand for watershed groups services.

The model controls for social capital through home-ownership. Home-ownership reduces mobility and increases investment in the neighborhood (Glaeser et al., 2002). Additionally, studies from social science have linked social capital with environmental actions (Rydin & Pennington, 2000). Wakefield et al. (2006) argued that local activism is a driving force for environmental protection, triggered by residents' group formation in order to have greater effect on decisions affecting the neighborhood in lieu of government regulations. In this research, home-ownership as the proxy for social capital and local activism is a driving force for environmental actions that increases demand for more provision of the public good, and, therefore, the number of watershed groups.

Based on the literature on nonprofits and on watershed management, education and age are added in this model (Scot & Willits, 1994). Both variables are assumed to have positive correlation due their impact on environmental actions that reflects on higher demand for nonprofit groups. Previous studies found that education is positively correlated with both environmental concerns and on the people's conservational behavior and their attitude towards environmental problems (Klineberg et al., 1998; Morton & Padgitt, 2005; Scot & Willits, 1994). These studies imply that social norms can act as incentives for sustainable practices to improve environmental quality. In addition to education, these studies also account for age as a factor that influences people's preferences and demand for environmental quality. Following these arguments, the model assumes that education and age are positively correlated with the number of environmental groups.

In the model, gender differences are included as well. Literature on nonprofit formation has included gender differences as a possible cause leading to heterogeneous demand. Some of the literature, however, has also examined gender differences and their impact on environmental actions and conservational behavior leaning towards more environmentally-friendly consumption habits (Hardy, 2010; Hooghe & Botterman, 2012; Ray et al., 2016; Scot & Willits, 1994). The model assumes that an increase in females in the population would be likely to increase the demand for watershed groups, and it follows the argument that women show more support for pro-environment choices (Johnson & Baltodano, 2004; Klineberg et al., 1998).

Ethnic diversity was also included in this empirical model, and it indicates how social and political forces can have an effect on environmental and collective actions. Theories on nonprofits that attempt to understand the role of voluntary organizations describes the heterogeneous demand model that leads to nonprofit formation, and other studies have also examined the effect of diversity on donations (Andreoni et al., 2016). Nonprofits are likely to arise when heterogeneous demand in the population leaves many individuals unsatisfied under public provision. In heterogeneous communities, citizens have different sensibilities regarding public good. These preferences diverge from the preferences of the median voter, and the voluntary-sector provision is formed to satisfy this under-provided demand (Ben-Ner, 1994; Rose-Ackerman, 1996; Weisbrod, 1988).

The last variable that is assumed to have a positive effect on the number of watershed groups is political inclination of the population, and specifically those that have impact on people's preferences for environmental quality (Scot & Willits, 1994). This variable represents public views towards environmental problems and the political forces that positively or negatively impact their actions to address these problems.

3.2 Data

The dataset includes the number of watershed groups in each watershed and the variables that control for factors that were identified to explain the variation in this number. Except for the information on endangered species, the data was collected by Laura Grant, Katherine Grooms, and

Christian Langpap (Grant & Grooms, 2017; Grant & Langpap, 2017) and is used with their consent.

Watershed boundaries were used as the observational unit in this study. Historically, water pollution has been regulated at point source of pollution; however, in order to address persistent water pollution problems, particularly those created by non-point sources, a comprehensive watershed approach has been developed, and water resource issues are examined today on the basis of the entire watershed instead of focusing only on individual pollution sources (Cline & Collins, 2003). Therefore, the watershed boundary seems to be the appropriate observational unit for this study, and watershed groups operate on this scale to handle water quality problems. Data was collected for every even year between 1996-2006[4], in alignment with the years in which states are mandated to provide the EPA with information about waterbodies listed in their jurisdiction. Data was gathered from different sources and was aggregated to the watershed level.

According to the US Geological Survey (USGS), watershed is defined as the area of land that drains water from precipitations, sediments and other dissolved materials into one common outlet. Watersheds consist of surface water such as streams, lakes, reservoirs and wetlands, and all the underlying groundwater. The definition of watershed as it is described here can be ambiguous, as the boundaries of watersheds can still be undefined due to drainage basin size and alternative water drainage paths. Yet, for the purposes of this research, USGS methodology, and the identifier Hydrological Unit Code (HUC) for each area in the country was used. This coding system divides the country into smaller units using a national standard hierarchical system based on surface hydrologic features and creates a code that consists of two to twelve digits based on the classification of the hierarchical hydrologic level. A 2-digit HUC identifier, for example, includes

[4] Due to insufficient data for the year 2008, this data was omitted from the tested models.

only the first level of classification of 21 regions, and a 12-digit HUC identifier includes the sixth level of classification up until the sub-watershed level[5]. This research uses an 8-digit HUC identifier (HUC8) because nonprofit groups operate at a local level and HUC8 corresponds to the smallest area a single group will likely affect. Watershed boundary data with their identifier HUC8 code were gathered from the USGS website (https://www.usgs.gov).

Dependent Variable:

Data and information on the number of watershed nonprofit groups comes from several resources. An initial search to create a comprehensive list was done in Guidestar (www.guidestar.org), an organization that gathers information about nonprofits. This data includes date of incorporation, location, type of the watershed group and the Employer Identification Number (EIN), or the federal tax identifier. The list from Guidestar was supplemented through the EPA, and River Network — a national organization assisting regional and local groups with the primary mission of protecting water resources. The model uses the information about the incorporation date and the location of watershed groups to account for the total number of watershed groups in each watershed and in each year in the data set.

Independent Variables:

The first variable that was used to explain the variation in watershed groups' number is the total number of waterbodies listed for impairment under CWA regulatory requirements. The data on impaired waterbodies listed was obtained from the EPA website (http://www.epa.gov/waters/ir/) and includes the count number of listed waterbodies for each HUC8 every even year.

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[5] The six levels of classifications are: HUC2 first-level (region), HUC4 second-level (subregion), HUC6 third-level (accounting unit), HUC8 forth-level (cataloguing unit), HUC10 fifth-level (watershed), HUC12 sixth-level (subwatershed).

The second independent variable that was used is the total number of endangered species in each watershed. The data on total of endangered species was acquired from the US Fish and Wildlife Service (USFWS) (https://www.fws.gov) and the National Oceanic and Atmospheric Administration (NOAA) (http://www.noaa.gov). These data include all vertebrate endangered and threatened species listed according to ESA guidelines. The ESA is administrated by these two federal agencies (USFWS and NOAA), and, while USFWS is responsible over listing freshwater fish and other species, NOAA handles listing marine species. Both agencies gather information about the endangered species, which includes the location and time in which the specie is identified as endangered or threatened. An initial list was gathered through USFWS website, and it contains all endangered or threatened vertebrates, including terrestrial mammals, birds, reptiles, amphibians and fish. The data was supplemented with additional information from NOAA's website, to include all other listed freshwater and terrestrial animals under their jurisdiction. The data was aggregated to the watershed level based on the information provided about the states' location in which the species is identified for listing and the time since its listing.

An additional factor that may have an effect on the number of watershed groups is the number of violations of the CWA. These data were derived from the EPA's Enforcement and Compliance History Online (ECHO), which specifies the facility (pollutant) location and total number of violations, inspections and enforcements, and these numbers and figures were aggregated to the HUC8 level.

The research also includes watershed size to account for the scaling effect on the number of watershed groups. Land use is another factor that is included in this research, and the model controls for this factor by adding variables for the proportion of rural and urban areas in the watershed. Data from the Multi-Resolution Land Characterization Consortium (MRLC) was used to include information about watershed size, the proportions of rural areas, and the proportion of urban areas in the watershed.

Demographic control variables were obtained at the county level from the US Census and Bureau of Economic Analysis. The model includes total population, population density, per capita income, unemployment rate. The model also includes education, age and race classifications, and to control for these factors respectively, the model used the percentage of the population with a college degree, the percentage of the population of the age of 50 years or more, percentage of males in the population, and the percentage of whites in the population.

Political inclination was also included in this model through the proportion of votes for Republican candidates in the US Senate. County level data from CQ Press Voting and Election was aggregated to the watershed level.

The last factor that may affect the number of watershed groups is the aggregate social capital in the population. Home-ownership was used to control for this factor and was measured by the percentage of population that own a house within the watershed boundaries. This variable was constructed from the census-tract level data on home ownership rates from the US Census for 1990, 2000, and 2010, interpolating intra-census years, and then was aggregated to the HUC8 level.

Including all the above instruments, a panel data set was constructed for 1,570 HUC8 (watersheds) and 38 states, with observations for every even year during the period 1996-2006.

The model setting identified the factors that are positively correlated with the number of environmental groups. Table 1 summarizes the hypothetical expected sign on the coefficient of these variables.

Table 1: Expected sign on the coefficients of the independent variables

Control Variable	Data of Description	Expected sign
Water bodies listed	Number of water bodies listed in the watershed	+
Endangered Species	Number of endangered species in the watershed	+
Degree of enforcement and compliance	Number of violations form CWA	-
Watershed size	Watershed size in SqKm	+
Rural land use	Proportion of rural areas	+
Urban land use	Proportion of urban areas	+
Employment	Unemployment rate	-
Population growth	Total population in the watershed	+
Population density	Population density	+
Income	Per capita income	+
Social capital	Home-ownership	+
Education	Percentage of population with college degree	+
Age	Percentage of population of 50 years old and more	+
Gender	Percentage of male in the population	-
Race	Percentage of white in the population	-
Political preferences to environments quality	Percentage of votes for republican in senates	-

3.3 Empirical Model:

The basic regression model describes the number of watershed groups for every watershed-HUC8 (i) in the year (t) as following:

$$N_{it} = \beta_0 + \beta_i X_{it} + \alpha T_t + \gamma S_i + u_{it}$$

$$i = 1\ldots,1570 \text{ and } t = 1\ldots,6$$

Where i is the watershed index, t is the year index, N is the total number of watershed groups in the watershed, X_{it} is the matrix for all the independent variables from the data description, T_t is the year dummy for every observed biennial year, and S_i is the dummy for state responsible for listing waterbodies as impaired in the watershed.

The model aims at explaining the variation in watershed groups using the independent variables discussed above. However, a possible concern with estimating a regular OLS model is the endogeneity of number of watershed groups, with the number of waterbodies listed as impaired. It is likely that there is a simultaneous causal relationship between these two variables and that the presence of watershed groups leads to listing more waterbodies for impairment. Therefore, an instrumental variable to overcome endogeneity problem was added, and the mean precipitation in the log transformation was used as an instrument for waterbodies listed in each HUC8. Precipitation was used as the instrument because it has strong correlation with listing waterbodies. Even relatively small amount of precipitation may cause wash of pollutants into waterbodies through runoff, and, inversely, a large amount of precipitation accelerates dilution of pollutants in the waterbodies (Baker, 1992; Novotny, 2004). Data on precipitation was constructed from the PRISM Climate Group (2013), which provides point measurements of precipitation for the entire US in a continuous 4 km grid.

The two vectors *Tt* and *Si* are dummies that were added to capture the influence of aggregate time trends or spatial heterogeneity. The *Tt* is time-dummy for every other year between the years 1996-2006, in which it captures any variation overtime that is not explained by the other independent variable, and, similarly, S_i is the dummy variable for state-responsible for listing impaired waterbodies. It captures any spatial variation between states, in which it is not explained by the other independent variables.

4. Results and Discussion

This section presents the results from the main model followed by robustness tests. The empirical model presents the relationship between the number of watershed groups and the variables that are assumed to have an effect on this number as the dependent variable. The empirical model was revisited through robustness tests and the analyses of these tests are presented in this section as well. All the results were estimated using Two-Stage Least Squares (2SLS) in Stata, and the *log(mean-precipitation)* variable was used as an instrumental variable for the number of waterbodies listed in the watershed. The results from the first stage of the estimated model are presented first in Table 2.

4.1 Instrumental Variable:

In the first stage of the regression analysis, as it appears in Table 2, the estimated coefficient on *log(mean-precipitation)* is positive and significant. Additionally, the Stock and Yogo (2005) *F-statistic* is greater than 10, which assures that *log(precipitation-mean)* is not a weak instrument. The positive sign on the coefficient reflects on a positive relationship between *log(mean-precipitation)* and the number of waterbodies listed in each watershed, and it implies that an increase in precipitation is significantly likely to increase the number of waterbodies listed in the watershed due to decrease in water quality. The direct cause of this relationship is due to the effect of precipitation on water quality. In the event of rainfall, urban and rural runoff washes pollutants to the nearby waterbodies, causing degradation in their water quality and eventually making the identified as listed for impairment.

Table 2. First Stage: Determinants of Number of Waterbodies Listed

Explanatory Variables	Dependent Variable: Number of Waterbodies Listed
Precipitations	2.453***
	(0.439)
Species	-0.074***
	(0.016)
Violations	0.874
	(1.261)
Watershed Area	3.533***
	(0.375)
Fraction Rural Land	-1.843**
	(0.746)
Fraction Urban Land	53.229***
	(8.159)
Home Ownership	17.238***
	(5.167)
Population	2.1e-05***
	(3.4e-06)
Population Density	-0.051***
	(0.009)
Unemployment Rate	47.23***
	(10)
Per Capita Income	0.119*
	(0.068)
Percentage 50+ Years Old	13.277***
	(4.297)
Percentage with College Degree	18.79***
	(6.826)
Percentage White Population	5.286***
	(1.657)
Percentage Republican Vote	3.235
	(3.289)
Percentage Male	61.558***
	(21.084)

Observations 9,420.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.

4.2 Determinants of the Number of Watershed Groups:

The model estimates the relationship between the dependent variable, the number of watershed groups, and a number of explanatory variables, to test whether any of these have an impact on the presence of watershed groups. Dummy variables representing time and state-responsible for listings were used to control for any variation over time or time-invariant geographical differences in the number of watershed groups, respectively. Results from the second stage of the empirical model are tabulated in Table 3.

Table 3. Second Stage: Determinants of Number of Watershed Groups

Explanatory Variables	Dependent Variable: Number of Watershed Groups
Waterbodies Listed	0.087*** (0.021)
Species	0.013*** (0.004)
Violations	-0.014 (0.165)
Watershed Area	-0.22*** (0.082)
Fraction Rural Land	0.397*** (0.124)
Fraction Urban Land	-0.743 (1.901)
Home Ownership	-3.213*** (0.724)
Population	4.49e-07 (6.55e-07)
Population Density	0.004* (0.002)
Unemployment Rate	-1.945 (1.623)
Per Capita Income	-0.019 (0.013)
Percentage 50+ Years Old	1.236 (0.754)
Percentage with College Degree	6.003*** (1.092)
Percentage White Population	-0.104 (0.278)
Percentage Republican Vote	-1.336*** (0.364)
Percentage Male	1.032 (2.695)

Table 3 – Continued:

R-Squared	0.35
Stock-Yogo F – Statistic	46.22
Prob>F	0.00

Observations 9,420.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.

The results indicate that there are several variables that explain a larger number of groups in a watershed. There is a positive and significant relationship between the number of waterbodies listed in the watershed and the number of watershed groups. This result is consistent with intuition. There is a higher pressure and demand for watershed group services when evidence showing that water quality is poor, and local citizens are likely to demand more watershed groups through contributions and support in order to improve water quality.

Similar results were obtained regarding the relationship between the total number of endangered species and the number of watershed groups. A positive correlation between these variables reveals that an increase in the number of endangered species in the watershed would likely increase the number of watershed groups due to an increase in the demand for their services. The result on this coefficient is also aligned with the intuition and the common sense of the model. Listing of endangered species is another indication of the severity of the environmental problems in the watershed, and it is likely that watershed groups would receive higher demand from the public when the number of endangered species is higher. However, the data for this research is derived from the total endangered species on the state level and was aggregated to the watershed level based on its location. Data on the watershed level for the number of endangered species can contribute to better estimates of the relationship between endangered species and the number of watershed groups.

Another variable that appears to contribute to the increase in the predicted number of watershed-groups is the proportion of rural areas in the watershed. Although the model includes both the percentage of rural and urban areas, results indicate a positive and significant correlation with the percentage of rural areas only. Forest and wilderness lands are omitted from this model, and the increase in urban or rural areas is proportional to this omitted category. Both variables explain human activities in the watershed, and the model assumes that both have adverse effect on water quality through pollutants discharge and runoff and positive relationship with number of watershed groups. These results may seem counterintuitive, mainly that urban areas appear to have no significant impact on the number of watershed groups, but there are two plausible explanations for that. First, the shift in water management towards dealing with non-point sources of pollution increases the supply of watershed groups' services in rural areas (Stedman et al., 2009), where agriculture land is a leading source for pollutant run-off. Another possible reason for these unexpected findings is the demand for water recreational activity (Keiser & Shapiro, 2017). Water sources for these activities are usually away from urban areas, in which the demand for watershed groups in rural areas becomes significant due to the increase in demand for water recreational activities. Although the model anticipated a positive correlation with urban areas as well, it is probable that controlling for other factors that are unique for urban areas has more power to explain the demand for watershed groups.

Population density also has a positive and significant correlation with the number of watershed groups. Watersheds with dense population seem to attract more watershed groups and have a higher demand for their services. In addition to higher potential for donors, population density water quality is another distinct factor leading to an increase in demand for watershed groups. The increase in population density results in an increase in pollutant discharge that in turn decreases water quality and increases demand for watershed groups.

Education is another variable that has a positive and significant correlation with the number of watershed groups. Percentage of watershed population with a college degree was used as a proxy for education. Results indicate that higher level of education contributes to a higher predicted number of watershed groups. Education is frequently used in empirical studies and literature that discuss watershed management and nonprofit formation. Some studies suggest that education increases human capital (Floress et al, 2011; Glaeser et al., 2002), which increases the likelihood for citizens' coalitions and partnerships to form in order to achieve better environmental outcomes than those achieved by government actions. Other studies also suggest that education increases civic participation and increases demand for self-governing, which encourages the formation of partnerships and the provision for private coalitions. Additionally, Arendt (2001) discusses the link between education and health, and suggests that those paying more attention to future welfare are more likely to engage in activities with current costs and future benefits; this may explain how differences in time preferences may also contribute to the correlation between education and the increase in number of watershed groups that provide services with higher emphasis on future outcomes.

Some variables appear to have negative impact on the number of watershed groups. These variables may be associated with an increase in the costs for the individual group or a decrease in their benefits to operate in specific areas of watersheds.

The first variable with a negative and significant correlation with the number of watershed groups is home-ownership. This variable measures the proportion of owned housing units from the total units in the watershed, and it was used to proxy for social capital and its impact on the presence of watershed groups. Literature from social science find positive correlation between social capital and environmental actions. Wakefield et al. (2006) argue that local activism is a driving force for environmental protection, triggered by residents' group formation in order to have greater effect in decisions affecting the neighborhood in lieu of government regulations. The prominence of social capital has also been studied specifically in the case of watershed management, focusing on the relationship between social capital and the number of watershed associations in certain case studies (Cline & Collins, 2003; Floress et al., 2011). All these studies share the hypothesis that social capital promotes greater social collaboration and enhances citizens' coalitions. Some skeptics, however, find that social capital-building activities may not show achievements of on-the-ground objectives (Kenny, 2000; Rydin & Pennington, 2000), and the skeptics raise questions about the cause and effect relationship between social capital and local associations. One explanation for this phenomena is that when coalition size gets larger, it generates a free-rider problem (Andreoni, 1988; Isac & Walker, 1988), potentially having an adverse effect on the number of participants and donations; hence, there are less contributions to nonprofit groups, and fewer of these groups.

Total watershed area is another variable that has negative and significant correlation with the number of watershed groups. Larger watersheds appear to be less attractive to watershed groups and have a smaller number of groups, whereas smaller watersheds seem to have greater presence of these groups. The negative sign on the coefficient differs from the intuition and the expectations of the model, which suggests a positive correlation between watershed size and the number of watershed groups. This assumption comes simply due to the scaling effect on the number of watershed groups; the larger the watershed is, the higher number of watershed groups we would expect to have. Additionally, there are some empirical and case studies that find a positive correlation between the number of watershed associations and the size of the watershed. However, the regression results indicate a negative correlation, and further investigation on the leading causes of this relationship is needed. It could be that nonprofit groups perceive more benefits from operating in small scale watersheds and managing smaller watersheds guarantees outcomes in a timely manner.

The last variable that shows a negative and significant relationship with the number of watershed groups is the percentage of votes for republican candidates in senate races. Higher percentages of votes for Republicans would be expected to have an adverse effect on the number of watershed groups and to contribute to less watershed group activities in the watershed. This variable was used as a proxy for political inclination and views with regards to environmental activism. The model assumes that a higher degree of environmental activism is correlated with lower levels of Republican support. The results aligned with the assumptions of the model, and, as was expected, an increase in votes for Republican candidates correlated with decreased number of watershed groups. The likely reason for this relationship is that environmental activism participation is lower in these watersheds, and, therefore, there is less support for watershed groups.

4.3 Sensitivity Analysis:

The model was tested for sensitivity to a variety of alternative specifications. The purpose of this section is to examine how the original regression coefficient estimates behave when the regression specifications are modified. Three robustness tests were applied to validate regression estimates. In the first test, some of the explanatory variables were lagged one period (two years), in the second test, the state-responsible for listing dummy variables were replaced by dummy variables for the state or states in which the watershed is located, and in the third one, the total endangered species count in the watershed was replaced by variables that measure that total count of endangered species by seven habitat types. The regressions for these tests were estimated using Two-Stage Least Squares (2SLS) in Stata as well, with *log(mean-precipitation)* variable as the instrument for the number of waterbodies listed in the watershed. Table 4 presents the first stage of the regressions from the three robustness tests, and Table 5 presents the second stage of the regression analysis.

Table 4. First Stage: Determinants of Number of Waterbodies Listed

Dependent Variable: Number of Waterbodies Listed

Explanatory Variables	Lags	Transboundary Watershed Dummies	Habitat Types
Precipitation	1.238*** (0.377)	2.116*** (0.448)	2.408*** (0.452)
Species	-0.064*** (0.016)	-0.573*** (0.105)	--
Violations	1.434 (1.357)	2.733** (1.28)	0.679 (1.284)
Watershed Area	3.132*** (0.376)	3.375*** (0.327)	3.618*** (0.381)
Fraction Rural Land	-1.161 (0.776)	-0.261 (0.709)	-1.48** (0.744)
Fraction Urban Land	47.719*** (8.758)	32.37*** (6.621)	54.185*** (8.215)
Home Ownership	16.068*** (5.779)	15.6*** 5.109	17.02*** (5.532)
Population	1.88e-05*** (3.44e-06)	1.76e-05*** (2.76e-06)	2.11e-05*** (3.44e-06)
Population Density	-0.046*** (0.01)	-0.036*** (0.008)	-0.051*** (0.009)
Unemployment Rate	51.102*** (10.732)	45.744*** (9.077)	49.606*** (10.159)
Per Capita Income	0.056 (0.062)	0.146** (0.059)	0.118* (0.066)
Percentage 50+ Years Old	14.951*** (4.344)	15.211*** (4.151)	15.107*** (4.294)
Percentage with College Degree	21.429*** (6.433)	23.56*** (6.327)	20.065*** (6.938)
Percentage White Population	5.852*** (1.638)	5.789*** (1.851)	5.156*** (1.693)

Table 4 – Continued:

Percentage Republican Vote	1.779 (3.299)	0.191 (2.927)	3.321 (3.327)
Percentage Male	50.018** (20.32)	76.278*** (23.38)	65.647*** (21.081)
Lacustrine Habitats	--	--	0.067 (0.189)
Marine Habitats	--	--	-0.307* (0.186)
Palustrine Habitat	--	--	-1.056*** (0.374)
Riverine Habitats	--	--	0.128 (0.125)
Special Habitat	--	--	0.364** (0.174)
Sub-Terrestrial Habitats	--	--	-1.383*** (0.516)
Terrestrial Habitats	--	--	0.279 (0.326)
Observations	7,850	9,420	9,420

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.

The results of the first stage follow the original model findings, and in these tests the estimated coefficient of log(mean-precipitation) is positive and significant. Additionally, the Stock - Yogo (2005) F-statistic for all regressions is greater than 10, suggesting log(precipitation-mean) is a sufficiently relevant instrument in these models as well.

Table 5. Second Stage: Determinants of Number of Watershed Groups
Dependent Variable: Number of Watershed Groups

Explanatory Variables	Lags	Transboundary Watershed Dummies	Habitat Types
Waterbodies Listed	0.161*** (0.056)	0.09*** (0.025)	0.088*** (0.022)
Species	0.016*** (0.005)	0.077*** (0.022)	--

Table 5 – Continued:			
Violations	-0.292	-0.299	0.005
	(0.242)	(0.19)	(0.166)
Watershed Area	-0.404**	-0.199**	-0.236***
	(0.179)	(0.091)	(0.083)
Fraction Rural Land	0.444**	0.072	0.365***
	(0.186)	(0.122)	(0.122)
Fraction Urban Land	-3.262	4.822***	-0.876
	(3.543)	(1.428)	(1.883)
Home Ownership	-4.435***	-2.614***	-3.165***
	(1.483)	0.675	(0.711)
Population	-6.80e-07	6.94e-07	4.38e-07
	(1.26e-06)	(5.17e-07)	(6.76e-07)
Population Density	0.006*	-0.001	0.004**
	(0.003)	(0.001)	(0.002)
Unemployment Rate	-6.091	-3.417**	-2.289
	(3.72)	(1.53)	(1.659)
Per Capita Income	-0.017	-0.024**	-0.019
	(0.016)	(0.011)	(0.012)
Percentage 50+ Years Old	0.039	1.56**	1.183
	(1.372)	(0.785)	(0.838)
Percentage with College Degree	4.273**	4.791***	5.906***
	(1.98)	(0.981)	(1.159)
Percentage White Population	-0.538	-0.335	-1.135
	(0.458)	(0.281)	(0.282)
Percentage Republican Vote	-1.356**	-1.049***	-1.438***
	(0.57)	(0.328)	(0.367)
Percentage Male	-1.524	-0.177	0.477
	(4.777)	(2.845)	(2.824)
Lacustrine Habitats	--	--	-0.102***
			(0.038)
Marine Habitats	--	--	0.069**
			(0.028)
Palustrine Habitat	--	--	0.127**
			(0.061)
Riverine Habitats	--	--	0.005
			(0.016)
Special Habitat	--	--	-0.005
			(0.021)
Sub-Terrestrial Habitats	--	--	0.158**
			(0.069)
Terrestrial Habitats	--	--	-0.057
			(0.041)

Table 5 – Continued:

R-Squared	0.301	0.413	0.351
Stock-Yogo F – Statistic	37.37	21.07	43.36
Prob>F	0.00	0.00	0.00
Observations	7,850	9,420	9,420

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.

4.3.1 Model with Lags:

In this robustness test the regression analysis of the main model was repeated while lagging the variables that may impact the number of watershed groups with some delay in time. With common sense, one could argue that the number of waterbodies listed, number of endangered species in the watershed, and the number of violations of the CWA are variables that might cause an increase in the number of watershed groups in the forthcoming years. Therefore, to test for this hypothesis, these variables were lagged one period (two years), along with the instrumental variable *log(mean-precipitation)*.

The results derived from this test are consistent with the main model. Even when lagging the variables, number of waterbodies listed in the watershed and the number of endangered species have a positive and significant correlation with the number of watershed groups. The number of violations of the CWA variable is also insignificant in this test, with a negative coefficient sign aligned with the results derived from the main model.

Along with the observation that results are consistent in significance level and coefficient sign, additional insights have been derived from the lag identification regression as well. It is noted that coefficients on the variables of interest are higher in magnitude when compared to the coefficients derived from the original model. Using the lagged explanatory variables improves our understanding of the supply response of watershed groups to environmental stressors and changes in demand, and it may suggest that there is a delay in watershed groups respond to environmental changes.

Literature that discusses nonprofit performance in general argues that the demand response of these nonprofits is sluggish and slow due to managerial inefficacy and lack of incentives to adapt quickly to changes in demand (H. Hansmann, 1996). Additionally, Morris et al. (2014) denote that collaboration between stakeholders takes time to be developed, and it needs to be nurtured through communication and facilitation, and, accordingly, it takes time for a new group to form, causing a delay between changes in water quality and establishments of new groups.

Additionally, the coefficient on the endangered species in this test is just slightly higher than in the main model and analyzing the data for the total number of endangered species shows that the variable does not change by much over time. The recovery of endangered species is an intrinsically long term process, and even though some listed species gain a stable or improving status now, new listed species do not show much improvement (Kenny, 2000; Wilcove et al., 1998).

4.3.2 Transboundary Watersheds:

The original model estimates the number of watershed groups while controlling for states responsible for impairment listing. However, almost 25 percent of the watersheds in the data are transboundary, as they are located in two or more states. This test estimates the model while controlling for the state or states in which the watershed is located in order to account for these transboundary watersheds. Dummy variables for all states and transboundary states were created. To illustrate the process of creating these dummies: three different dummy variables were created to represent if the watershed crosses Oregon-Idaho or Oregon-Idaho-Nevada, or if the watershed is fully contained in Oregon. These new dummy variables were used in this robustness test instead of dummies for the state responsible for listing dummies. The basic results of the model after using this robustness test are consistent. Environmental stressors and watershed characteristics still seem to have an impact on the number of watershed groups. A few changes were recorded in the results for variables that are related to population and land use, but these changes do not contradict the intuition of the main model.

4.3.3 Habitat Types:

The total number of endangered species in the watershed includes all vertebrates listed in this category based on the ESA guidelines. It is possible that watershed groups respond significantly to listed species with freshwater habitats or other aquatic habitat, rather than to the total number of species listed in the watershed. Therefore, additional variables that account for the total number of endangered species for 7 habitat types were added[6] and were counted in the same way the number of total species was, taking into account the transboundary watersheds. In this test, the regression of the original model was repeated while dropping the total number of endangered species variable and including variables for the total number of endangered species in each habitat. The results of this test are consistent with the preferred model, and the coefficients on the independent variables have the same sign and magnitude as for the original model. Additionally, coefficients on the species-count of the 7 habitat types variables are mostly significant, with different signs. It seems that some of these habitats have a positive correlation with the number of watershed groups and some are negatively correlated with it. However, the results also suggest that the total number of endangered species in the watershed is a sufficient variable to explain the

[6] The habitat types include: Lacustrine, Marine, Palustrine, Riverine, Special Habitats, Sub-Terrestrial Habitat, and Terrestrial Habitat.

number of watershed groups, and an increase in this the total endangered species would be likely to contribute to an increase in the number of watershed groups.

Few results from the main model appear to be counterintuitive, and specific attention is drawn towards land use variables, or the fraction of rural and urban areas. To test this further, an additional regression was added. This regression does not include the watershed size and total population variables. Results from the first and second stage are tabulated in Table A1 and A2, respectively. The results from this regression do not change the conclusions that were reached from the main model, and, in fact, they are very similar.

5. Conclusion:

The literature on watershed groups has primarily focused on their performance and presence through survey data and through examining cases for specific regions. Little has been known however, about watershed groups' growth and variation across the country and the factors that contribute to the increase in their presence. This research provides the first large scale empirical study of the factors that are correlated with the presence of watershed groups through examining their relationship with the number of watershed groups in each watershed. The focus of this study is on the variables that affect the demand for watershed groups and the variables that are associated with the benefits that an individual group may receive.

Policies that focus on environmental pollution problems have gone through several different historical milestones. At first, the focus on water treatment was in dealing with point sources of pollution. Yet this approach has failed to meet goals for water quality standards, and environmental control. Today, watershed management focuses more on non-point sources because they appear to be the main cause of persistent water pollution problems. Additionally, failure of the command and control approach has shifted responsibilities towards environmental pollution problems to include public participation and involvement in implementing plans and decision making. In addition, the pressure of citizens to improve the environment in places where government has failed has contributed to changes in the watershed management. Local citizens have high demand for water and environmental quality, and they satisfy some of this demand by monetary contributions to watershed groups through donations to and/or volunteering in managing water problems through these watershed groups. The model of bottom-up watershed management, where citizens partake in decision making through their contributions to watershed groups, seems to be more sufficient in addressing water pollution and watershed management plans. Interested stakeholders possess more power and freedom to manage resources that they share. Another shift in water problem solutions and water management plans has occurred because managers have adopted the watershed approach as constituent of one ecosystem, and the watershed has become the boundary to deal with persistent water pollution and environmental problems. These changes encourage dealing with environmental stressors on the watershed level that are also comprehensive enough to tackle environmental problems more efficiently, including water quality and habitat recovery for endangered species.

The analysis and results of this study suggest that watershed groups respond to demand for intervention that comes as a result of environmental stressors. Numbers of waterbodies listed, and numbers of endangered species are positively correlated with the number of watershed groups. It is also apparent from the results that public involvement and the demand for water quality have high impact on the presence of watershed groups. Population density, home-ownership, political inclinations and education are all correlated with the number of watershed groups as well. However, these factors also bring attention to ater problems that arise in places where demographic characteristics have low impact on the presence of watershed groups, yet environmental problems can be severe.

Finally, some interesting observations that require further investigation come from the results on the coefficients of land use variables and watershed size. The results suggest that the increase in the proportion of rural areas have positive impact on the number of watershed groups. This conclusion is slightly against the common sense and intuition that would suggest higher demand for watershed groups in urban areas, and we should expect that the increase in the proportion of urban areas is positively correlated with the number of watershed groups. Although this study attempts at suggesting plausible explanations, further research on this topic is recommended. The coefficient on watershed size is another unexpected finding of this research. Common sense suggests that larger watersheds would have more watershed groups; in fact, similar studies for specific regions have found a positive correlation between watershed size and the number of watershed groups. The results of this research, however, show that watershed groups tend to self-allocate more frequently in smaller watersheds. Further research is needed to explore reasons for this relationship as well.

References

Albers, H. J., & Ando, A. W. (2003). Could State-Level Variation in the Number of Land Trusts Make Economic Sense? *Land Economics*, *79*(3), 311–327. http://doi.org/10.2307/3147019

Aligica, P. D. (2015). Addressing Limits to Mainstream Economic Analysis of Voluntary and Nonprofit Organizations: The "Austrian" Alternative. *Nonprofit and Voluntary Sector Quarterly*, *44*(5), 1026–1040. http://doi.org/10.1177/0899764014555988

Aligica, P. D. (2016). Neither Market nor Sate Domain: Nonprofits From teh Ostroms' Theoretical Perspective. *Nonprofit and Voluntary Sector Quarterly*, *45*(4S), 43S–60S. http://doi.org/10.1177/0899764016651727

Andreoni, J. (1988). Privately Provided Public Goods in a Large Economy: The Limits of Altruism. *Journal of Public Economics*, *35*(1), 57–73. http://doi.org/10.1016/0047-2727(88)90061-8

Andreoni, J. (1990). Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving. *The Economic Journal*, *100*(401), 464–477.

Andreoni, J., Payne, A. A., Smith, J., & Karp, D. (2016). Diversity and Donations: The Effect of Religious and Ethnic Diversity on Charitable Giving. *Journal of Economic Behavior and Organization*, *128*, 47–58. http://doi.org/10.1016/j.jebo.2016.05.010

Antoci, A., Sacco, P. L., & Zarri, L. (2008). Social Preferences and Private Provision of Public Goods: A "Double Critical Mass" Model. *Public Choice*, *135*(3/4), 257–276. http://doi.org/10.1007/sl

Arendt, J. N. (2001). *Education Effects on Health: Causal or from Unobserved Components? A Panel Data Analysis with Endogenous Education*. Retrieved from http://www.econ.ku.dk/okojn/Public/Research/jarendt.pdf

Bagnoli, M., & Lipman, B. L. (1992). Private Provision of Public Goods Can Be Efficient. *Public Choice*, *74*(1), 59–78.

Bagnoli, M., & Mckee, M. (1991). Voluntary Contribution Games: Efficient Private Provision of Public Goods. *Economic Inquiry*, *29*(2), 351–366.

Baker, L. A. (1992). Introduction to Nonpoint Source Pollution in the United States and Prospects for Wetland Use. *Ecological Engineering*, *1*, 1–26. http://doi.org/10.1016/0925-8574(92)90023-U

Ben-Ner, A. (1994). Who Benefits from the Nonprofit Sector? Reforming Law and Public Policy Towards Nonprofit Organizations. *The Yale Law Journal*, *104*(3), 731–762.

Ben-Ner, A., & Hoomissen, T. Van. (1991). Nonprofit Organizations in the Mixed Economy: A Demand and Supply Analysis. *Annals of Public and Cooperative Economics*, *62*(4), 519–

550. http://doi.org/10.1111/j.1467-8292.1991.tb01366.x

Breckenridge, L. P. (1999). Nonprofit Environmental Organizations and the Restructuring of Institutions for Ecosystem Management. *Ecology Law Quarterly*, *25*(4), 692–706. http://doi.org/10.15779/Z38C82P

Cable, S., & Benson, M. (1993). Acting Locally: Environmental Injustice and the Emergence of Grass-roots Environmental Organizations. *Social Problems*, *40*(4), 464–477.

Chaffin, B. C., Mahler, R. L., Wulfhorst, J. D., & Shafii, B. (2012). Collaborative Watershed Groups in Three Pacific Northwest States: A Regional Evaluation of Group Metrics and Perceived Success. *Journal of the American Water Resources Association*, *48*(1), 113–122. http://doi.org/10.1111/j.1752-1688.2011.00599.x

Chikoto, G. L., & Halicki, M. (2013). Contextual Factors and Negotiating Spaces: Exploring teh Emergence of Nonprofit and Hybrid Voluntary Organizations. *Nonprofit Management and Leadership*, *23*(3), 347–365. http://doi.org/10.1002/nml

Chu, H. J., Liu, C. Y., & Wang, C. K. (2013). Identifying the Relationships Between Water Quality and Land Cover Changes in the Tseng-Wen Reservoir Watershed of Taiwan. *International Journal of Environmental Research and Public Health*, *10*, 478–489. http://doi.org/10.3390/ijerph10020478

Cline, S. A., & Collins, A. R. (2003). Watershed Associations in West Virginia: Their Impact on Environmental Protection. *Journal of Environmental Management*, *67*, 373–383. http://doi.org/10.1016/S0301-4797(02)00222-0

Draeger, K. (2001). *Defining and Evaluating Watershed Organizational Effectiveness*.

Easley, D., & O'Hara, M. (1983). The Economic Role of the Nonprofit Firm. *The Bell Journal of Economics*, *14*(2), 531–538.

Economides, N., & Rose-Ackerman, S. (1993). Differentiated Public Goods: Privatization and Optimality. In *Does Economic Space Matter?* (H. Ohta an, pp. 111–132). St. Martin's Press, London.

Edwards, J. (2013). *Organizational Behavior, Efficiency, and Dynamics in Non-Profit Markets: Evidence from Transitional Housing*. Retrieved from http://home.uchicago.edu/~jedwards/nonprofitbehavior.pdf

Fishman, J. (1987). Standards of Conduct for Directors of Nonprofit Corporations. In *Pace Law Review* (pp. 389–462).

Floress, K., Prokopy, L. S., & Allred, S. B. (2011). It's Who You Know: Social Capital, Social Networks, and Watershed Groups. *Society & Natural Resources*, *24*, 871–886. http://doi.org/10.1080/08941920903493926

Glaeser, E. L., Laibson, D., & Sacerdote, B. (2002). An Economic Approach to Social Capital. *The Economic Journal*, *112*(483), F437–F458.

Glazer, A. (2016). The Profit-Maximizing Non-Profit. *Oxford Economic Papers*, *68*(2), 301–315. http://doi.org/10.1093/oep/gpv067

Grant, L. E., & Grooms, K. K. (2017). Do nonprofits encourage environmental compliance? *Journal of the Association of Environmental and Resource Economists*, *4*(S1), S261–S288.

Grant, L., & Langpap, C. (2017). *Private Provision for Public Giids: Evidence from the Effect of Environmental Groups on Water Quality*.

Griffin, C. B. (1999). Watershed Councils : an Emerging Form of Public Participation in Natural Resource Management. *Journal of the American Water Resources Association*, *35*(3), 505–518.

Hansmann, H. (1993). The Effect of Tax Exemption and other Factors on the market share of Nonprofit versus For-Profit Firms. *National Tax Journal*, *40*, 71–82.

Hansmann, H. (1996). The Changing Roles of Public, Private, and Nonprofit Enterprise in Education, Health Care, and Other Human Services. In V. R. Fuchs (Ed.), *Individual and Social Responsibility: Child Care, Education, Medical Care, and Long-Term Care in America* (pp. 245–276). National Bureau of Economic Research. Retrieved from http://www.nber.org/chapters/c6565.pdf

Hansmann, H. B. (1980). The Role of Nonprofit Enterprise. *The Yale Law Journal*, *89*, 835–902.

Harbaugh, W. T. (1998). What Do Donations Buy? A Model of Philanthropy Based on Prestige and Warm Glow. *Journal of Public Economics*, *67*, 269–284.

Hardy, S. D. (2010). Governments, Group Membership, and Watershed Partnerships. *Society & Natural Resources*, *23*(7), 587–603. http://doi.org/10.1080/08941920802534572

Harrison, T. D., & Laincz, C. A. (2008). Entry and Exit in the Nonprofit Sector. *The B.E. Journal of Economic Analysis & Policy*, *8*(1), 1–40.

Heyes, A., & Rickman, N. (1999). Regulatory Dealing–Revisiting the Harrington Paradox. *Journal of Public Economics*, *72*, 361–378. http://doi.org/10.1016/S0047-2727(98)00098-X

Hollander, H. (1990). A Social Exchange Approach to Voluntary Cooperation. *American Economic Review*, *80*(5), 1157–1167.

Hone, S., Foster, A., & O'Keefe, S. (2011). A Role for the Private Sector in the Provision of River and Riparian Goods? *Economic Papers*, *30*(2), 157–166. http://doi.org/10.1111/j.1759-3441.2011.00108.x

Hooghe, M., & Botterman, S. (2012). Urbanization, Community Size, and Population Density: Is There a Rural-Urban Divide in Participation in Voluntary Organizations or Social Network Formation? *Nonprofit and Voluntary Sector Quarterly*, *41*(1), 120–144. http://doi.org/10.1177/0899764011398297

Isac, M. R., & Walker, J. M. (1988). Group Size Effects in Public Goods Provision: The Voluntary Contributions Mechanism. *The Quarterly Journal of Economics*, *103*(1), 179–199.

Jacobsen, G. D., Kotchen, M. J., & Vandenbergh, M. P. (2012). The Behavioral Response to Voluntary Provision of an Environmental Public Good: Evidence from Residential Electricity Demand. *European Economic Review*, *56*, 946–960. http://doi.org/10.1016/j.euroecorev.2012.02.008

Johnson, N. L., & Baltodano, M. E. (2004). The Economics of Community Watershed Management: Some Evidence from Nicaragua. *Ecological Economics*, *49*, 57–71. http://doi.org/10.1016/j.ecolecon.2003.11.009

Kauffman, J. B., Beschta, R. L., Otting, N., & Lytjen, D. (1997). An Ecological Perspective of Riparian and Stream Restoration in the Western United States. *Fisheries*, *22*(5), 12–24. http://doi.org/10.1577/1548-8446(1997)022<0012

Keiser, D. A., & Shapiro, J. S. (2017). *Consequences of the Clean Water Act and the Demand for Water Quality*.

Kenny, D. (2000). *Arguing about Consensus: Examining the Case Against Western Watershed Initiatives and Other Collaborative Groups Active in Natural Resources Management. Natural Resources Law Center, University of Colorado*.

Kershner, J. L. (1997). Setting Riparian/Aquatic Restoration Objectives within a Watershed Context. *Restoration Ecology*, *5*(4S), 15–24. http://doi.org/10.1111/j.1526-100X.1997.tb00201.x

Kim, I. (2009). The Effect of Uncertainty on the Voluntary Private Provision of Impure Public Goods. *The Singapore Economic Review*, *54*(1), 61–73. Retrieved from http://core.coll.mpg.de/Record/RDG010000000000000125785

King, R. S., Baker, M. E., Whigham, D. F., Weller, D. E., Jordan, T. E., Kazyak, P. F., & Hurd, M. K. (2005). Spatial Considerations for Linking Watershed Land Cover To Ecological Indicators in Streams. *Ecological Application*, *15*(1), 137–153.

Kingma, B. R. (1997). Public Good Theories of the Nonprofit Sector: Weisbrod Revisited. *Voluntas: International Journal of Voluntary & Nonprofit Organizations*, *8*(2), 135–148. http://doi.org/10.1007/978-1-4615-0131-2_3

Klineberg, S. L., McKeever, M., & Rothenbach, B. (1998). Demographic Predictors of Environmental Concern : It Does Make a Difference How It's Measured. *Social Science Quarterly*, *79*(4), 734–753. http://doi.org/10.2307/42863844

Knutsen, W. L. (2012). Value as a Self-Sustaining Mechanism: Why Some Nonprofit Organizations are Different from and Similar to Private and Public Organizations. *Nonprofit and Voluntary Sector Quarterly*, *42*(5), 985–1005. http://doi.org/10.1177/0899764012457244

Kondo, H., & Glazer, A. (2016). *Governmental Provision of Public Goods Need Not Crowd Out Private Provision*.

Koontz, T. M., & Johnson, E. M. (2004). One Size Does Not Fit All : Matching Breadth of Stakeholder Participation to Watershed Group Accomplishments. *Policy Science*, *37*(2), 185–204.

Kotchen, M. J. (2006). Green Markets and Private Provision of Public Goods. *Journal of Political Economy*, *114*(4), 816–834.

Kotchen, M. J., & Moore, M. R. (2007). Private Provision of Environmental Public Goods: Household Participation in Green-Electricity Programs. *Journal of Environmental Economics and Management*, *53*, 1–16. http://doi.org/10.1016/j.jeem.2006.06.003

Lahiri, S. (2013). Voluntary Provision of a Public Good in a Strategic Market Game. *Recherches Économiques de Louvain*, *79*, 45–73. http://doi.org/10.3917/rel.794.0045

Lakdawalla, D., & Philipson, T. (2006). The Nonprofit Sector and Industry Performance. *Journal of Public Economics*, *90*, 1681–1698. http://doi.org/10.1016/j.jpubeco.2005.11.004

Lant, C. (2003). Watershed Governance in the United States: The Challenges Ahead. In *Water Resources Update* (Vol. 126, pp. 21–28).

Leach, W. D., & Pelkey, N. W. (2001). Making Watershed Partnerships Work: A Review of the Empirical Literature. *Journal Of Water Resources Planning And Management*, *127*(6), 378–385.

Lilley, A., & Slonim, R. (2014). The Price of Warm Glow. *Journal of Public Economics*, *114*, 58–74. http://doi.org/10.1016/j.jpubeco.2013.12.004

Lubell, M., Schneider, M., Scholz, J. T., & Mete, M. (2002). Watershed Partnerships and the Emergence of Collectuve Action Institutions. *American Journal of Political Science*, *46*(1), 148–163.

Marcuello, C. (1998). Determinants of the Non-Profit Sector Size: An Empirical Analysis in Spain. *Annals of Public and Cooperative Economics*, *69*(2), 175–192.

Mcdougle, L. M., & Handy, F. (2014). The Influence of Information Costs on Donor Decision

Making. *Nonprofit Management and Leadership*, *24*(4), 465–485. http://doi.org/10.1002/nml

Metzenbaum, S. H. (2015). Environmental Compliance and Enforcement Measurement: Why, What and How? In *Penn Program on Regulation's International Expert Dialogue on "Defining and Measuring Regulatory Excellence"* (pp. 1–21). University of Pennsylvania.

Moore, E. A., & Koontz, T. M. (2003). Research Note A Typology of Collaborative Watershed Groups: Citizen-Based, Agency-Based, and Mixed Partnerships. *Society and Natural Resources*, *16*(5), 451–460. http://doi.org/10.1080/08941920309182

Morris, J. C., Gibson, W. A., Leavitt, W. M., & Jones, S. C. (2014). Collaborative Federalism and the Emerging Role of Local Nonprofits in Water Quality Implementation. *The Journal of Federalism*, *44*(3), 499–518.

Morrison, C. C. (1978). A Note on Providing Public Goods Through Voluntary Contributions. *Public Choice*, *33*(3), 119–123.

Morton, L. W., & Padgitt, S. (2005). Selecting Socio-Economic Metrics for Watershed Management. *Environmental Monitoring and Assessment*, *103*, 83–98. http://doi.org/10.1007/s10661-005-6855-z

Novotny, V. (1999). Integrationg Diffuse/Nonpoint Pollution Control and Water Body Restoration into Watershed Management. *Journal Of The American Water Resources Association*, *35*(4), 717–727.

Novotny, V. (2004). Watershed and Water Body Vulnerability Assessments – Their Place in Watershed Management. In *8th International Conference on Diffuse/Nonpoint Population* (pp. 1–8).

Okten, C., & Weisbrod, B. A. (2000). Determinants of Donations in Private Nonprofit Markets. *Journal of Public Economics*, *75*, 255–272. http://doi.org/10.1016/S0047-2727(99)00066-3

Ostrom, E. (2010). Analyzing Collective Action. *International Association of Agricultural Economics*, *41*(SUPPL. 1), 155–166. http://doi.org/10.1111/j.1574-0862.2010.00497.x

Piemonti, A. D., Babbar-Sebens, M., & Jane Luzar, E. (2013). Optimizing Conservation Practices in Watersheds: Do Community Preferences Matter? *Water Resources Research*, *49*, 6425–6449. http://doi.org/10.1002/wrcr.20491

Preston, A. E. (1988). The Nonprofit Firm: A Potential Solution to Inherent Market Failures. *Economic Inquiry*, *26*(3), 493–506.

Ray, B., Mukherjee, P., & Bhattacharya, R. N. (2016). Attitudes and Cooperation: Does Gender Matter in Community-Based Forest Management? *Environment and Development Economics*, 1–30. http://doi.org/10.1017/S1355770X16000358

Ribar, D. C., & Wilhelm, M. O. (2002). Altruistic and Joy-of-Giving Motivations in Charitable Behavior. *Journal of Politican Economy*, *110*(2), 425–457.

Rondeau, D., Poe, G. L., & Schulze, W. D. (2005). VCM or PPM? A Comparison of the Performance of Two Voluntary Public Goods Mechanisms. *Journal of Public Economics*, *89*, 1581–1592. http://doi.org/10.1016/j.jpubeco.2004.06.014

Rose-Ackerman, S. (1996). Altruism, Nonprofits, and Economic Theory. *Journal of Economic Literature*, *34*(2), 701–728.

Rose, S. K., Clark, J., L.Poe, G., Rondeau, D., & Schulze, W. D. (2002). The Private Provision of Public Goods: Test of a Provision Point Mechanism for Funding Green Power Programs. *Resource and Energy Economics*, *24*, 131–155.

Rydin, Y., & Pennington, M. (2000). Public Participation and Local Environmental Planning: The Collective Action Problem and the Potential of Social Capital. *Local Environment*, *5*(2), 153–169. http://doi.org/10.1080/13549830050009328

Salamon, L. M. (2012). *The State of Nonprofit America. Brookings Institution Press Washington, D.C. Published, 2nd ed.*

Scot, D., & Willits, F. k. (1994). Environmental Attitudes and Behavior: A Pennsylvania Survey. *Environment and Behavior*, *26*(2), 239–260.

Shimshack, J. P. (2014). The Economics of Environmental Monitoring and Enforcement. *Annual Review of Resource Economics*, *6*(1), 339–360. http://doi.org/10.1146/annurev-resource-091912-151821

Smith, V. H., Kehoe, M. R., & Cremer, M. E. (1995). The Private Provision of Public-Goods: Altruism and Voluntary Giving. *Journal of Public Economics*, *58*, 107–126.

Stedman, R., Lee, B., Brasier, K., Weigle, J. L., & Higdon, F. (2009). Cleaning Up Water? Or Building Rural Community? Community Watershed Organizations in Pennsylvania. *Rural Sociology*, *74*(2), 178–200. http://doi.org/10.1111/j.1549-0831.2009.tb00388.x

Stock, J. H., & Yogo, M. (2005). Testing for Weak Instruments in Linear IV Regression. In *The National Bureau of Economic Research* (pp. 1–73). http://doi.org/citeulike-article-id:1459542

Sun, G. (2012). When does Everyone Contribute in the Private Provision of Local Public Goods. *The Journal of Public Economic Theory*, *14*(6), 911–925.

Tang, Z., Engel, B. A., Pijanowski, B. C., & Lim, K. J. (2005). Forecasting Land Use Change and its Environmental Impact at a Watershed Scale. *Journal of Environmental Management*, *76*(1), 35–45. http://doi.org/10.1016/j.jenvman.2005.01.006

Twombly, E. C. (2003). What Factors Affect the Entry and Exit of Nonprofit Human Service Organisations in Metropolitan Areas? *Nonprofit and Voluntary Sector Quarterly*, *32*(2), 211–235. http://doi.org/10.1177/0899764003251612

Valentinov, V., & Iliopoulos, C. (2013). Economic Theories of Nonprofits and Agricultural Cooperatives Compared: New Perspectives for Nonprofit Scholar. *Nonprofit and Voluntary Sector Quarterly*, *42*(1), 109–126. http://doi.org/10.1177/0899764012436399

Van Puyvelde, S., & Brown, W. A. (2016). Determinants of Nonprofit Sector Density: A Stakeholder Approach. *Voluntas: International Journal of Voluntary & Nonprofit Organizations*, *27*, 1045–1063. http://doi.org/10.1007/s11266-015-9656-1

Wakefield, S. E. L., Elliott, S. J., Eyles, J. D., & Cole, D. C. (2005). Taking Environmental Action: The Role of Local Composition, Context, and Collective. *Environmental Management*, *37*(1), 40–53. http://doi.org/10.1007/s00267-004-0323-3

Wallis, J. (2006). Evaluating Economic Theories of NPOs: A Survey, a Case Study and Some New Directions for Socio-Economics. *Journal of Socio-Economics*, *35*, 959–979. http://doi.org/10.1016/j.socec.2005.11.018

Waters, R. D. (2011). Increasing Fundraising Efficiency Through Evaluation: Applying Communication Theory to the Nonprofit Organization-Donor Relationship. *Nonprofit and Voluntary Sector Quarterly*, *40*(3), 458–475. http://doi.org/10.1177/0899764009354322

Weerawardena, J., McDonald, R. E., & Mort, G. S. (2010). Sustainability of Nonprofit Organizations: An Empirical Investigation. *Journal of World Business*, *45*, 346–356. http://doi.org/10.1016/j.jwb.2009.08.004

Weisbrod, B. A. (1972). Toward a Theory of the Voluntary Non-Profit Sector in a Three-Sector Economy. In *Altruism and Economic Theory* (pp. 137–172). New York: Russell Sage Foundation.

Weisbrod, B. A. (1988). *The Nonprofit Economy*. Cambridge, Mass.: Harvard University Press.

West, E. G. (1989). Nonprofit Organizations : Revised Theory and New Evidence. *Public Choice*, *63*(2), 165–174.

White, A. T., & Ford, R. C. (1995). The Emergence and Evolution of Collective Action: Lessons from Watershed Management in Haiti. *World Development*, *23*(10), 1683–1698. http://doi.org/10.1016/0305-750X(95)00076-O

Wilcove, D. S., Rothstein, D., Dubow, J., Phillips, A., & Losos, E. (1998). Quantifying Threats to Imperiled Species in the United States. *BioScience*, *48*(8), 607–615. http://doi.org/10.2307/1313420

Wu, J., & Boggess, W. G. (1999). The Optimal Allocation of Conservation Funds. *Journal of Environmental Economics and Management*, *38*, 302–321. http://doi.org/10.1006/jeem.1999.1091

Xu, Y., Zhang, L., & Zheng, X. (2013). Cost-Sharing Rules and Efficient Provisions of Public Goods. *Studies in Microeconomics*, *1*(2), 235–241. http://doi.org/10.1177/2321022213501261

Appendix: Results from the Model Excluding Watershed Size and Total Population

Table A1. First Stage: Determinants of Number of Waterbodies Listed

Explanatory Variables	Dependent Variable: Number of Waterbodies Listed
Precipitations	1.426***
	(0.418)
Species	-0.046***
	(0.015)
Violations	0.83
	(1.28)
Fraction Rural Land	-2.494***
	(0.788)
Fraction Urban Land	53.346***
	(8.864)
Home Ownership	16.54***
	(5.74)
Population Density	-0.014**
	(0.006)
Unemployment Rate	57.385***
	(10.617)
Per Capita Income	0.184**
	(0.076)
Percentage 50+ Years Old	1.149
	(4.119)
Percentage with College Degree	24.837***
	(6.808)
Percentage White Population	5.829***
	(1.694)
Percentage Republican Vote	1.292
	(3.353)
Percentage Male	26.953
	(19.35)

Observations 9,420.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.

Table A2. Second Stage: Determinants of Number of Watershed Groups

Explanatory Variables	Dependent Variable: Number of Watershed Groups
Waterbodies Listed	0.102***
	(0.04)
Species	0.012***
	(0.004)
Violations	-0.035
	(0.179)
Fraction Rural Land	0.485***
	(0.162)
Fraction Urban Land	-1.344
	(2.593)
Home Ownership	-3.329***
	(0.998)
Population Density	0.005***
	(0.002)
Unemployment Rate	-2.74
	(2.797)
Per Capita Income	-0.021
	(0.015)
Percentage 50+ Years Old	1.32**
	(0.624)
Percentage with College Degree	5.643***
	(1.571)
Percentage White Population	-0.249
	(0.343)
Percentage Republican Vote	-1.358***
	(0.401)
Percentage Male	0.742
	(2.611)
R-Squared	0.33
Stock-Yogo F – Statistic	43.79
Prob>F	0.00

Observations 9,420.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
Heteroscedasticity and autocorrelation robust std. errors in parentheses.