FORTUNE FAVORS THE FUNDED

EQUITY V. EFFICIENCY IN GOVERNMENT GRANT DESIGN

A Thesis

Presented to the faculty of the Department of Public Policy and Administration

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Submitted in partial satisfaction of
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MASTER OF PUBLIC POLICY AND ADMINISTRATION

by

Katerina Libuše Robinson

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Department of Public Policy and Administration

Abstract

of

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Katerina Libuše Robinson

This thesis explores the balance between equity and efficiency in government granting, particularly in regards to government grants to remediate environmental pollution. Through statistical analysis, I analyze California cities to see whether there is a link between pollution and staff capacity, and whether that link impacts a city's likelihood to apply for and receive state money to reduce pollution in the community. My research employs ordinary least squares (OLS) regression and logistic regression and utilizes city data obtained from the California Environmental Protection Agency, Strategic Growth Council, State Controller's Office, and the US Census.

I find that cities with more pollution also have statistically fewer staff per capita. Further, I find that cities with higher administrative staff capacity are more likely to apply for funding from the state's Affordable Housing and Sustainable Communities program, and applicants with higher administrative staff capacity are more likely to be awarded funding from the state. Furthermore, administrative staff capacity is the only variable that has a real impact on the outcome for a city or an applicant, with only a very weak effect of poverty on a city's likelihood of applying for funds and no statistically significant effect from any other variable in the models.

Based on this research, I recommend that the state begin tracking staff capacity for all cities in California to identify the cities that will be less likely to have capacity to apply for and win government grants. The state should then use these data to conduct proactive outreach to cities that are unlikely to apply for funds and that may statistically be in the most need of funds. I also suggest that the state set aside special funds for cities with low staff capacity, and that policy makers consider other policy mechanisms besides competitive grants, like providing direct services to cities with the highest need.

_______________________, Committee Chair
Edward L. Lascher, Jr., Ph.D.

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Date

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To my husband, David Strunk, who shepherded me through the blurred weeks of work and school with a kiss and a smile, and who (crucially) told me to stop working when I needed rest. To our child, who I have yet to meet but already love beyond words. To my mother and father, Eva and Eddy Robinson, who gave me every opportunity and always put my education first. To Professors Ted Lascher, Stacy Fisher, and Mary Kirlin for guiding my research and education through my three years in graduate school. To my siblings, Tomas, Sasha, and Alena – you are the spice of life and I will always cherish you. To my graduate student companions – I would not have survived these three years without you. We made a great team. To my friends and colleagues for keeping me sane and grounded throughout. Thank you.

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Chapter 1

Introduction

Public organizations have long sought to forge a balance between equity and efficiency in allocating scarce resources. Nowhere is this more apparent than in government grant programs. Government agencies, federal, state, and local, are responsible for allocating billions of dollars a year in grant funding. Federal grants alone averaged 27% of local government budgets in 1993 (Cantelme, 1996). Federal and state governments typically award grants in hopes of achieving particular policy goals or prompting certain behavior in local governments, but grant programs are also a key way government redistribute wealth to needy populations. To this end, government constantly balances both *efficiency* in achieving policy goals and *equity* in redistributing wealth to those most in need.

In California, this delicate balance between equity and efficiency is captured well in the state's distribution of greenhouse gas reduction funds to help reduce greenhouse gas emissions and air pollution in communities across California. California is uniquely plagued with the worst air pollution in the nation, with Los Angeles and Bakersfield topping the charts in particulate matter pollution from industry emissions, traffic, diesel trucks, and wood-burning stoves. Air pollution can cause asthma, heart attacks, lung cancer, and early death (Smith, 2016). In addition, although per capita California is the tenth cleanest state in the nation, because of its size the state still emits the eighth most greenhouse gas pollution of any state in the US, contributing just under 117 million metric tons of carbon into the earth's atmosphere each year (Light, 2014). In many cases, greenhouse gas emissions and air pollution are caused by the same sources – the industry facilities, traffic, diesel trucks, and wood-burning stoves that create air pollution also create greenhouse gas emissions.

California has sought to address greenhouse gas emissions and air pollution in several ways. Most significant for this paper are the many grants to local governments which the state has created to address pollution. One such effort is the state's Cap-and-Trade program, which puts a price on pollution by limiting each business' greenhouse gas emissions and requiring businesses that exceed their cap to purchase additional pollution credits or pay a fine. A helpful side-effect of Cap-and-Trade is its ability to raise billions of dollars a year from the sale of emission credits. This money is deposited into the greenhouse gas reduction fund (GGRF) and subsequently invested in activities that reduce greenhouse gas (GHG) emissions, improve air quality, and provide other co-benefits. The first expenditure of GGRF funds by the state occurred in 2015 through a variety of grant programs at various state agencies.

Academic literature suggests that government, in grant making, is always confronted with a tradeoff between equity and efficiency. In the case of GGRF funds, the tradeoff manifests itself in a very real public debate: is state government funding those who need the money the most in order to reduce pollution in their communities, or is the state funding those with the most impressive application? Research showing that poor people of color tend to live closer to environmental pollution has spurred environmental justice advocates to suggest GGRF funding should be prioritized for poor communities. At the same time, to meet California's ambitious greenhouse gas reduction goals established in AB 32 and SB 32, the Air Resources Board has an interest in using GGRF money to fund projects that provide the maximum emissions reductions at the lowest cost. The result is compromise: develop a grant program that can achieve benefits for poor communities while maximizing emissions reductions. But has California been successful in developing a program that integrates equity into granting, or are poor, polluted communities still less likely to be successful in accessing state funding?

In order to balance equity and efficiency, government must take a closer look at grant design, identifying links between what makes applicants more competitive versus what makes them *neediest*. It is only once we understand what makes applicants more likely to succeed or fail in accessing grant funding that we can identify how to develop grant programs that are accessible to all communities. Literature suggests that applicants with higher staff capacity and private funding are more likely to succeed in obtaining funding. But it stands to reason that wealthier applicants with more staff capacity would also be less in need of government assistance. ***Looking at pollution specifically, I hypothesize that cities with higher pollution burdens also have lower staff capacity and that this, in turn, makes them less likely to apply for and receive government grants to build healthier communities with less pollution.***

This paper seeks to determine whether there is, indeed, a link between pollution and staff capacity, and whether that link impacts a city's likelihood to apply for and receive state resources to build healthier communities with fewer environmental contaminants. Chapter 2 explores the literature behind equity, efficiency, and design of government grant programs – particularly with regards to environmental health and pollution – to determine what type of grant design succeeds in pushing funds to target populations and in achieving desired policy goals. Chapter 3 focuses on the link between *staff capacity* and *pollution* in California cities, outlining the quantitative methodology I use to determine whether there is a statistical link between the two variables and summarizing my findings. Chapter 4 takes a closer look at a single government grant program in California, the Affordable Housing and Sustainable Communities Program, to determine what criteria made cities more or less likely to apply to the program, move forward through the application process, and ultimately be awarded funding. Lastly, Chapter 5 offers some concluding thoughts on the overall findings, provides some policy recommendations on how to balance for equity and efficiency in the government granting process, and offers proposals for future research.

I will conclude this introductory chapter with a note on the overall goals of this thesis. My goal, through this paper, is to stitch together the literature surrounding government granting and test whether the academic theories of government granting are relevant to California's pollution abatement grants. In this way, I hope to offer guidance to state governments, particularly California, on how it might adjust its programs to better balance equity and efficiency in government granting. Ultimately, if California wishes to succeed in lifting its poorest and most polluted populations out of dangerous environmental conditions which cut years off of their lives, affect their children's ability to learn, and impact the economy of the region, the state must first understand how it can successfully funnel funds to these communities. To this end, this thesis will argue that local governments need staff capacity in order to successfully apply for and receive funding. For local governments without this capacity, the State must figure out how to meet them halfway.

Chapter 2

Literature Review

National and state all too often feature stories of environmental pollution, particularly in poor communities, and the resulting health impacts of this pollution on the local community. Last year, lead contamination found in the drinking water of a poor, predominantly African-American community in Flint, Michigan made national news, particularly when details came to light that local water officials had known about the lead contamination for several months and did not notify the affected community (Lorscheider, 2016). Exposure to lead can cause cancer, mental impairment, and even death. California has its own sordid history with pollution in poor communities. In the early 1990's, Erin Brockovich discovered that the water supply of Hinkley, a small desert city in San Bernardino, was contaminated with chromium-6 – another known carcinogen – from operations of a nearby Pacific Gas and Electric utility facility (Litoff, 2011). More recently, emissions from a battery factory in Vernon, California were found to be resulting in high lead levels in local children of the impoverished city of Vernon (Barboza, 2016). Additionally, California is uniquely plagued with the worst air pollution in the nation. Air pollution can cause asthma, heart attacks, lung cancer, and early death (Smith, 2016). This begs the question: Are poverty and pollution linked? And if so, what can government do about it?

Before embarking on an exploration of California's plight to balance equity and efficiency in government grants to remediate pollution, it is important to outline the historic struggle between equity and efficiency in United States democracy, to understand the evidence linking poverty and pollution that gave rise to the environmental justice movement, and to summarize what is already known about government grant design in regards to equity and efficiency.

I. Equity v. Efficiency: the Classic Literature

Though even our founding fathers acknowledged the rights of all citizens to equality of opportunity – in the famous lines "all men are created equal," with inalienable rights such as "life, liberty, and the pursuit of happiness," – equality of outcomes took another century to make its way into the public consciousness (The Declaration of Independence, 1776). Arthur Okun, widely considered the father of the equity versus efficiency tradeoff in modern government, motivated generations of government managers to evaluate government programs for tradeoffs between equity and efficiency (Okun, 1975). Okun's seminal book *Equality and Efficiency* acknowledges that blind pursuit of efficiency leads to significant disparities between individual material welfare. In essence, government programs and policies could drive wealth to certain individuals while leaving other, disadvantaged individuals with less wealth and no government assistance. This is true for federal, state, and local governments as well as private institutions: how governments design policies effect outcomes for its citizens.

Okun writes of the "double standard" of a capitalist democracy – that the United States Constitution espouses the equality of man while the free market economy, though in theory egalitarian, allows some to rise to wealth while others sink into poverty, sometimes by relative virtue, sometime by sheer luck or lack thereof. America talks of equality, but market economies can create vast disparities. Okun feared that these disparities, if allowed to grow too great, could threaten the very bedrock of capitalist democracy, and that it was therefore necessary that government temper the disparities created by a market economy, so that no human being was allowed to suffer to the point that their human dignity and thus the social contract of democracy, was violated. In other words, government promotes equality in the face of the market's bent toward efficiency.

Okun highlighted a few main ways in which government tempers the efficiency of markets. First, governments establish rights. By establishing rights for citizens of the capitalist democracy, government can assure citizens that all people will be afforded a minimum set of protections – that they will be given representation if accused of a crime, that they will be provided free speech no matter what their social status, that they will be prevented from falling into abject poverty, that they will be provided basic health services, and the like. Second, governments provide "transfer payments" like social security or unemployment to individuals who have been left behind by the efficiencies of a market economy. Okun calls these transfer payments the "big equalizer" because they are the primary way that governments provide for the poorest citizens. Third, governments can employ taxation policies that advantage the poor over the wealthy, like progressive income taxes. This allows for formulaic redistribution of wealth and reduces the overall income gap between citizens. Lastly, governments can redirect their expenditures to income-equalizing programs, or change the way they allocate program funds in order to benefit lower income or economically disadvantaged populations. It is this fourth and final means of redistributing wealth that I will explore below.

II. Rise of Environmental Justice

The Environmental Justice movement formed around the perception that environmental pollution and toxic chemicals were inequitably distributed across the country's population – with an undue burden of pollution in low-income, ethnically and racially diverse communities (Ringquist, 2005). The literature regarding pollution burden strongly suggests that communities with ethnic and racial minorities are more likely to house environmental pollution, even when controlling for level of aggregation, type of control variables used, and type of environmental risk examined (Rinquist, 2005). However, the literature on economic class is far less conclusive. Environmental Justices advocates argue that pollution burden also rests inordinately on low-income communities. However, a study of 49 environmental equity papers shows that evidence supporting class-based inequity is substantially weaker than evidence of race-based inequity, and that though class-based inequity may exist in some regions, it is not generalizable across areas and pollution sources. Further, Rinquest argues that areas of extreme poverty are less likely to house environmental pollution (2005). Perhaps this data shows that facilities that produce environmental pollution also often come with decent jobs for local residents, reducing the overall poverty of the region.

A second meta-analysis of environmental equity tells a more conclusive story about environmental injustice, and government's role in its creation. Through a literature review of environmental programs, Goldman showed that in at least 47 cases between 1967 and 1993 government environmental policies resulted in economic or racial disparities in the distribution of environmental hazard (Goldman, 1993). This was true for federal, state, and local programs. In other words, Goldman's research shows that both poor people and people of color are subjected to greater exposure to environmental pollution than the rest of America – and government policies are partially to blame.

This heightened exposure to pollution held true in research on populations living closest to pollution sources. Existing academic literature shows a correlation between poverty and pollution. Pastor, Morello-Frosch, Sadd, and Scoggins (2010) show that household income has a negative relationship to likelihood of living near pollution: as income decreases, the likelihood of living within six miles of a pollution-spewing facility, like a power plant, oil refinery, or cement factory, increases. There is also a racial component to this relationship: in a controlled comparison, households of color are more likely to live near polluting sites than non-Hispanic Whites, and African Americans were far more likely than all other racial minorities to live near pollution (with 70 percent of African American households that make under $10k per year living within six miles of a facility compared to 60 percent of Asians and Latinos and just over 40 percent of non-Hispanic Whites)[1].

[1] This research could have benefited from controlling for additional variables, like education, age, parental income, and rural versus urban populations.

Regardless of the data, the perception that pollution burden breaks down across racial, ethnic, and income lines is pervasive across the United States, and both federal and state governments in the United States have responded to this perception. Since the rise of the Environmental Justice movement, the federal government has responded by creating the Office of Environmental Justice (OEJ) within the Environmental Protection Agency. OEJ works with communities to reverse inequities and provides grants for environmental cleanup. Further, nearly all state have responded in some way to public perception of environmental inequities (Bonorris, 2004; Rinquist & Clark, 1999). In California, the state's Environmental Protection Agency added an Assistant Secretary of Environmental Justices and Tribal Affairs and hosts an Environmental Justice Task Force which analyzes the state's programs for environmental justice concerns (EPA, 2017).

III. Toxic Trends: Correlating Poverty and Pollution

If there is, indeed, a link between environmental equity and race, ethnicity, or economic class, this has significant implications for society, particularly regarding public health. Morello-Frosch, Pastor, JR, and Sadd (2002) link health risks associated with living near a polluting facility to school performance in the LA area, controlling for median household income, rate of home ownership, and minority percentage in the school. Morello-Frosch et al find that schools nearer pollution, and therefore posing a higher respiratory and health risk for students, also have lower average SAT scores than schools farther from pollution (with a performance differential of about 20 percent)[2]. Still other studies showed that air pollution and particulate matter from power plants and oil refineries are linked to asthma, respiratory ailments, and chronic mortality, and that heavy metals, another byproduct of polluting smokestacks, are linked to a variety of cancers (Rable, Spadaro, 2000; Dockery, 2009). If pollution makes individuals less likely to do well in school and more likely to have healthy problems, than the sheer fact that low-income, racially and ethnically-diverse individuals are more likely to live near pollution implies a self-perpetuating loop of poverty.

If it is true that, as the literature broadly suggests, racial minorities, ethnic minorities, and lower-income individuals tend to live in more polluted environments than the rich, this research also casts further shadow on how the state has chosen to pursue emissions reductions. Through Cap-and-Trade, lawmakers in California have chosen to pursue a policy that does not directly reduce pollution in racially diverse, low-income areas, but instead allows industrial facilities to continue to pollute in these communities as long as the pollution is offset elsewhere – often in wealthier white communities. This policy overtly impairs the ability of adults and children in low-income communities of color to grow, exercise, work, play, and generally flourish in exchange for a more predictable and flexible regulatory structure for industries and a more efficient means of emissions reductions statewide. If California is to continue with a Cap-and-Trade system

[2] Though the findings offer an interesting view into the perpetuating loop of poverty and pollution, the study has several flaws. First, using aggregated SAT scores as the sole measure of educational success of students in the school creates internal validity issues. Researchers could have included graduation rate and college acceptance rate instead. Further, the study's limited sample frame (school districts in the LA region) means the research has low external validity.

that promotes efficiency, this argues even more for a keen eye to equity in the distribution of grant funds collected through the Cap-and-Trade program.

IV. Government Grant Getting: Efficiency v. Equity

Government has struggled with how to equitably distribute resources for decades. Is the competitive grant process – so popular amongst politicians today – an appropriate means of remediating pollution injustices? How must grant programs be designed to access the communities most in need? Many environmental policies are instituted to remediate injustices produced by an economic system that does not capture external costs, like air or water pollution. However, funds are not always distributed based on need. The literature surrounding government grant getting is robust and points time and again to a tradeoff between efficiency and equity in fund allocation, arguing that in many cases competitive grants favor applicants with more capacity, not necessarily applicants with the highest need.

Collins and Gerber (2008) assert that purely competitive granting formulas often undercut social equity. In an analysis of counties that applied for block grants of federal HUD funding, the authors find that in states with a pure competitive grant process there was no statistically significant relationship between need and funding level of counties. In states with more flexible grant processes, funding increased as a county's need increased. Collins and Gerber also find that as administrative capacity increases, funding levels increase, suggesting that in all granting scenarios counties that have more staff are able to write more competitive grant applications. However, the study only considered counties in four states: California, Kentucky, Texas, and Utah. Need was defined in relationship to the county's level of low- and moderate-income (LMI) households, and the definition of administrative capacity was not clear. Because Collins and Gerber considered grants of federal funding, there is question as to whether the findings can apply to the granting of state-level funds. However, the findings are significant and do not stand alone.

Hall (2008) also finds a positive relationship between administrative capacity and government funding. Hall expands the definition of need to include measures of poverty, income, unemployment, and population. Administrative capacity is operationalized as number of staff and amount of local revenue, a proxy measure for the availability of local matching funds that could be used to draw down federal funds. Though Hall's study included an analysis of multiple federal grants, not solely HUD grants, Hall's study is also limited to counties in one state (Kentucky), raising external validity concerns. However, because Kentucky has a large number of counties (120 counties in all) that vary across several control variables, the internal sample size should create an adequate sample.

Dull and Wernstedt (2010) bridge the gap between government granting literature and pollution/poverty literature with their study of counties receiving federal funds for the cleanup of contaminated "brownfield" sites. Dull and Wernstedt include both environmental pollution burden and poverty in the definition of local need. The authors find that poverty has a negative effect on a county's likelihood of receiving funds, again pointing to the significance of administrative capacity in winning government funds in a competitive granting process.

V. Evaluating Need in Distributing Grant Funding

Finally, in order to truly advance environmental justice, lawmakers must consider which communities are likely to implement environmental policies themselves and which truly need government help to pursue environmental policies. Several authors explore the influence of a city's wealth in its decision to implement environmental policy, suggesting that cities with high wealth (and therefore generally higher administrative capacity) are already more likely to implement environmental policy with or without additional government assistance.

Lubell, Feiock, and Handy (2009) find that cities with better fiscal health and higher socioeconomic status are more likely to implement environmental policies than cities with poor fiscal health and low socioeconomic status. This argues that governments seeking to spur adoption of environmental policy in areas that are least likely to implement environmental policies themselves should target funding to poorer cities. Kwon, Jang, and Feiock (2014) find that education level of constituents has the highest correlation to a city's likelihood of instituting sustainability programs, environmental conservation, and energy use reductions. These findings could also suggest that government should fund poorer, lower-educated cities that are less likely to implement environmental policy on their own.[3] Lastly, Jacobs and Whitefield (2012) review multiple state-level college grant programs to improve educational outcomes and find that funding is best utilized to enroll students who would otherwise not enroll in college, and to help support those same students to remain in school. Jacobs et al also suggested consolidating and simplifying grant programs, as complexity acted as a barrier of entry for the neediest students.

VI. Conclusion

The current literature shows both a connection between poverty and pollution and a connection between administrative capacity and the likelihood of receiving a government grant. The literature further intimates that wealthier cities are more likely to implement environmental policies on their own than poorer cities. In light of this literature, how do Cap-and-Trade funds square up? Are cities most in need accessing funds? The literature suggests that the answer will be closely linked to whether cities with the highest need have significantly less staff capacity than cities with the lowest need, and what type of grant design the state has employed to distribute the funds. California's current pollution reduction grant programs rely predominantly on competitive grants, though some programs do have built-in carve outs or allocation goals for disadvantaged communities.

[3] A major flaw with this study is that Kwon et al may have actually been measuring liberalism (which is highly correlated with education level), not just education.

By law, California must spend a minimum of 25 percent of Cap-and-Trade funds to the benefit of environmentally disadvantaged and pollution-burdened communities, with 10 percent spent in disadvantaged communities themselves (De Leon, 2012). However, arguably the state should spend more funds in the communities most impacted by climate change and pollution because they are the least likely to be able to afford to implement environmental policies on their own. Policy analysts can assess how Greenhouse Gas Reduction Fund allocations measure up on the equity versus efficiency scale by examining which cities succeed in securing state funds through GGRF and which do not, then comparing grant awards with local need. Given the literature on government grant getting, ***I hypothesize that cities with higher need are less successful in securing GGRF funds than cities with lower need.***

But this hypothesis stems from an underlying assumption about the link between pollution, poverty, and administrative capacity. The literature shows that polluted areas tend also to be poor. It stands to reason that poor areas should have less local revenue to hire administrative staff and grant writers to apply for and administer GGRF funding – in other words, that poor areas should have less administrative capacity. Proving this link is crucial to showing that communities with less administrative capacity are also the communities most in need. ***I hypothesize that in a comparison of cities, those with higher environmental pollution burdens will have lower administrative capacity than cities with lower environmental pollution burdens.***

By identifying whether staff capacity varies significantly over cities with differing environmental pollution burdens, I will have an indicator of whether cities with the most need are likely to succeed in winning GGRF grants. This will allow me to continue to knit together literature on environmental pollutions and government grant getting to explore whether California's greenhouse gas reduction policies are able to produce equitable outcomes when the state utilizes competitive grants to distribute the funds.

Chapter 3

Linking Pollution and Staff Capacity

The first step in determining whether polluted cities are less likely to be competitive in winning government grant dollars to combat pollution is to explore the statistical link between pollution and staff capacity. The literature shows that administrative staff capacity affects an applicant's likelihood of winning grant funding. But are more polluted cities systematically less likely to have strong administrative staff capacity? If so, this would argue that polluted cities most in need of government assistance are least able to access funding. ***I hypothesize that in a comparison of cities, those with higher environmental pollution burdens will have lower administrative capacity and higher poverty than cities with lower environmental pollution burdens.***

By identifying whether staff capacity varies significantly over cities with differing environmental pollution burdens, or if this population trends toward lower staff capacity, I will have an indicator of whether cities with the most need are likely to succeed in winning grant funding. This will allow me to continue to knit together literature on environmental pollutions and government grant getting to explore whether California's grant programs, including its greenhouse gas reduction policies, are able to produce equitable outcomes when the state utilizes competitive grants to distribute the funds.

I. Methodology

This section will detail the methodology and model used to test the above hypothesis, as well as provide descriptions and justifications for the independent and dependent variables utilized in the model. The section will conclude with a graphic depiction of the model, including potential confounding variables added to the model, and a table describing each variable and my hypotheses on the relationship between the independent and dependent variables.

I use an ordinary least squares (OLS) regression analysis model to evaluate the relationship between a city's need and its likelihood of receiving funds. I use a city's pollution burden as a proxy for "need." This proxy is appropriate because the more polluted the city is, the more the city could benefit from government funding to remediate or offset pollution. Administrative capacity serves as a proxy for "likelihood that a city will apply for and receive government funds." This proxy is appropriate because, as described above, the literature shows a relationship between number of government staff and the likelihood of receiving funds.

The model includes pollution burden as the independent variable and administrative capacity as the dependent variable. Much of the literature on government grant getting focuses on the county as a unit of analysis, while much of the pollution and environmental justice literature focuses on city or census tract-level data. I chose individual cities as the unit of analysis for this study, as cities are often applicants for GGRF funds in California and because data on administrative capacity was only available by city. Additionally, I exclude unincorporated areas from my model, as data on administrative capacity was present for incorporated cities only, and unincorporated cities have varying levels of formalized government and are served primarily by the county in which they reside, which could skew my results.

Independent Variable: Pollution Burden

Pollution burden serves as the independent variable in this model. I operationalize pollution burden using an index of pollution developed by the Office of Environmental Health Hazard Assessment (OEHHA) within the California Environmental Protection Agency (CalEPA). CalEPA's environmental health screening tool, CalEnviroScreen 2.0, is the second iteration of a tool developed in response to legislation passed in 2012 requiring the state to spend 25 percent of its GGRF funds in disadvantaged communities (SB 535, De Leon, Chapter 830). The tool measures pollution burden across twelve indicators for each census tract in California, averaging this data into a single pollution burden score for each census tract. Pollution indicators include three measures of air quality (Ozone, PM2.5, Diesel PM), drinking water contamination, pesticide use, traffic density, and toxic cleanup sites (CalEnviroScreen 2.0, 2014). CalEnviroScreen 2.0 then adds these pollution factors into one measure of pollution burden for each census tract. Scores range from 12.45 to 67.27. I used Stata to average pollution burden across census tracts for each city to create an average pollution burden score for each incorporated city in California.

Table 3.1 presents the CalEnviroScreen 2.0 scores for a sample of California cities, to give a sense of how scores vary across the state. CalEnviroScreen 2.0 assigns pollution scores to each community by census tract. This table presents an average across the census tracts of each city. Small, industrialized urban cities in Los Angeles and the Central Valley – like Bell and Fresno – tend to have higher CalEnviroScreen scores. These cities have high numbers of point source pollution, like refineries and power plants, and are close to heavily-trafficked freight corridors. They also lack proximity to the coast, and therefore tend to benefit less from coastal breezes clearing away poor air quality. The Central Valley acts as a settling basin for air pollution blown inland from the Los Angeles basin, adding to its poor CalEnviroScreen scores. Small rural cities in Northern California – like Tahoe City and Yreka – tend to have very low CalEnviroScreen scores. Large coastal cities – like San Jose and San Francisco – benefit from coastal breeze improving their local air quality and reducing their overall CalEnviroScreen scores.

Table 3.1: Sample of Average CalEnviroscreen 2.0 Scores, by City

City	**County**	**CalEnviroScreen 2.0 Score (Average)**
Bell	Los Angeles	54.43
Baldwin Park	Los Angeles	52.10
Ontario	San Bernardino	48.84
Fresno	Fresno	48.15
Stockton	San Joaquin	42.62

Los Angeles	Los Angeles	39.10
Pasadena	Los Angeles	29.08
Sacramento	Sacramento	28.14
Chico	Butte	23.48
San Jose	Santa Clara	22.05
San Francisco	San Francisco	15.63
Yreka	Siskiyou	14.09
Tahoe City	Placer	7.31

Dependent Variable: Administrative Capacity

Administrative capacity serves as the dependent variable in this model. The government grant getting literature offers several options for operationalizing administrative capacity (Appendix, Table 4). Local tax revenue is one popular indicator, both as a measure of a city's ability to hire administrative staff and as a measure of its ability to provide matching funds for government grants. Another is government or administrative staff numbers. Hall proposes a third dimension of political capacity, or government representatives for the region that share the same party affiliation as political leadership.

I have chosen to utilize Tokunaga's approach, operationalizing administrative capacity as government staff per capita for each city. Though this does not capture the political dimensions raised by Hall, it is the clearest single indicator of a city's capacity to apply for competitive grants. Ideally, I would be able to specifically measure grant writing staff for each city (both in sum and per capita), but US Census Bureau data only included a raw number of government staff for each city. Data provided by Tokunaga divides this raw number of government staff for each city by each city's population to obtain a number for "government staff per capita."

Other Explanatory Variables

As part of the regression model, I include other socioeconomic factors that may also have an impact on a city's administrative capacity as control variables. This ensures that I am accurately measuring the independent effect of pollution on a city's administrative capacity, instead of the indirect effect of another confounding variable. These socioeconomic factors were obtained from CalEnviroScreen 2.0, which gathers a variety of socioeconomic data by census tract as part of a population characteristic index. Below I have summarized confounding variables used as control variables in the model, detailing the rational for inclusion in the model and expected effect on the dependent variable:

Population **–** Cities with higher populations might naturally have more staff, no matter what their pollution level, because higher populations require more governmental services and because higher populations often equate to a higher tax base. Additionally, urban areas tend to have higher air pollution and toxic contamination levels than rural areas, so population may also have an interaction with pollution. Therefore, I would expect that population has a positive effect on administrative staff, and that there is a relationship between population and pollution burden. In this study, population is measured as the average population across census tracts for each city, according to 2010 census data.

***Unemployment* –** Cities with high unemployment may also have a lower tax base, providing less funding for government staff capacity. Therefore, I would expect unemployment to have a negative effect on administrative capacity. In this study, unemployment is measured as the percent of the population over the age of sixteen that is unemployed and eligible for the labor force, averaged across census tracts for each city.

***Poverty* –** Likewise, high poverty rates may lower the tax base within a city, providing less funding for government staff capacity. Additionally, there may be an existing correlation between poverty and pollution, as the literature suggests that as poverty increases, pollution increases. I expect poverty to be highly correlated with unemployment, but I expect both to have independent impacts on administrative capacity so I retain both variables in the model. In this study, poverty is measures as the percent of population living below two times the federal poverty level, averaged across census tracts for each city.

Regression Model

The final regression model to test the relationship between city pollution burden and city administrative capacity, controlling for socioeconomic factors, is as follows:

$$\textit{Government Staff} = \beta_0 + \beta_1(\textit{Pollution Burden}) + \beta_2(\textit{Population}) + \beta_3(\textit{Unemployment}) + \beta_4(\textit{Poverty}) + \beta_5(\textit{Log Square Population}) + e$$

Table 3.2: Description of Independent and Dependent Variables

Category	Variable	Description	Anticipated Direction of Relationship	Source
Independent Variable (Explanatory)	Pollution Burden	Average of twelve pollution indicators across census tracts for each city	-	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Population	Average population across census tracts for each city, according to 2010 census data	+	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Unemployment	Percent of the population over the age of 16 that is unemployed and eligible for the labor force, averaged across census tracts for each city	-	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Poverty	Percent of population living below two times the federal poverty level, averaged across census tracts for each city	-	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
DEPENDENT VARIABLE				
Dependent Variable	Government Staff Per Capita	Reported number of city staff divided by the population of the city	N/A	Tokunaga, 2015 (data gathered from US Census Bureau)

II. Data

Data Manipulation

Because data I obtained from CalEPA's CalEnviroScreen 2.0 was gathered by census tract, I used Stata to average all data across census tracts for each city, with the exception of population which I summed across census tracts, then collapsed the data into a single number per variable per city.

Below is a description of each variable used in the model, including the mean, standard deviation, minimum, and maximum values for each variable. This provides an idea of the variation across each measure.

Table 3.3: Descriptive Statistics for Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
DEPENDENT VARIABLE				
Government Staff (Per Capita)	5.10	3.84	0.04	32.08
INDEPENDENT VARIABLES				
Pollution Burden	38.66	11.63	12.45	67.27
Population	72,782.68	156732.9	1,847	2,392,743
Unemployment	11.26	4.25	1.93	27.61
Poverty	33.07	15.42	3.70	87.78

Correlation Between Variables

An initial correlation matrix between all independent and dependent variables suggests early confirmation of my hypotheses. There is at least a negative correlation between government staff and pollution burden: as pollution goes up, government staff per capita declines. The data is also consistent with the literature, showing there is indeed a positive correlation between poverty and pollution burden in California cities: as poverty increases, pollution burden increases. There is also an initial correlation, as expected, between population and pollution burden: as population increases, pollution increases. The initial correlation between population and government staff is negative, but this may change once control variables such as poverty and pollution are included in the analysis. The regression model will shed additional light on the relationship between population and government staff, controlling for these variables. There is a positive relationship, though smaller, between pollution and unemployment, and a strong relationship, as predicted, between poverty and unemployment (Appendix, Table 1).

Though initial bivariate analysis is consistent my expectations, I must turn to a more rigorous multivariate analysis to help address the potential for spurious relationships. Therefore, we turn next to the results of the OLS regression analysis of these variables.

III. Regression Analysis

Using the theoretical model described in Section I and the data outlined in Section II of this chapter, this section presents the findings of the OLS regression analysis, including which independent variables showed a statistically significant effect on the dependent variable and the results of testing for both multicollinearity and heteroskedasticity.

I hypothesize that in a comparison of cities, those with higher environmental pollution burdens will have lower administrative capacity than cities with lower environmental pollution burdens. The findings of the regression analysis support this hypothesis, showing that pollution burden has a statistically significant negative effect on government staff per capita.[4] The regression analysis shows that with every unit increase in pollution burden, there is a 0.04-unit decrease in staff per capita.

The regression model also shows that unemployment, poverty, and population all have statistically significant effects on staff capacity, though the relationship between poverty and staff capacity is contrary to expectation. As expected, unemployment has a negative relationship with government staff per capita: as unemployment increases, a city's government staff per capita decreases. Poverty, however, has a slightly positive relationship to government staff per capital: as poverty increases, a city's government staff per capita decreases. This may be a result of cities with high levels of poverty requiring more government staff to provide social services.

The effect of population on administrative capacity was more complicated. A check for heteroskedasticity in each variable revealed a curvilinear relationship between population and number of staff: staff per capita fell until a city reached a certain threshold, then rose again. This may be an illustration of a city moving from a small government with relatively few social services and government staff to a large government with more social services and government staff. I therefore included a logged

[4] Within a 99 percent confidence interval, with P-value reported at 0.01

square of population in the model to account for both sides of the curvilinear relationship. I also chose to log population data to correct for a positive skew in the variable.

A check for multicollinearity using a variance inflation factor (VIF) test comes back negative, with the highest reported VIF number at 1.97.[5] After running Cook's d in Stata to check for outliers that exhibited a large influence on the model, I did choose to drop one obvious outlier from the model, which was having a large effect on the outcome of the regression analysis. San Francisco has the highest number of staff per capita, at 32.08, and relatively low pollution burden, at 29.53. This is largely because of the good air quality in the Bay Area, improved by ocean breezes. Additionally, San Francisco is the only combined city and county in the state. This alone helps explain its high staff numbers, since it performs functions – for example in the areas of criminal justice and public health – that California cities normally do not perform. Because San Francisco skewed the outcome of the model so dramatically, I chose to exclude it from the final regression analysis.[6] The model as a whole is significant, with an observed F of 12.05.

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[5] Population and Log Square Population are clearly highly correlated, because they consist of the same data. However, if Log Square Population is removed from the model, the regression still runs with no multicollinearity, with the highest value (Population) showing at 2.02.

[6] CooksD for San Francisco came in at 0.45, with the next highest value coming in at 0.14 (City of Trinidad)

Table 3.4: Regression Coefficients

Variable	Regression Coefficient (Standard Error)
Pollution Burden	-0.04* (0.01)
Population	-10.59* (1.78)
Unemployment	-0.20* (0.05)
Poverty	0.04* (0.01)
+Log Square Population	0.49* (0.08)
Constant	64.13* (9.39)

N = 441
F = 12.05, Prob > F = 0.00
Adjusted R-squared = 0.11
chi2 = 59.76
Prob > chi2 = 0.00
* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
+ log squared population takes into account a curvilinear relationship between population and government staff, where government staff per capital declines until a tipping point, where it increases

IV. Conclusion

My results clearly show the correlation between poverty and pollution is real, and that cities that are more polluted also have less administrative capacity to apply for state and federal grant funding to address that pollution. These findings suggest that the competitive grant process may not be the best way of reducing pollution in low-income, disadvantaged communities. If the state wishes to fulfill its mandates to expend a percentage of GGRF funds in disadvantaged communities in an effective manner, while also maximizing pollution reduction that would not have occurred without state assistance, the data suggests that agencies should consider providing funds directly to the cities with the highest need, not with the most competitive application. If direct funding of low-income communities is not feasible politically or institutionally, the literature indicates that a moderating hybrid competitive granting model, as discussed in Collins & Gerber (2008), that allows government staff to prioritize funding for particular communities of need could be effective in improving outcomes for these communities.

Though this study uses administrative staff capacity as a proxy for a city's likelihood of receiving GGRF funds, further research to validate whether GGRF funds do, in fact, go to cities with more staff is required. Additionally, this study would have benefited from the inclusion of several other control variables, including local financial capacity or tax base, local political capacity, and racial composition. Given the timeframe for this paper, I was forced to exclude these potential confounding variables from my regression model.

The state has an opportunity to begin to address deep inequities in pollution burdens, and associated public health and environmental health impacts, in low-income communities of color. Whether they are able to overcome institutional barriers that favor efficiency over equity in order to promote true change remains to be seen.

Chapter 4

Case Study: AHSC Grant Program

With the statistical link between pollution and staff capacity demonstrated, my next goal is to determine whether, as the literature suggests, staff capacity has an impact on a city's likelihood of applying for and winning state grant funding to reduce pollution. To do this, I will look at a single greenhouse gas reduction fund program, the Affordable Housing and Sustainable Communities Grant Program (AHSC) administered by the Strategic Growth Council to provide funding to cities to build housing and transit that reduces emissions by promoting proximity to public transit, reducing vehicle traffic, and promoting infill development into urban cores. I will test two hypotheses here: ***(1) In a comparison of cities, cities with higher administrative staff capacity are more likely to apply for an AHSC grant than cities with lower administrative staff capacity, and (2) In a comparison of applicants, applicants from cities with higher administrative staff capacity are more likely to be awarded an AHSC grant than applicants from cities with lower administrative staff capacity.***

I. Methodology

This section will detail the methodology and model used to test the above hypotheses, as well as provide descriptions and justifications for the independent and dependent variables utilized in the model. The section will conclude with a graphic depiction of the model, including potential confounding variables added to the model, and a table describing each variable and my hypotheses on the relationship between the independent and dependent variables.

I used a logistic regression to test both hypotheses. The unit of analysis for this study was an individual city in the first logistic regression and a single project application to the AHSC program in the second logistic regression. Some cities submitted multiple applications. This was largely a concern in the second regression analysis, as an applicant that submitted multiple applications might be more likely to ultimately be awarded funding. To correct for this in the second regression model, I created a control variable for the number of applications submitted.[7]

In these logistic regressions I used two proxies which I ultimately combined into an index of administrative staff capacity. First, I used the same variable for administrative capacity as used in the regression analysis described in Chapter 3. This variable allowed me to measure the overall staff available to the city. However, the variable did not differentiate staff dedicated to planning and grant writing from staff responsible for other city functions (police, fire, parks, general office staff, etc.). Unable to find data specific to grant-writing staff for each city, I turned to a second variable: city funding dedicated to planning. As in Chapter 3, I exclude unincorporated cities from my model, as data on administrative capacity was present for incorporated cities only, and unincorporated cities have varying levels of formalized government and are served primarily by the county in which they reside, which could skew my results.

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[7] I created a binary variable in the first regression model to measure whether a city submitted even one application (Yes/No) but did not take into account the number of applications submitted.

Independent Variable

Administrative staff capacity serves as the independent variable in this model. I have created two variables to measure administrative capacity in this model, which I eventually collapsed into a staff capacity index. The first is the same variable used in the regression analysis in Chapter 3. Data provided by Tokunaga divides the raw number of government staff for each city by each city's population to obtain a number for "government staff per capita."

Second, I developed a new variable to target administrative capacity for planning and grant writing. I gathered this data from the Local Government Annual Financial Reports dataset maintained by the California State Controller's Office (SCO, 2016). To adjust for yearly fluctuations in city spending on planning, I took a three-year average of a city's planning expenditures. To maintain temporal consistency among my variables, I chose to use planning expenditure data from the three years surrounding the census data used in my first administrative capacity variable (2009, 2010, and 2011).[8] To control for the relative population size of the city (cities with higher populations might naturally have more staff), I divided the three-year planning expenditure by the city's population to obtain per capita expenditure data.

For the purposes of the regression model, I combined these two variables into a single independent variable. To do this, I first divided three-year planning average by

[8] In my datasets, this variable is titled "Ave_Planning_TotalperCapita."

1,000 to put it on the same scale as government staff per capita. I then averaged the two variables to create a single number.[9]

Dependent Variable

The dependent variable in the logistic regression models is whether a city (1) applied for AHSC funding, and (2) was awarded AHSC funding, respectively. To obtain this data, I looked specifically at project applications submitted during the 2015 funding cycle for the AHSC program. I obtained data on projects and their progression through the application process from the Strategic Growth Council, which publically releases data on all projects at the end of each funding cycle (SGC, 2016). I coded each variable 0 or 1, with 0 indicating that a project was unsuccessful at this stage and 1 meaning a project was successful.

Other Explanatory Variables

I included many of the same socioeconomic factors in these logistic regressions as I did in Chapter 3's OLS regression as control variables, including pollution burden, population, unemployment, and poverty. This allows me to more clearly measure the independent effect of administrative staff capacity on a project's likelihood to move forward within the application process while maintaining theoretical consistency between my models. In my second logistic regression, I also controlled for number of applications submitted. In Chapter 3, I include a more in depth discussion of why each of these

[9] In my datasets, this variable is titled "index2"

variables are included in my theoretical models, so I will only briefly touch upon my justification for including them in these two logistic regressions here:

Pollution Burden **–** Cities with higher pollution burden may apply for state GGRF funding to reduce pollution at a higher rate than cities with low pollution burdens, all else being equal. Therefore, I expect pollution burden to have a positive effect on a city's likelihood of applying for and receiving funding.

Population **–** Cities with higher populations may be more likely to look to the state for resources, and for the state – in turn – to funnel resources to these metropolitan areas rich in voting constituents. Large cities may also have more representation in state government, further improving their political chances of receiving funding as local politicians look to bring home the political "pork" to their district. Therefore, I would expect population to have a positive effect on a city's likelihood of applying for and receiving funding.

Unemployment **–** Cities with high unemployment may also have a lower tax base, providing less funding for administrative capacity and also less resources to offer as matching funds for state grant applications. Cities with high unemployment may also be too distracted providing other state services – increased police services, welfare services etc. – to spend administrative capacity applying for state grants to reduce pollution and build more sustainable communities. Therefore, I would expect that as unemployment increases within the project applicant's city, a project will be less likely to move forward in the application process or ultimately receive funding (negative statistical effect).

***Poverty* –** Similar to unemployment, high poverty rates may lower the tax base within a city, providing less funding for government staff capacity, and district cities from applying for state funding to reduce pollution. Therefore, I would expect a negative effect of poverty on a city's likelihood of applying for and receiving funding.

Regression Analysis Models

The logistic regression between a city's administrative staff capacity and likelihood applying for funding is as follows:

Logistic Regression #1: "Applied for Funding?"

$$\text{Applied} = \beta_0 + \beta_1(\text{Staff Capacity}) + \beta_2(\text{Pollution Burden}) + \beta_3(\text{Populationt}) + \beta_4(\text{Unemployment}) + \beta_5(\text{Poverty}) + e$$

The logistic regression between an applicant's administrative staff and likelihood of being awarded funding is as follows:

<u>Logistic Regression #2: "Awarded Funding?"</u>

$$\textit{Awarded} = \beta_0 + \beta_1(\textit{Staff Capacity}) + \beta_2(\textit{Pollution Burden}) + \beta_3(\textit{Populationt}) + \beta_4(\textit{Unemployment}) + \beta_5(\textit{Poverty}) + \beta_5(\textit{Number of Applications}) + e$$

Table 4.1: Description of Independent and Dependent Variables for Logistic Regressions

Category	Variable	Description	Anticipated Direction of Relationship	Source
Independent Variable (Explanatory)	Administrative Staff Capacity	Average of city staff per capita and 3-year planning expenditures on planning	+	Tokunaga, 2015 (data gathered from US Census Bureau); Local Government Annual Financial Reports (State Controller's Office)
Control Variable	Pollution Burden	Average of twelve pollution indicators across census tracts for each city	+	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Population	Average population across census tracts for each city, according to 2010 census data	+	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)

Control Variable	Unemployment	Percent of the population over the age of 16 that is unemployed and eligible for the labor force, averaged across census tracts for each city	-	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Poverty	Percent of population living below two times the federal poverty level, averaged across census tracts for each city	-	CalEnviroScreen 2.0 (Office of Environmental Health Hazards Assessment, CalEPA)
Control Variable	Number of Applications	Nuber of applications submitted to the AHSC program for funding	+	AHSC 15-16 Basic Project Information and GHG Reductions (Strategic Growth Council)
DEPENDENT VARIABLE				
Dependent Variable #1	Applied	Cities that applied to the AHSC program for funding	N/A	AHSC 15-16 Basic Project Information and GHG Reductions (Strategic Growth Council)
Dependent Variable #2	Awarded	Applicants that were awarded funding through the AHSC program	N/A	AHSC 15-16 Basic Project Information and GHG Reductions (Strategic Growth Council)

II. Data

Below, I have provided descriptive statistics for each variable used in the model, including the mean, standard deviation, minimum, and maximum values for each variable, to provide an idea of the variation across each measure.

Table 4.2: Descriptive Statistics for Variables, Logit #1: "Applied for Funding?"

Variable	Mean	Standard Deviation	Minimum	Maximum
INDEPENDENT VARIABLES				
Administrative Staff Capacity	6.27	5.30	0.35	54.27
Pollution Burden	36.58	11.92	3.58	70.39
Population	4,648.53	2,395.33	0	37,452
Unemployment	11.59	5.43	0	38.09
Poverty	33.57	15.60	1.72	84.78

Table 4.3: Descriptive Statistics for Variables, Logit #2: "Awarded Funding?"

Variable	Mean	Standard Deviation	Minimum	Maximum
INDEPENDENT VARIABLES				
Administrative Staff Capacity	15.08	14.81	1.00	54.27
Pollution Burden	41.71	9.77	24.07	65.69
Population	5,366.37	1,950.02	1,320	13,694
Unemployment	12.21	4.49	6.62	38.09
Poverty	41.31	13.29	14.27	84.78
Number of Applications	4.43	5.15	1	17

Correlation Between Variables

An initial analysis of the correlation between the independent and dependent variables in both logistic regression models suggests that my hypotheses about staff capacity are correct. There is a positive and statistically significant correlation between administrative staff capacity and both the likelihood of applying for and receiving funding (Appendix, Table 3-4). Interestingly, both unemployment and poverty are positively correlated with a city's likelihood of applying for an AHSC grant, but the correlation is weak and only statistically significant for poverty. Unemployment is negatively correlated with an applicant being awarded AHSC funding, and poverty is positively correlated, but both only weakly and not statistically significantly.

III. Regression Analysis

Using the theoretical model described in Section I and the data outlined in Section II, this section presents the findings of the logistic regression analyses, including which independent variables showed a statistically significant effect on the dependent variable and the results of testing for both goodness of fit of the model as a whole and multicollinearity between variables.

I tested two hypotheses: As administrative staff capacity increases, (1) a city's likelihood of applying for AHSC funding increases, and (2) an applicant's likelihood of being awarded AHSC funding increases. The findings of the logistic regression analysis support both hypotheses, showing that administrative staff capacity has a positive effect on both likelihood of applying to the AHSC program and likelihood of receiving funds.[10] The logistic regression shows that with every point increase in the administrative staff capacity matrix, a city is twice as likely to apply to the AHSC program and an applicant is almost two and a half times more likely to be awarded funding.[11] The first logistic regression model also shows that poverty has a statistically significant effects on a city's likelihood of applying for funding. However, the relationship is very weak, with a city only 2% more likely to apply for grant funding with every unit increase in administrative staff capacity. The weak positive relationship may be related to my findings from Chapter 3, which showed that cities with higher levels of poverty also had higher levels of government staff per capita. Putting the weak effect of poverty aside, administrative staff capacity is the only variable that has a statistically significant effect within the two models, and a statistically significant effect in both.

A check for goodness of fit shows that the model explains an acceptable portion of the relationship between the variables, but shows that more variables may be at work as well. In the first logistic regression, goodness of fit numbers ranged from 0.027[12] to 0.088[13]. This means that the model explains between 3% and 9% of variance in the dependent variable. In the second logistic regression, goodness of fit numbers ranges from 0.019[12] to 0.193[13]. This means that the model explains between 2% and 19% of the variance in the dependent variable.

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[10] Within a 95 percent confidence interval, with P-value reported at 0.05

[11] A reminder here that administrative staff capacity is measures as an index. A later study may wish to run these variables independently to explore the relative impact of adding one additional staffer per capita (no small feat) or spending one additional dollar per capita.

[12] McFadden's Adjusted R2, run using Fitstat in Stata

[13] Cragg & Uhler's R2, run using Fitstat in Stata

A test for multicollinearity showed that unemployment and poverty are strongly correlated in both models, but removing them from the model did not change the results significantly, so I retained both variables in the model for theoretical reasons. Poverty and pollution are also strongly correlated amongst applicants who applied for funding, but both are important to keep in the model for theoretical reasons, as both poverty and pollution should have independent effects on a city's likelihood of applying for funds and an applicant's likelihood of being awarded funds. Administrative capacity and number of applications submitted was strongly correlated, indicating that larger cities are able to create more opportunities for themselves to be funded than other, smaller cities.

Table 4.4: Regression Coefficients, Logit #1 "Applied for Funding?"

Variable	Log Odds	Odds Ratio
Administrative Staff Capacity	**0.78* (0.23)**	**2.18* (0.49)**
Pollution Burden	**0.01 (0.01)**	**1.01 (0.01)**
Population	**0.00 (0.01)**	**1.00 (0.01)**
Unemployment	**-0.01 (0.04)**	**0.99 (0.04)**
Poverty	**0.02* (0.01)**	**1.02* (0.01)**

N = 415
Cragg & Uhler's Rs = 0.088
Prob > chi2 = 0.0005
Pseudo R2 = 0.0603
* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
+ square root of population takes into account uneven distribution within the population variable

Table 4.5: Regression Coefficients, Logit #2 "Awarded Funding?"

Variable	Log Odds	Odds Ratio
Administrative Staff Capacity	**0.91*** **(0.37)**	**2.49*** **(0.91)**
Pollution Burden	**0.02** **(0.03)**	**1.02** **(0.03)**
Population	**0.00** **(0.00)**	**1.00** **(0.00)**
Unemployment	**0.03** **(0.12)**	**1.03** **(0.12)**
Poverty	**-0.00** **(0.02)**	**1.00** **(0.02)**
Number of Applications	**-0.00** **(0.07)**	**1.00** **(0.07)**

N = 117
Cragg & Uhler's Rs = 0.174
Prob > chi2 = 0.0108
Pseudo R2 = 0.1101
* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
+ square root of population takes into account uneven distribution within the population variable

IV. Conclusion

My data supports both my hypotheses and the literature surrounding government grant getting. Statistical analysis clearly show that cities with higher administrative staff capacity are more likely to apply for funding from the state's AHSC program, and applicants with higher administrative staff capacity are more likely to be awarded funding from the state. Further, administrative staff capacity is the only variable that has a real impact on the outcome for a city or an applicant, with only a very weak effect of poverty on a city's likelihood of applying for funds and no statistically significant effect from any other variable in the models.

In the final chapter, I will discuss the findings from Chapter 3 and 4 as well as draw some broader conclusions and recommendations for policy makers looking to balance between equity and efficiency in California's GGRF grant programs, and in government granting in general.

Chapter 5

Conclusion

With the analytical work behind us, I now turn to the underlying question of all scientific research: What have we learned and how can it be used to improve the world around us? In this chapter, I will summarize the major findings of my research, explore the policy implications from these findings, and offer policy suggestions for how government granting can be improved to better balance equity and efficiency. I will end with a discussion of the weaknesses in my study and outline further research opportunities to build on this work and the body of research it rests upon. Finally, I will offer some concluding thoughts on government granting and the endless struggle of government to allocate resources appropriately.

I. Major Findings

The regression analyses conducted in Chapters 3 and 4 tell a fascinating story about which cities need help addressing pollution and which cities receive help from the state to do so. My research can be distilled into the following two findings:

Finding #1. Cities with higher pollution burdens, higher unemployment, and smaller populations tend to have lower government staff capacity.

> **Finding #2.** Cities with lower government staff capacity are less likely to apply for state funding to address pollution burden and, when they do apply, they are less likely to be awarded funding from the state.

In other words, data suggest that those cities who are most in need of funding to address pollution are also the least likely to have the internal resources to successfully secure funding in a competitive grant program. More concerning for policymakers, those most in need may not even apply for funds.

II. Policy Implications

For policymakers seeking to allocate funds to address pollution to the communities most in need, my research holds some alarming implications. In its attempt to balance equity and efficiency, how can government improve equity and aid a population most in need if that populations does not have the staff capacity to even ask for help? For California, how can the GGRF program equitably allocate Cap and Trade funding to clean up environmental contamination in the state's dirties cities if these cities lack the resources to even apply for competitive grants?

Up to now, the state of California has sought to address this problem mostly through carve outs within the GGRF program itself. Policymakers, aware that disadvantaged communities might have a difficult time applying for funding, conditioned the GGRF program from its inception to require 25% of all funds to be spent to the benefit of disadvantaged communities (De Leon, SB 535). However, the calculation for "disadvantaged community" – CalEnviroScreen – does not focus on staff capacity, but instead includes a matrix of twelve pollution indicators and seven population indicators (CalEPA, 2012). Staff capacity is not even a factor in this calculation. If my findings are correct, this suggests that California lawmakers have been preferentially aiding the wrong communities.

Further, carve outs do not address the larger problem – that the cities most in need are not able to even apply for funds. To address this issue, lawmakers have begun experimenting with technical assistance to cities in need. However, efforts have so far been paltry. In 2015, the legislature appropriated a meager $500,000 for a pilot project offering technical assistance for the Affordable Housing and Sustainable Community program at Strategic Growth Council. No other GGRF program received technical assistance dollars. The AHSC program's technical assistance program granted funding for cities to hire third-party technical assistance providers to assist in grant writing, analytics, and program management. However, cities still had to actively apply for technical assistance – there was no direct outreach to cities with low staff capacity. Further, the technical assistance pilot was targeted at "disadvantaged communities" as identified by CalEnviroScreen, not at cities with low staff capacity. Making matters even worse, only cities that had *previously applied to the AHSC program and been unsuccessful in winning funds* were eligible to apply for technical assistance. This excluded all cities that did not have staff capacity to apply for funding to begin with (SGC, 2015).

III. Policy Suggestions

Based on the findings from my research, I argue that the state's attempts to address inequality and improve equity in allocation of GGRF funds, though well intentioned, has had the wrong focus. If government staff capacity is the real barrier keeping cities from applying for funds, the state must ask itself the following policy questions: (1) How can the state encourage cities with lower staff capacity to apply for funds? (2) How can the state help these populations win grant funding once they have applied? (3) What other policy mechanisms does the state have at its disposal other than the competitive granting process to address these inequalities and improve equity? I will address each of these questions separately and offer some policy suggestions.

Encouraging Cities with Low Staff Capacity to Apply

I recommend that the state begin tracking staff capacity for all cities in California to identify the cities that will be less likely to have capacity to apply for and win government grants. Grant administrators, like Strategic Growth Council, should then use this data to conduct proactive outreach to cities that are unlikely to apply for funds AND that may statistically be in the most need of funds (high pollution burden, etc.) to identify good candidates for state funding. SGC should then work with these cities to put together a grant proposal for the AHSC program – using the technical assistance grant program to provide capacity to cities at this crucial stage in the application process. This will help tap into cities in need that would otherwise have lacked the capacity to even apply for funds.

Helping Needy Populations Win Funding

Once a city has been convinced to participate in the grant process through government outreach and provision of supplemental staff capacity, the state must ensure that these cities compete amongst themselves for funding and not against high-performing cities with more staff capacity. This means a carve out of funding – perhaps 25% – for applicants with low staff capacity. This maintains efficiency by retaining an element of competition between grant proposals, but improved equity by allowing cities with similar staff constraints to compete against one another. This approach is also supported by the literature on government granting, which shows that a hybrid approach to competitive grants is better for equity outcomes than a pure competitive grant process (Collins & Gerber, 2008).

Other Policy Mechanisms

The state could also consider other policy mechanisms besides a competitive grant process for distributing pollution funding. For example, California could choose to offer direct government services to cities most in need of funding. This would bypass the equity problems inherent in a competitive grant model, but may negatively impact efficiency of resource distribution, as funds may be distributed to cities who are incapable

– because of the very staff capacity problems that keep them from applying for funds – of properly administering funds to address pollution issues.

IV. Areas for Further Research

No scientific research is perfect, and all statistical models rely on assumptions that can skew the final results. With that in mind, I strive in this paper to lay out my assumptions for public scrutiny. Here, I will acknowledge a few specific weaknesses in my research that warrant further study.

First, my findings are limited by only considering grant applications from a single GGRF program – the Affordable Housing and Sustainable Communities Program. This is because SGC does a particularly good job of publishing complete data on applications to the AHSC program, allowing researchers like myself to follow the progress of applicants through the grant process and conduct statistical analysis. California should require all GGRF grant administrators to make similar information available to the public, and future researchers should conduct similar regression analyses on these grant programs to determine whether the statistically significant effect of government staff capacity holds up across grant programs. The AHSC program is a particularly cumbersome program, requiring high levels of sophistication and expertise to put together development plans that accommodate housing and commercial development near public transit hubs. It would be interesting to see if staff capacity plays as significant a role for grant program that require less sophistication, like urban forestry grants to plant trees in urbanized areas.

Second, my research used an index for administrative staff capacity, which limited my ability to show the relative significance of adding a single additional government staffer per capita or adding $100,000 more in planning dollars per year. Additionally, my research would have been improved by having specific data on the number of staff in each city dedicated to grant writing or pollution remediation. Future researchers may choose to test the effects of the number of staff per capita and dollars spent on planning separately to parse out the independent significance of each. Future researchers may also seek to develop a better dataset accounting for city staff directly responsible for grant writing or pollution remediation.

Lastly, my regression models could all benefit from the inclusion of additional confounding variables that may also affect a city's likelihood of applying for and receiving funds. If time had allowed, I would have included some additional political variables, like whether a city tended to vote Democratic or Republican, whether the city had a large budget per capita, and whether the city acknowledged the struggle with environmental pollution to begin with. These variables would strengthen the statistical modeling and provide further certainty that the findings in this study are, indeed, accurate. Future researchers could experiment with different theoretical statistical models to see if staff capacity continues to have a statistically significant effect on application and award of funds, and could add new variables to further strengthen the statistical modeling.

V. Conclusion

As long as government plans to stay in the role of redistributing wealth, it must be vigilant in analyzing the unintended outcomes of grant design. Government has the ability to make the rich wealthier and poor poorer. But government also has the unique ability and authority to collect funds from the general population and redistribute those funds to communities most in need. If nothing else, I hope that this research shows lawmakers that sometimes those most in need are unable to access funding in the complicated ways governments make it available. Our responsibility to these communities extends past simply making funding available – it continues through the grant application and award process, and further still to the implementation of the desired policy outcome.

Governments must be careful with how they allocate funds, lest they perpetuate inequities. To do this, governments need to explore their populations and identify those who will struggle to access funds. This research argues that California, and governments throughout the nation and the world, should pay closer attention to their populations and make conscious decisions about grant design, because in the end, grant design will determine who is funded and who is left out in the cold.

Appendix

Table 1
OLS Regression: Bivariate Correlation Between Variables

	Government Staff (Per Capita)	Pollution Burden	Population	Unemployment	Poverty
Government Staff (Per Capita)	1.00				
Pollution Burden	-0.14*	1.00			
Population	-0.13	0.23*	1.00		
Unemployment	-0.09*	0.09*	-0.08	1.00	
Poverty	0.02	0.22*	-0.03	0.68*	1.00

* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
Note: Coefficients that are close to 1 or -1 are very strong (with the sign establishing the direction of the relationship)

Table 2
OLS Regression: Multicollinearity

Variable	VIF Score
Pollution Burden	1.12
Population	161.04
+Log Square Population	161.66
Unemployment	1.89
Poverty	1.97

+ log square population takes into account a curvilinear relationship between population and government staff, where government staff per capital declines until a tipping point, where it increases

Table 3

Logistic Regression #1: Bivariate Correlation Between Variables

	Applied for AHSC	Administrative Staff Capacity	Pollution Burden	Population	Unemployment	Poverty
Applied for AHSC	1.00					
Administrative Staff Capacity	0.17*	1.00				
Pollution Burden	0.12*	-0.12*	1.00			
Population	0.06	-0.20*	0.21*	1.00		
Unemployment	0.02	-0.15*	0.08*	0.07	1.00	
Poverty	0.14*	0.00	0.21*	0.02	0.49*	1.00

* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
Note: Coefficients that are close to 1 or -1 are very strong (with the sign establishing the direction of the relationship)

Table 4

Logistic Regression #2: Bivariate Correlation Between Variables

	Applied for AHSC	Administrative Staff Capacity	Pollution Burden	Pop.	Unempl.	Poverty	Number of Applications
Applied for AHSC	1.00						
Administrative Staff Capacity	0.34*	1.00					
Pollution Burden	0.08	-0.02	1.00				
Population	0.04	0.27*	0.14	1.00			
Unemployment	-0.06	0.21*	0.20*	0.32*	1.00		
Poverty	0.09	0.18	0.50*	0.20*	0.52*	1.00	
Number of Applications	0.27*	0.63*	0.31*	0.31*	-0.02	0.46*	1.00

* indicates statistical significance, at 95% confidence interval, with a P-value less than 0.05
Note: Coefficients that are close to 1 or -1 are very strong (with the sign establishing the direction of the relationship)

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