

DRINKING WATER PROVISION IN RURAL CHINA

by

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ABSTRACT

Why do governments succeed in delivering services to some communities but not to others? To assess the factors that explain cross-community variation in public goods provision, I examine government spending on water infrastructure and drinking water outcomes in China. I find that connections from villagers to individuals and officials outside the village affect drinking water provision. Despite the lack of elections and associated need to cater to voter demands, the Chinese government spends more on water provision to the politically dominant ethnic group. I find that the dominant group is favored because officials rely on network connections for policy implementation and spending decisions. In addition, counter to the conventional wisdom that migration disrupts local public service delivery, I find that labor migration out of the villages helps to attract, not discourage, outside investment for public goods provision because migration builds know-how, increases accountability, and extends social networks beyond the village. Effective public goods provision is most likely where there are collaborative relations among villagers and between the village community and the government. I support these arguments with quantitative and qualitative analyses of a survey of rural villages and a dataset of public works projects.

DEDICATION

I dedicate this dissertation to my parents for their endless love and support.

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TABLE OF CONTENTS

LIST OF TABLES	VIII
LIST OF FIGURES.....	IX
CHAPTER 1: DRINKING WATER PROVISION IN RURAL CHINA	1
INTRODUCTION	1
PUBLIC GOODS IN CHINA.....	1
MAIN FINDINGS.....	3
RESEARCH DESIGN	5
OVERVIEW OF THE CHAPTERS.....	11
CHAPTER 2: DRINKING WATER PROVISION IN RURAL CHINA: CONNECTING GOVERNMENT AND COMMUNITY EXPLANATIONS.....	13
2.1 ARGUMENT	14
2.2 WHAT ARE THE CHALLENGES OF DRINKING WATER PROVISION IN RURAL CHINA?	15
2.3 TOP-DOWN EXPLANATIONS: HOW DOES GOVERNMENT AFFECT PUBLIC GOODS PROVISION?	18
2.4 WHAT IS THE ROLE OF LOCAL GOVERNMENTS IN PUBLIC GOODS PROVISION?	23
2.5 BOTTOM-UP EXPLANATIONS: HOW DO LOCAL SOCIAL CONDITIONS AFFECT GOVERNANCE OUTCOMES?	25
2.6 HOW DOES THE RELATIONSHIP BETWEEN GOVERNMENT AND COMMUNITIES AFFECT GOVERNANCE OUTCOMES?.....	27
2.7 IMPLICATIONS FOR PUBLIC GOODS OUTCOMES.....	33
CHAPTER 3: PUBLIC GOODS SPENDING AND ETHNIC IDENTITY IN RURAL CHINA.....	35
3.1 INTRODUCTION	35
3.2 EXPLAINING PUBLIC GOODS PROVISION.....	36
3.3 ARGUMENT: PUBLIC GOODS PROVISION IN CHINA	40
3.4 RESEARCH DESIGN AND METHODOLOGY.....	43
3.5 STATISTICAL EVIDENCE	58
3.6 DISCUSSION & CONCLUSION.....	66
CHAPTER 4: MIGRATION AND PUBLIC GOODS PROVISION IN RURAL CHINA.....	69
4.1 INTRODUCTION	69
4.2 EXPLAINING PUBLIC GOODS PROVISION.....	70
4.3 ARGUMENT	77
4.4 HYPOTHESIS.....	82
4.5 RESEARCH DESIGN AND METHODOLOGY.....	83
4.6 STATISTICAL EVIDENCE	95
4.7 DISCUSSION.....	98
4.8 CONCLUSION.....	101
CHAPTER 5: INFRASTRUCTURE DESIGN AND COMMUNITY MANAGEMENT	103
5.1 INTRODUCTION	103
5.2 THE LOCAL CONTEXT	106
5.3 ARGUMENT	108
5.4 RESEARCH DESIGN	110
5.5 ANALYSIS.....	119
5.6 IMPLICATIONS & CONCLUSION	128
CHAPTER 6: CONCLUSION	131
SUMMARY OF FINDINGS.....	131

LOOKING FORWARD	132
BIBLIOGRAPHY	136
APPENDIX	147

LIST OF TABLES

CHAPTER 3:

1. Table 1: MWR Project Analysis
2. Table 2: County Level Analysis

CHAPTER 4:

3. Table 3: Administrative Villages
4. Table 4: Public Drinking Water
5. Table 5: Explaining Village Water Provision

CHAPTER 5:

6. Table 6: Community management & Project Design in Jin Shan and Ni Luo

LIST OF FIGURES

CHAPTER 3:

1. Graph 1: Effect of Percent_Han on Funding per Capita
2. Graph 2: Percent_Han and Share of Population Benefiting

CHAPTER 4:

3. Graph 3: Predicted Probability of Water Access

CHAPTER 1: DRINKING WATER PROVISION IN RURAL CHINA

INTRODUCTION

Public goods provision is crucial for development and is an important function of governments, especially in the developed world. Government provided services like health care, environmental protection, water and electricity, and education are often viewed as critical factors in human wellbeing and development. The variation in public goods provision both across and within countries is a well-explored topic in political science, but there is still no definitive answer as to what causes good public goods provision or hinders public goods provision in some areas. Instead, outcomes are often caused by a combination of factors in specific contexts, but those same factors are not necessary for public goods provision in all places. This research demonstrates that the way government policy implementation interacts with social factors including migration, ethnic identity, and collective action within rural villages explains variation in public goods provision.

PUBLIC GOODS IN CHINA

While public goods provision varies widely both within and across countries, China is of particular interest because it has made recent efforts to increase access to public goods, generally, and safe drinking water, specifically. The issues of public services and of environmental management and sustainability are increasingly important as China develops. The Chinese government plays a role in most public goods provision and is responsible for drinking water provision. The latest data available (2000) show that access to water varies widely between provinces (Asian Development Bank 2004). Only 30% of households in Guizhou Province and 9% in Tibet had access to safe drinking water. Rich eastern province of Beijing, Tianjin, and

Shanghai had access rates of 98%, 97%, and 99%, respectively. Why is there so much variation in access to public goods within the same state?

Differences in the provision of public goods are symptomatic of inequality within China. In terms of wealth and access to public services, China faces growing inequality between rural and urban areas and between coastal and interior provinces. The government is trying to address this inequality by investing in major infrastructure projects in poorer areas of the country. Through this added investment, the government hopes to avoid the social and political instability that may come with growing inequality.¹ However, government investments in water provision projects are not evenly distributed, don't always target those who need the most help, and are not always successful. In terms of water provision, some villages get duplicate water systems while others only have drinking water during the rainy season.

Why isn't the government able to provide broader access to public drinking water? The Chinese government has devoted funding to increasing infrastructure, but this is not enough for successful outcomes. The government aimed to completely resolve rural drinking water problems by 2015 (Liu 2015). However, at the beginning of 2015, only 80% of the rural population has access to communal water supply, and 44% still face water shortages. The inability to resolve access problems poses a puzzle not just for China but for governments in general – how can the government rapidly increase access to public services if not through increased funding? This focus on increasing access to public services and especially on government-initiated public goods provision makes China a useful case to explore why there is

¹ Some of these projects also benefit areas that are already developed. The balance of which areas benefit the most from hydropower and other large infrastructure projects isn't always clear (see Oakes 2004).

variation in the success of government provided public goods and how developing countries can address these issues.

MAIN FINDINGS

Variation in public goods provision can be explained by both government and societal factors and by the interaction between government and society. Top-down explanations, including government institutions, accountability, and state capacity, are especially likely to play a role in public goods provision. Even where states take responsibility for the provision of public goods, they cannot always perform their full range of administrative functions effectively or efficiently, especially in developing countries (Evans and Rauch 1999). Still, most states are able to provide public goods to their citizens at least some of the time. It is not just that the state's overall capacity – its ability to meet policy goals and the needs of citizens – is limited, but that local conditions and the relationship between the citizens and the state make government provision more likely in some places than others. Bottom-up explanations based on societal- and group-level characteristics are likely to be important where the government does not play a role in public goods provision, either due to policy choices or weak capacity. Local conditions can affect policy outcomes by limiting the success of policy implementation and the accountability of local government institutions. In these cases, collective action is often cited as the key to public goods provision. A full explanation of public goods provision needs to incorporate both top-down and bottom-up mechanisms (Banerjee et al 2007).

This dissertation explores the interaction between these top-down and bottom-up processes—between government actors and local communities—to understand public drinking water provision in rural China. I argue that variation in drinking water outcomes is due to the way government policy implementation interacts with local conditions (including geographic

constraints and societal factors within the village). While policy is designed to improve access to drinking water through infrastructure construction, it is not always implemented effectively or in ways that are appropriate to the local social and political context. Local governments and villages are both more accountable and better able to carry out policy when there are more connections among levels of governments and with villages. Where organs and officials of the state are more embedded in society, the likelihood of effective government action is higher (Tsai 2007; Evans 1995). Social connections and networks linking villagers to those outside the village are useful for the state to gain information about local village needs and to carry out construction projects that meet those needs. There are likely to be more social connections between villagers and officials when they are from the same ethnic group and when there is more labor migration from the village. The result is that communities with connections are more likely to have government provision of public goods.

There are three factors that increase the likelihood the Chinese government will favor a community and that public good provisions outcomes will be successful. First, where the dominant ethnic group makes up a larger portion of the population, the government will thus spend more on public goods infrastructure. Second, labor migration increases the likelihood of public goods provision through several overlapping and complementary mechanisms. In some villages, migration improves local government accountability through improved access to information. Village Party secretaries and township officials are accountable to officials outside the village, not the local community. Villagers who venture outside the village may be more able to report local problems to higher authorities. In addition, villagers who know the conditions in other villages and in cities may demand better services from local governments. In other villages, migration attracts more external investment for public goods. Those outside the village

find it easier to work with villagers with experience in cities. The government also tries to focus new services to villages that have the most difficult conditions, perhaps because so many working-age villagers have migrated. Migration thus increases the chance of government provision of public goods. Third, the ability of the community to act collectively and build infrastructure that is designed to ease collective action make provision more likely. Even with government infrastructure provision, communities must manage water resources and maintain infrastructure. Villages that are able to act collectively and government spending that incorporates community input are the most likely to succeed. Together, these factors demonstrate that the extent of connections between the community and government explain the capacity of the state to effectively implement policy and thus to provide public drinking water access in rural areas.

RESEARCH DESIGN

To test my argument, I examine public goods provision in rural China. I use mixed methods and look at two levels of analysis – the county and natural village levels. I draw on more than 10 months of fieldwork, visits to more than 60 natural villages and more than 90 interviews. Two problems that have plagued previous studies are the lack of data (water is rarely metered and usually any information is aggregated to provincial levels) and the inattention to geographic constraints and historical legacies that affect water politics (Magee 2013). This dissertation addresses both of these problems by using newly collected data from the county and village levels and through attention to natural conditions and local social dynamics. This section explains the choice of water as the public good of interest and the selection of Guizhou Province for research on Chinese politics.

PUBLIC GOODS PROVISION MEASUREMENT

Measuring public goods is not straightforward. One concern is the selection of which public good to study. Previous work on public goods includes the study of outcomes as diverse as infant survival, primary education, drinking water and electricity access, tax rates, and roads. Some research focuses on a single public good such as primary education and generalizes to other public goods (for example, Miguel & Gugerty 2005). However, the systems for production or distribution of these outcomes do not necessarily follow similar patterns, and we should be cautious when generalizing mechanisms that explain the provision of one to the provision of another (Jackson 2013; Kramon and Posner 2013; Diaz-Cayeros et al 2013). For example, education is an ‘ethnic good’ because the language or content of education may affect the demand for it, the willingness to contribute to its provision, or its accessibility across ethnic or linguistic groups. In some cases, only those who will benefit may be willing to contribute or the provision of schools may be a form of government patronage for a specific group. In contrast, drinking water provision is a community good. The focus of this study is drinking water provision because it is one of the most basic public goods, necessary for all ethnic groups, income levels, and social classes. While we should generalize the mechanisms studied here to other public goods with caution, understanding drinking water provision for itself is still a worthwhile pursuit.

A second challenge of public goods research is the measurement of provision. The presence of infrastructure does not lead to provision in all circumstances. Especially in poor areas of developing countries, teacher and healthcare professional absenteeism occurs at high

enough rates that the presence of a school or clinic should not be mistaken for the provision of education or healthcare (Chaudhury et al 2006; Banerjee et al 2004). If students go to school but have no books and no way to learn or people go to hospitals where there are no doctors, nurses, or medicines, they do not have meaningful access to public goods provision. To address these concerns, this dissertation is careful and explicit in its measurement of public goods provision. In terms of measurement, chapter three deliberately examines not outcomes but spending. Government spending on public goods provision infrastructure is not the same as outcomes. However, government intervention and infrastructure spending can have a strong effect on drinking water provision. In addition, the choices of how and where to spend government funds on drinking water infrastructure (as the main way the Chinese government influences access) tells us about government policy, favoritism or patronage, and policy implementation in relation to public goods access, which are also of interest to political scientists. To understand not only government action but outcomes, chapters four and five measure water access directly.

WATER POLITICS IN CHINA

This research follows other well-known scholars in using water policy as a means to explore the complex and fragmented nature of China's authoritarian government (Lampton 1987; Lieberthal 1997; Mertha 2008). This dissertation explores water management not only because it is an important issue for health and wellbeing but also because it is especially pressing for developing countries, in general, and for China, specifically. Water management and water shortages have become increasingly urgent political problems for China. Key problems for China include scarcity, pollution, and flooding (Sun 2002). China has only 70% of the average water supply of Asia and 35% of the world average (Shen 2009). In per capita terms, the supply is

only a fourth of the US and less than a quarter of the world average (Magee 2013). Water shortages have affected some 400 of China's 600 biggest cities (Circle 2014). Natural water shortages have been made worse by pollution that is so severe some rivers are too dirty for industrial uses, let alone human consumption.

The statistics on average annual water supply obscure one of the main challenges Chinese water authorities face in trying to provide water to 1.3 billion people: there are major temporal and geographic variations in water supply. Southern China has over 69% of the available water resources (Zhang et al 2012). However, the north has 64% of the arable land, more than half of the population, and produces some 55.5% of GDP. The south barely beats the international threshold for water scarcity of 100 cubic meters of water per capita per year while the north is more than 50% below that, with a mere 424 cubic meters per capita (Zhang et al 2012). Seasonal variations add to the complexity of managing water as most of the rain falls in the summer.

Water shortages increase income disparities and can hurt economic growth because they most directly affect agriculture, which is one of the key sources of income for the poor (Challaney 2011). Since 1990, the economy has lost more than 1% of its annual GDP due to loss and damages from drought and between 2004 and 2007, the direct economic losses due to drought averaged \$8 billion annually (Zhang et al 2012). These concerns have led activists and environmentalists to ask whether China has enough water to sustain its growth (Circle 2014).

The focus of this dissertation is on public goods with particular attention to the role of government in providing water access. In China, the government's main response to water concerns has been to build infrastructure, both at the local level and major infrastructure projects across provinces (the South to North Water Transfer is one example) (Zhang et al 2012; Turner 2006). A disproportionate amount of funding for water infrastructure goes to large-scale

projects, leaving less than 8% to improving drinking water in rural areas (Nitikin et al 2012). The focus on large-scale supply-side infrastructure may be inadequate not only because of the scale of the problem (and the growing problem from pollution-induced scarcity) but also because human, ecological, and geological factors can undermine infrastructure projects. This dissertation therefore examines the patterns of spending on efforts to provide drinking water to rural areas but also examines the outcomes and has implications beyond water provision to the ability of government to effect change in rural areas.

Public goods provision in China is relevant for research on public goods and community-local government dynamics in other developing countries, particularly non-democratic contexts or countries where democracy is weak. The important variables and relationships explored in this dissertation are also found in other developing countries. For example, the importance of social networks and connections, especially in the absence of effective formal institutions, is not unique to China (Xin and Pearce 1996). Similarly, labor migration at rates comparable to those of China is common in developing countries, including India, Mexico, Vietnam, (Mendola 2012). Perhaps most importantly, drinking water provision is an ongoing concern worldwide, as UN Water reports that 783 million people lack access to clean drinking water (UNWater.org). Thus, lessons from China can help scholars and policymakers understand drinking water provision well beyond China's borders.

GUIZHOU PROVINCE

The data for this study are from the southwestern province of Guizhou. Ministry of Water Resources officials report that only 2.8 million people, or about 8% of the total population, lack

access to drinking water in Guizhou (20140604.GY.02).² Therefore, there must be some successful provision, including by the government, even while that there is still variation in both water outcomes and government spending on infrastructure. The natural conditions in Guizhou make it especially appropriate for an investigation into local governance and the ability of the government to implement provision at the local level. Guizhou is in the middle of one of the largest karst landforms in the world. Karst landscapes pose unique problems for water management, problems that tend to trump climate in determining overall access to water. Because rainwater quickly flows into underground streams, it becomes inaccessible from the surface. Karst is also prone to erosion and desertification. Worldwide, a quarter of the world's population (around 1.5 billion people) live in karst areas (Circle 2010). Between 80 and 100 million people live in the south China karst area, almost 8 million of them below the poverty line (Baker and Groves 2008).

In addition, villages within Guizhou vary widely in terms of both ethnic makeup and labor migration rates. Around a third of Guizhou is part of a government-designated minority group, but the province does not draw special attention from Beijing like Tibet and Xinjiang do. Guizhou is not a border province and has no notable separatist movement to concern the center. Instead, the main issue for Guizhou is poverty and the (relatively) slow pace of economic growth. In per capita terms, Guizhou is the poorest province in China, and the average daily wage for rural residents is less than \$1 per day (Zhang et al 2012). Poverty is certainly one driver of labor migration. The rate of migration from Guizhou is above the national average, and most migrants go to the richer coastal provinces to find work (Donaldson 2011). Still, some

² Interviews are cited according to the date and location. A list of cited interviews is in the appendix.

villages produce very few migrants. The result is that Guizhou varies on key variables for this study, including migration, ethnic makeup, and access to drinking water provision.

OVERVIEW OF THE CHAPTERS

The dissertation includes a chapter explaining the theoretical foundation of the research and three empirical chapters. Chapter 2 explains the argument and the case of water provision in China in more detail. The first empirical chapter, Chapter 3, revisits the well-established relationship between ethnic diversity and public goods provision. In a comparison of all 82 counties in Guizhou Province, I find that the Chinese government spends more money providing public drinking water facilities to areas where the population has a higher proportion of the dominant ethnic group. I argue that in China, counties with more minorities receive less funding for public goods infrastructure not because of policy but because state capacity is lower in these areas and government are less willing and able to effectively spend the funds.

The subsequent chapter, Chapter 4, explores the provision of public goods at the natural village level. This chapter examines variation across villages in two townships of Shi Bing County, Guizhou Province, and finds that migration leads to more drinking water provision through several complementary mechanisms. Migration increases access to funding and expertise because county governments and NGOs are more likely to want to work with returned migrants and more likely to provide extra support to villages where migration makes independent local organization challenging. In other villages, migration improves accountability by increasing the likelihood that villagers will know what services the government is responsible for providing and by increasing opportunities for migrants to make complaints and demands of the township and county officials who have control over budgets. While there are several paths

between migration and public goods, the overall effect is that migration increases the likelihood of drinking water provision.

Finally, I examine the ongoing management of facilities and water quantity management. While the government is able to provide infrastructure, maintenance and quantity management are village responsibilities. Some villages are able to do these tasks even without government intervention. This chapter draws on qualitative analysis of villages across Guizhou Province. I find that the government can increase the likelihood villages will successfully maintain long-term water provision and manage quantity effectively by appropriately designing water projects to fit village needs. Taken together these chapters demonstrate the way local conditions and the relationship between the state and society affect the ability of the state to provide public goods in rural areas.

CHAPTER 2: DRINKING WATER PROVISION IN RURAL CHINA: CONNECTING GOVERNMENT AND COMMUNITY EXPLANATIONS

This chapter discusses what we know about public goods provision, generally, and drinking water provision in China, specifically, and argues that the connection and interaction between government and local communities are critical to understanding public goods provision. Public goods can be consumed by anyone in the community, regardless of contribution to provision, and are thus associated with collective action problems.³ While communities can provide public goods and often do, the government usually plays a role in public goods provision, especially in developed countries. Because things like forestry and water are tied to specific natural conditions and locations, the local context and communities also affect outcomes. In China, drinking water provision is officially the responsibility of the government, but local villagers play a direct role. Drinking water provision in rural China involves both managing the quantity of water and ensuring that there is a delivery system to get water from natural sources to villagers. The government, at all levels, is most often involved in infrastructure development but communities must manage the quantity and maintain infrastructure themselves.

Each village faces different natural conditions and thus demands for infrastructure and management. The Chinese state owns all land and natural resources, including water, although renters do get some limited rights of access to the resources (Magee 2013). Water in China is thus shared and villagers cannot be denied access to it. Unlike in other countries, there are no

³ While common pool resources and public goods are not the same thing, literature related to both draw on collective action as an explanation. Both of these are applicable to understanding water provision in rural areas in China. Pure public goods are ‘non-excludable’ and ‘non-rival,’ meaning that withdrawal by one user does not affect the availability for others. This is not the case with water, especially in villages with limited water sources. However, the literature often considers education, infrastructure, water and electricity, and other public services as public goods, especially when looking at either collective action problems or government provision of services.

private water rights. The most common water sources are natural springs, but some villages gain water from reservoirs or even rivers. While some springs provide constant supply, many others vary between the wet and dry seasons. Provision systems include public water basins, where villagers can draw water in buckets, and tap water systems. The challenges for drinking water provision thus include managing water quantity, which can vary seasonally, and managing infrastructure that ranges in its complexity. Even when the government provides infrastructure, quantity management and maintenance are the village's responsibility.

2.1 ARGUMENT

In this dissertation, I argue that drinking water provision varies depending primarily on the relationship between the government and rural communities. Top-down and bottom-up mechanisms are not exclusive or alternatives but rather complementary and intersecting explanations of the variance in public goods provision within countries (Banerjee et al 2007). Drinking water provision is most likely when the government invests in infrastructure that is designed with community input to fit the local context and respond to community-specific needs.

Drinking water provision is more likely where the government favors communities with investment and expertise. Favorable treatment by the government comes from connections between officials and villagers, those inside and outside the local community. These connections include networks of friends, family, coworkers, and other contacts within and outside the community. The government relies on channels of connections to gain information about conditions in the villages and to implement policy. Strong ties to government officials are more likely in villages where the population is from the dominant ethnic group.

The government can provide funding and expertise for infrastructure development, but villagers know their local conditions, social and geographic constraints. Where there are more connections, the government is better able to design policies that meet the needs of the community and make water provision more likely. Connections between villages provide information about conditions in other places, ways to address ongoing problems, and information about what government responsibilities and actions. At the same time, connections help local leaders and villagers gain access to resources, expertise, and funding. Villages that are more isolated from government agents are less likely to receive funding for water provision infrastructure. Villagers can develop these networks through labor migration. Overall, when village and government efforts are complementary – when the government provides funding and expertise, when there is community input on infrastructure design, and when provision projects include aspects that ease ongoing maintenance and resource management – drinking water outcomes are more likely to be favorable.

2.2 WHAT ARE THE CHALLENGES OF DRINKING WATER PROVISION IN RURAL CHINA?

This study tests the implications of my argument on the provision of public drinking water in rural Guizhou Province, in China's relatively water-rich southwest. The natural conditions in Guizhou Province ensure that water provision is a local issue. There are two main challenges for drinking water provision in rural Guizhou Province: creating a delivery system to bring water from local water sources to villagers and quantity management. The degree of difficulty each challenge poses varies from village to village. Depending on the local context and the extent of government involvement, collective action is needed to guarantee the success of drinking water delivery.

Provision systems include public water basins, where villagers can draw water in buckets, and tap water systems. Most systems of provision include a cistern to store water and pipes to bring water to the village. Some villages have water meters. A few have shared water taps. Some delegate responsibility for maintenance to specific individuals or households. Others have no system for management or responsibility for maintenance. *De facto* responsibility for provision is local, and higher levels of government generally do not interfere unless local officials request assistance. External authorities provide funding and sometime expertise, but construction of facilities, maintenance, and even identification of appropriate water sources are the villagers' responsibility.

The nature of the local water source also varies. Village water sources are mainly small local springs and occasionally rivers or reservoirs. There is little need for wells or large reservoirs because villages usually have at least one small water source nearby. However, water quantity is a problem for some villages. Water resources in China, generally, and in Guizhou, specifically, are unevenly distributed geographically and temporally. In Guizhou Province, rivers and rainfall are both relatively abundant. However, much of Guizhou and about 80% of Shi Bing County (the focus of Chapter 4) is characterized by karst formations. In karst areas, the surface retains very little water (Baker and Grover 2008; Huntoon 1992; Groves 2008). Instead, water flows through systems of underground rivers and caves. These can be extremely difficult to access, in part because in most cases, they have not been mapped (Baker and Groves 2008). In addition to this geologic challenge, rainfall is unevenly distributed. Some 80% of rain falls during the summer months, leaving wells, springs, and lakes to dry – sometimes completely – during the winter months.

The management of each water source depends on the nearby village, not on any central coordination or higher-level authority. Chapters 4 and 5 of study look at natural villages, which generally distinct hamlets and clusters of households. Natural villages are clustered within administrative villages, which are administered from the lowest official level of government, the township. There is occasionally coordination between natural villages within the same administrative village, but there is no evidence of coordination or cooperation across administrative villages in this area. Local communities and leaders work within their communities to manage water quantity and construct water provision systems for their community exclusively. In other words, although funding and expertise can come from outside the village, the coordination of water provision in rural Guizhou is a local issue.

Typically, three points during water provision process require some collaborative effort by villagers. First, in most villages service delivery requires coordination to build facilities. In most cases, every household sends one individual to help with construction each day. Second, management of the facilities, repairs, and even reconstruction may need coordinated action. In some villages, the facilities include water meters, which help pay for repairs and sometimes for an individual or several individuals to manage the facilities. However, not every village gets water meters or effectively uses water meters. Finally, quantity management also demands coordination. Some villages have abundant, year-round water sources that do not require any coordination. Other villages suffer severe water shortages, especially during the dry winter months. Unless they carefully manage water quantity and limit consumption, these villagers need to travel outside the village and carry water back home in buckets.

Villages are able to coordinate their own drinking water provision systems without the support or investment of the government. In some cases, the government has built a duplicate

system in villages that already had drinking water delivery service. The government can provide funding and build water delivery infrastructure. In a few cases, the government even manages quantity and maintains facilities. Government support may make some aspects easier and lower the cost of coordinating provision, but only rarely do government systems function without collective action around some issue. Even government facilities do not obviate the need to coordinate quantity management and infrastructure maintenance. Most villages must have collective action at some point in order to have ongoing access to drinking water.

2.3 TOP-DOWN EXPLANATIONS: HOW DOES GOVERNMENT AFFECT PUBLIC GOODS PROVISION?

Public goods provision is often the responsibility of the state. Even when social structure and community characteristics are able to predict systematic variation in the provision of public goods, there remains unexplained variation (Banerjee et al 2007). Policy, state capacity, and the government organization and power structures can affect public goods provision directly and indirectly through easing or hindering local collective action.

Some literature cites state capacity as a key explanation of variation in public goods provision. While this makes sense theoretically – weak states cannot tax to gain revenue to spend on public goods and cannot implement policies that would expand the scope and reach of state provided goods – sources of state capacity, its measurement, and consequences in previous research remain unclear (Diaz-Cayeros et al 2013).⁴ State capacity in general is weakened when states cannot raise revenue or implement policies and due to “leakages” or corruption within the

⁴ While originally “state capacity” referred to the ability to tax, the term has been expanded to include the effectiveness of the state and its ability to implement policy. As noted in Diaz-Cayeros et al (2013), many studies use measures of institutions (such as settler mortality rates in Acemoglu, Johnson, and Robinson 2001) or proxies such as GDP/capita (Fearon and Laitin 2003) instead of measuring state capacity directly.

government (Olken 2006, 208; World Bank 2003). Direct measures of state capacity include bureaucratic quality and the ability to tax (Hendrix 2010), but even good measures do not explain within country variance in policy implementation or public goods outcomes.

State capacity, in general, and the ability of local governments to meet the needs of local communities varies within countries. One study shows that 80% of the variation in World Bank project outcomes is due to within-country variation (Denizer et al 2013). While measuring state capacity may be difficult, especially within countries, the effects can be seen in the implementation of policies and the level at which local governments meet community needs, including those for public goods provision. Where community action and government action are complementary, policy outcomes are more likely to succeed (Evans 1995). Governance quality thus helps explain some of the observed variation in public goods provision.

GOVERNMENT PROVISION OF PUBLIC GOODS IN CHINA

Access to public goods provision varies widely across countries and within China. While the Chinese government would like to increase access to safe drinking water in rural areas and has spent RMB300 billion (about US\$48.3b) over the 10 years (2000-2010) to try to improve access, there are still some 52 million people in rural China without safe drinking water (Liu 2015). Why doesn't the government provide broader access to public drinking water?

The structure of the Chinese government makes implementing policies in rural areas particularly challenging. The ability of the state to implement policy depends on the priority of the policy and the actors involved. Major decisions are made centrally but authority is fragmented along both functional lines (for example, the Ministry of Water Resources) and geographic territories within China (Yu 2014; Lieberthal and Oksenberg 1988). However, policy

implementation does not always reflect the policy as it was formulated or intended (Oi 1989; Lieberthal 1997). “Soft policy” like the campaign to Open Up the West incorporated a broad set of agendas that appeal to different actors and, as a consequence, fosters diverse interpretation and implementation strategies by regional and local actors (Holbig 2004). In addition, policy priorities can vary by region or issue area, but so can the effectiveness and thoroughness of implementation. While environmental policy is increasingly seen as a priority for the Chinese government in Beijing, at the local level, economic growth remains more important. The effect is that even though there is money for resource management, capacity and local government willingness to prioritize water provision and access for local communities is more limited and can vary.

In addition, the relationship between organs and levels of government affects public goods outcomes, especially where funding for infrastructure and distribution of goods and services are controlled by higher levels of government. China has five official levels of government: the central government in Beijing, provincial governments like Guizhou Province, prefectures, counties, and townships. Villages are the administrative level below townships, but are not an official level of government. “Villages” can refer either to administrative villages (*xingzhen cun*), which each have an elected council, village leader, and Party secretary, or to natural villages (*ziran cun*), which are hamlets and small communities nested within administrative villages. In 2004, there were more than 650,000 administrative villages in China and almost 3 million village officials (He 2007). While county-level governments are responsible for water management within their territories (Zhang et al 2012), in rural areas, this responsibility is mainly delegated to the local governments so that, in practice, township and village levels have responsibility for public goods provision. Negotiation between these levels of

government about the flexibility and resources devoted to carrying out policy can be more complicated than the policy itself, and makes impeding policy easier than implementing it (Lieberthal 1997).

LOCAL GOVERNMENT CAPACITY

A possible explanation for variation in public goods provision is the reliance on local governments, which may not be capable of carrying out policy. A policy to provide public goods and the authority to do so are insufficient to explain why drinking water provision varies within China. Local governments also need the capacity to implement policy and govern at the local level (Kauneckis and Andersson 2009). Government capacity is a concern for governments worldwide, but can also vary within countries. Weak states cannot tax to gain the revenue necessary to spend on public goods or policy implementation. Tax revenue alone however misses any potential “leakages” or corruption that may prevent even high-tax countries from implementing policy (Olken 2006; World Bank 2003). State capacity is certainly an issue for China, especially when it comes to carrying out water management plans (Zhang et al 2012).

Village committees often depend heavily on the township governments. Fiscal constraints on the village mean that village officials must rely on the township to fund public goods provisions and fulfill other responsibilities (O’Brien and Han 2009). Often, villages do not have their own budgets or lack have control over them. Especially in these cases, village officials may find it difficult to refuse township requests.⁵ In turn, village committees are supposed to implement government policies. However, in high-priority policy areas, the townships often treat the committees as subordinates and delegate tasks to them.

⁵ Officially, the township government is supposed to act as a ‘guide’ (*zhidao*) for the village committees, not ‘lead’ (*lindao*) them (Organic Law article 4, cited in O’Brien and Han 2009).

Environmental policies are especially difficult to carry out effectively because they rarely meet three key conditions for policy implementation: there must be consensus among top leaders, the issues must be a priority, and there must be a way to measure compliance (Lieberthal 1997). Policies that meet these (most famously, the One-Child Policy) can be implemented relatively successfully, even in rural areas. Few water policies meet these requirements. Even though the environment is a growing concern and increasingly a policy priority, local officials are promoted according to the economic performance of their towns and thus prioritize growth over the economy (Li and Zhou 2005).

While the capacity to implement policies varies within China, in some instances poor implementation is not only due to capacity but due to unclear or inconsistent policy priorities and the inability to hold local governments to account (Edin 2003). In China, the center makes policy but relies on local organs for implementation.⁶ Still, policy implementation does not always reflect policy formulation or intention (Oi 1989). Local government bodies can resist or delay the implementation of policies they do not like (Zhao 2013; O'Brien and Li 1999; Bernstein and Lu 2000). These “selectively effective” state organs thus obscure the cause of variation policy implementation and public goods provision. Where higher levels of government do not have the ability to hold local leaders accountable, accountability depends on the social dynamics of the community (Tsai 2007). The capacity and willingness of the local governments to implement policy made at higher levels of government thus explains some of the success of those policies. This begs the question of what makes local governments willing and capable of implementing

⁶ Treisman (2007) calls this *administrative* decentralization. While *political* decentralization is increasingly common in democracies, *administrative* decentralization is common in all but the smallest states.

policies to provide public goods. I argue that the answer lies in social connections and the relationship between the government and villagers.

2.4 WHAT IS THE ROLE OF LOCAL GOVERNMENTS IN PUBLIC GOODS PROVISION?

LOCAL GOVERNANCE & ACCOUNTABILITY

The Chinese government has implemented some reforms to increase the effectiveness and accountability of local governments. Most importantly, village leaders are now elected. Democratization scholars might hope that this could lead to better public goods provision and more responsive local governance. After all, across countries, democracies provide more and better public goods than non-democracies (Olson 1993; Sen 1999; Brown 1999; Baum and Lake 2001; Bueno de Mesquita et al 2003). Even within countries, previous research shows that service delivery is improved when local officials have real responsibility and democratic accountability (Kauneckis and Andersson 2009; Diaz-Cayeros et al 2013).

However, along with the expansion of elections has come the weakening of village governments. Since reforms in the 1990s, rural administrative power is increasingly concentrated at the township level of government, where there are no elected officials or formal means of accountability (Oi in Yu 2014). Elections have led to more direct government investment but competing reforms (Tax for Fee reform) has reduced overall investments (Luo et al 2007). The system is increasingly responsive to society, but still not accountable through electoral systems (Mertha 2009; 2010). The result is continuing underperformance. Almost 80% of villagers surveyed by Luo et al (2007) reported that they were dissatisfied with current village infrastructure and public goods provision.

ELECTORAL ACCOUNTABILITY

Why haven't elections led to better public goods? In principal, China could have real responsibility and democratic accountability resting in village officials. However, universal elections has not necessarily meant that all villages are better governed, have accountable leadership, or that there have even been real changes in the post-election exercise of power.⁷ Instead, the election of one official (the village leader) and the appointment of another (the Party secretary) has complicated the exercise of power because there are now two possible leaders with different sources of legitimacy and authority and who are responsible to different constituencies.

The process of gaining positions of power – through elections or appointment – is distinct from the process of exercising power. Villages in China hold elections for a village council, but every village also has a branch of the Chinese Communist Party (O'Brien and Han 2009; Oi and Rozelle 2000; He 2007). Even though committee members gain their positions through election, they must take into account or often compete with Party officials, township governments, and other social forces in order to govern.⁸ Most often, it is either the Party secretary or the village leader who controls actual power in the village.⁹ The division of labor between the Party secretary and village leader is ambiguous under the law, and often depends on personal characteristics, personal relations (as both are long-term residents of the village), or the

⁷ The process of elections of the village leader and the village representative assembly have improved over time, but this does not mean that elections are uniformly free and fair or even that the election process is standardized across villages or provinces (Manion 2009; O'Brien and Han 2009; He 2007). Anonymous ballots and multiple candidates are regular features of village elections, but so is township intervention and meddling, especially in the nomination process.

⁸ In principal the village council is the highest decision-making body in the village, although many villages allow smaller representative assemblies (*cunmin daibiao huiyi*) make decisions instead (Oi and Rozelle 2000; He 2007).

⁹ There are instances where these are the same person under the 'one shoulder carries' (*yijiantiao*) policy, but adoption varies widely (Sun et al 2012).

economic situation in the village (Oi and Rozelle 2000; Alpermann 2009; Sun et al 2013).¹⁰

However, in most cases, there is little doubt that *de facto* power lies with the Party secretary, not the elected village leader.

When there are disputes between the village leader and the Party secretary over roles and responsibilities, the township most often favors the Party secretary (Zhenglin and Bernstein 2004). Village leaders are accountable to their electorate, the villagers, whereas Party secretaries are appointed or at least approved by the township level Party branch. Since the source of authority and legitimacy is more closely tied to the township, officials expect Party secretaries to be more “obedient” (Zhenglin and Bernstein 2004). The result is that although there are elections for officials, there is little of the electoral accountability that has improved local public goods provision in other countries. Weak accountability has an impact on government provision of public goods and thus on whether villages have access to drinking water.

2.5 BOTTOM-UP EXPLANATIONS: HOW DO LOCAL SOCIAL CONDITIONS AFFECT GOVERNANCE OUTCOMES?

Theories of collective action explain variation in public goods provision, especially in developing countries and absent government provision. Common pool resource management and public goods provision are associated with collective action problems. Public goods can be consumed by anyone in the community, regardless of whether they contribute to provision.

When the community is responsible for providing public goods, this leads to the classic

¹⁰ Unofficially, the Party secretary often is more influential. According to a survey of officials, only 15% of village leaders think they have more power than the Party secretary. Especially where both individuals have real influence, “Decision making is impossible whenever there is disagreement between the village head and the party secretary” (He 2007, p115). In a survey of villagers, a plurality (50%) agree that the Party secretary has more power (Sun et al 2013). Authority is shared in 32% of villages. It is the rare village where the elected official – the village leader – has more power.

collective action problem – the incentive to shirk on any expectation to contribute to the provision of public goods and instead to free ride on the efforts of others (Olson 1971). The difficulty of limiting consumption to those who contribute to provision results in an incentive for individuals to free ride on the labor of others (Ostrom 1990). Thus, community provision of public goods and common pool resources management requires overcoming this collective action problem.

Research on public goods provision focuses on the types of community characteristics that help or hinder collective action. The most prevalent research has been on the relationship between diversity and public goods provision. Public goods have repeatedly been shown to be worse in ethnically diverse places (Easterly and Levine 1997; Alesina et al 2003; Posner 2004). Where there are different groups within the community, preferences over which public goods to supply or how to organize may lead to an inability to coordinate across ethnic groups for the benefit of the whole community (Alesina et al 1999). Alternatively, it may be that monitoring and enforcement of obligations to contribute to public goods are more likely to be enforceable within ethnic groups than across groups (Habyarimana et al 2007, 2009; Miguel and Gugerty 2005).

Other group-level characteristics have also been shown to affect the likelihood of public goods provision but with less reliable outcomes. Villagers embedded in strong social networks are more likely to care about their reputation and benefit from norms of reciprocity, which can then help ensure collective action (Ostrom 2000b; Putnam 2002). Social networks within ethnic groups are often stronger than across groups, which makes collective action in diverse places less likely (Habyarimana et al 2007). Similarly, identifying the number of appropriators of the resource (those who will access and use the resource) helps determine the expected benefits of

collective action (Ostrom 1990, 2000b). Partly for this reason, smaller groups may be more likely to overcome the collective action problem (Olson 1971), but this dynamic may depend on the nature of the public good as well as the marginal costs of contributing (Esteban and Ray 2001, Banerjee et al 2008).

Collective action explains variation in public goods provision in the absence of the state, but there are limits to the effectiveness of looking at community characteristics as the key explanation for variation in public good outcomes (Cox et al 2010). The context in which groups operate is especially important because this can affect the identity or makeup of the group, the external resources available to it, and even what kinds of processes that need to be resolved through collective action. In developing countries and rural areas with weak state presence, little external investment, and minimal help with public goods delivery, collective action is especially useful. However, the overall variation in of public goods provision – both across countries and within them – should not ignore the role the government plays in public goods provision.

2.6 HOW DOES THE RELATIONSHIP BETWEEN GOVERNMENT AND COMMUNITIES AFFECT GOVERNANCE OUTCOMES?

The range of variation in public goods provision in rural villages is best explained by looking at both government and communities as potential actors and at their interaction. Links between the government and the community are especially important for the success of government efforts to increase provision of public goods. Networks within the village may help with local collective action, but connections outside the village are important for the community to increase access to outside resources and provide more public goods. These connections can be

thought of as bonding and bridging social capital, which Woolcock and Naryan define as “the norms and networks that enable people to act collectively” (2000, p226).

Networks and social capital can explain collective action within villages and access to government resources (Woolcock and Narayan 2000).¹¹ “Bonding” social capital occurs within villages, makes collective action within communities more likely, and can help strengthens group identity. This social capital can be beneficial when groups need to coordinate and provide their own public goods, perhaps in the absence of government capacity. However, this same “bonding” social capital can also be detrimental to overall wellbeing as within-group bonds can isolate group members from other groups, from the government, and can lead to competition instead of collaboration across groups. “Bridging” social capital in the form of cross-group connections and networks linking government and citizens can help improve access to resources, government accountability, and overall public goods provision. Successful public goods provision benefits from both “bonding” and “bridging” social capital.

¹¹ In the Chinese context, personal connection or relationship can be referred to as *guanxi*. *Guanxi* can be thought of as interpersonal connections between individuals that imply mutual obligations, commitments, trust, and loyalty (Chen and Chen 2004). These connections then form a network, which helps individuals secure favors and advancement and govern social and business relationships (Luo 1997). However, there are multiple definitions of *guanxi* incorporating and emphasizing various aspects of the overall term, including a “special” or preferential relationship, interaction or exchange, connections, or as a process of social interactions (Fan 2002).

For the purposes of this dissertation, I draw on the broad similarities between *guanxi* and social capital (see Li 2007 for a discussion of social capital derived from the *guanxi* literature). Instead of analyzing specific characteristics of *guanxi*, I thus focus on interpersonal connections and relationships as opportunities for building networks and social capital.

While there is some debate about the extent to which *guanxi* is declining in importance in urban areas (Yang 2002; Guthrie 1998), there is no doubt that personal relationships are historically important across China and are still important in rural China. *Guanxi* is also important for business development, particularly where legal systems are weak and firms must depend on trust built through individual relationships instead of uncertain legal systems (Xin and Pearce 1996).

GOVERNMENT RESOURCES

The success of government provision of public goods depends on the relationship between levels of government and the local community. Variation in local state capacity to provide public goods depends on the political context in which local governments operate. This is especially true in China because higher levels of government must rely on local organs and individuals to implement all types of policy (Zhao 2013). Where local leaders cannot implement policy, government funding will be ineffective.

Local governments often rely on transfers of funds from higher levels of government. That is, the ability of the local government to implement policy and provide public goods depends in part on the ability to get funding from higher levels of government. Instead of relying only on collective action to raise local taxes for funding and build facilities, the government can provide funds, project designs, and organize construction. However, at least partly due to capacity problems, the government does not (or cannot) do this in every village. Communities that are able to gain investments from higher levels of government will thus be more likely to have public goods provision (Banerjee et al 2007). The amount of funding given to a particular infrastructure project affects the quality of the public good outcome, so villages that can attract more external funding (even for the same project) can expect better results (Tian et al 2013). Within village networks that might affect collective action for public goods production therefore are less important here than networks outside the village that allow access to external resources (Woolcock and Narayan 2000). Public goods outcomes are thus not only determined by local conditions but also affected by the relationship between the community and external authorities.

Because projects that are underfunded or poorly designed are not likely to succeed, projects need to be appropriate for the local natural and social context of the village. Where

maintenance and use are community responsibilities, the quality of the original design and construction affects longer-term provision (Khwaja 2007). Design is particularly important for public goods that depend on infrastructure such as roads, irrigation, and drinking water. Communities that can act collectively – that have more bonding social capital – are likely to be able to maintain infrastructure and have on going public goods. In other villages, government infrastructure design can make collective action for ongoing maintenance and use possible. Thus, the long-term effectiveness of infrastructure projects depends on government project funding and design and on community characteristics.

GOVERNMENT ACCOUNTABILITY

Local access to higher-level government funding alone is insufficient to explain outcomes. Villages not only need access to funds for public goods infrastructure, but also need a way to guarantee that village leaders are using the fund in a way that serves the community as a whole. Where communities have funds that are targeted for infrastructure and where those funds are not simply political rewards, variation in implementation can be explained by local structures that facilitate participation, monitoring, and sanctioning of leaders (Diaz-Cayeros et al 2013). Of course, institutionalizing accountability mechanisms like regular elections or making clear and enforceable rules about responsibility and rights for use can help communities overcome collective action problems related to maintenance and water quantity management (Ostrom 1990, 2000b). In new democracies, party competition helps with this accountability (Diaz-Cayeros et al 2007).

In non-democracies, “solidary” groups such as temple associations or lineages can hold leaders accountable for appropriate use of government funds (Tsai 2007). Where the leaders are

embedded in an encompassing temple group or lineage, public goods provision is better. In contrast, competition between lineages can make governance nearly impossible (O'Brien and Han 2009). In villages with one encompassing group, local solidary groups provide accountability for the use of government funds. As a result, leaders are more likely to use government funds for public goods provision.

In China, lineages consist of branches that at times compete and at other times collaborate (Chan et al 2009). In recent years, religious and lineage groups have become politically assertive and more influential within the village (Manion 2009). At the same time, the increased mobility of the countryside as labor migrants leave the village to find work in the cities has hurt the local power base (He 2007). In some cases, the change in lineage dynamics can benefit public goods provision because village leaders will take a broader view of their responsibility – they will work for the village as a whole, not just their extended family relations. Alternatively, where there are multiple branches or lineages, elections and Party secretary appointments can be used to balance power and responsibility among different subgroups within the village. The social and political dynamic in each village make up the context in which officials operate and, thus, affect the ability of the state to provide public goods in different locations.

ETHNIC DIVERSITY & POLICY IMPLEMENTATION

Public spending on public goods is not independent of ethnic identity. Ethnicity affects policy formation and implementation in China. Across the world, diverse places tend to have worse public goods. In many countries, this is because the government is responding to voter preferences or to ethnic voting with policies that fall on ethnic lines (Posner 2005; Weber 2009;

Franck and Rainer 2012; Alesina et al 1999; Kimenyi 2006; Jackson 2013). When the government favors some ethnic groups or communities over others, overall public goods provision is worse.

Even when voters might not prefer it, policies related to state capacity, such as taxes, can vary by ethnic group (Kasara 2007). In weak democracies, it is easier for the government to select and monitor the local representatives who collect taxes in the leader's home region and among the leader's co-ethnics. Similarly in China, tax rates are higher in regions where the dominant Han ethnic group is more numerous than they are for regions with larger minority populations (Zhan 2013). The Chinese government wants to avoid conflict, especially over extractions that minority groups might perceive to be excessive. This fiscal strategy is based on the goal of promoting national unity by placating minority groups and limiting separatist tendencies.

However, if taxation rates represent state capacity as well as policy choices, it is possible that provincial-level variation in tax rates between minorities and Han reflects ethnic identity-related variation in state capacity. Like tax rates, spending rates may also vary. If unity and promoting harmony and equality among ethnic groups is a goal of fiscal policy, then we should see more government spending on public goods provision in areas where minorities are more prevalent, especially given that minorities tend to live in poorer areas and be poorer than their Han counterparts. Alternatively, if tax rates across provinces tell us about state capacity, as previous work in political science would have us believe (Hendrix 2010), state capacity also varies with ethnic identity.

2.7 IMPLICATIONS FOR PUBLIC GOODS OUTCOMES

Governments succeed in delivering services to some communities but not to others varies for two related reasons. First, variation in public goods provision in China is in large part due to the differences in capacity across regions and villages. Central policy for public goods provision may be standard, but local governments and the dynamics of relationships between county, township, and village governments affect outcomes. Second, the accountability of local governments is not institutionalized in elections but is instead dictated by local social conditions like lineages and ethnicity. Depending on the social dynamics, village and townships governments will be more responsive to villager's demands. Social networks are especially important. These networks and the social capital needed to make governance effective are not limited to within-community networks ("bonding" social capital) but include more tenuous connections outside the village ("bridging" social capital) (Woolcock and Narayan 2000). Especially where communities compete with each other for limited government resources, the relationship between the local community and the external authorities will also play a role in public goods outcomes (Banerjee et al 2007). Communities favored by higher levels of government are thus more likely to have public goods provision.

Which communities, then, are favored by the government and have public goods provision? This dissertation explores three factors. First, the government spends more money on public goods for the dominant ethnic group than for minorities. This spending pattern arises because the government has more capacity to implement policy there and stronger networks between local communities and the government to provide information and accountability for spending. Second, local leaders, including the township officials who compete for funding from the county government, will be more likely to provide public goods when there are stronger

connections between villagers and the county or outside officials. These connections develop when villagers leave the village in search of work. These temporary laborers also attract more investment and bring expertise back to the village. Migration thus boosts local governance and public goods provision. Finally, the ability of the state to change the dynamics of each village is limited, so local factors – for example, their history of collective action and leadership – still matter at the local level. However, when the government provides public goods infrastructure in a way that makes collective action easier for the local community by incorporating villagers' input, developing rules for use and maintenance systems, and providing water meters, even some of the villages that do not have ideal social dynamics gain access to public goods provision. Because the state relies on local agents and because the abilities of local governments and dynamics of local communities vary, public goods provision in rural China is not uniform. When the relationship between the government and community leads to government investment in infrastructure that suits local social and geographic conditions and promotes collective action, as needed for the local context, drinking water access is most likely. The following chapters test the implications of this argument.

CHAPTER 3: PUBLIC GOODS SPENDING AND ETHNIC IDENTITY IN RURAL CHINA

3.1 INTRODUCTION

Why is ethnic diversity associated with poor public goods provision? Most of the previous research relies on the voter preferences to explain why governments provide fewer public goods in diverse places, but elections do not explain government public goods provision in non-democracies. This chapter addresses the question of whether government provision of public goods in non-democratic countries varies depending on the ethnic makeup of the community.

This chapter argues that the cause of this variation is not policy *per se* but the relationship between the state and the community. Because the community-government relations are stronger in areas where a larger proportion of the population comes from the dominant political group, the provision of public goods is easier in areas where the politically dominant ethnic group makes up a larger portion of the population. It is thus not ethnic diversity *per se* that explains public goods provision. Instead, government provision of public goods depends on the proportion of the population that is from the dominant ethnic group. In rural China, this means that drinking water infrastructure is most often built in counties with larger Han populations and fewer minority ethnic groups.

This chapter begins with an examination of how previous research informs our expectations related to public goods provision in China. The third section explains the hypothesis. The fourth section discusses the research design, methods, and data used. Section five includes the statistical analysis, followed by a final section discussing the results.

3.2 EXPLAINING PUBLIC GOODS PROVISION

There is no shortage of research linking ethnic diversity to poor public goods provision. Most scholars are no longer concerned with *whether* ethnic diversity hinders public goods provision but *why* (Habyarimana et al 2007). The connection has been so reliable that controlling for ethnic diversity is now expected in studies of political and economic outcomes (for example Mauro 1995; Przeworski et al 2000). Indeed, Banerjee, Iyer, and Somanathan call the link “one of the most powerful hypotheses in political economy” (2005: 639). However, careful examination of influential previous work shows that this may overstate the robustness and generalizability of the relationship (Gisselquist 2014). This section discusses what we know about the relationship between ethnic diversity and public goods provision and the limits to previous research. Specifically, because many of these studies rely on voter preferences to explain correlations between diversity and public goods provision, the proposed mechanisms explaining this relationship do not generalize to non-democratic contexts. Since ethnic makeup is still associated with poor public goods in non-democracies, this study examines the reason.

The literature on diversity and public goods provision suggests that there are benefits to having co-ethnics in power. The logic underlying these previous works suggests that public goods provision will primarily benefit the group in power. When there are elections, we expect the dominant voter group (for example, white Americans) to vote to spend tax dollars on patronage goods and overall public goods provision will be worse (Alesina et al 1999). When voting for elected officials and not just on policies, voters prefer co-ethnics because the promises of co-ethnics are more credible (Dunning and Harrison 2010). The benefits of co-ethnics in power include not just psychological benefits such as greater feelings of empowerment and efficacy (Chandra 2007; Banducci et al 2004; Gay 2002) but also material benefits and spending

on public services and development outcomes (Posner 2005; Weber 2009; Franck and Rainer 2012). The consequences of ethnic preferences among voters are not limited to the group in power, however. The overall effect of focusing provision on co-ethnics is that groups in power benefit and others fall behind. For the country as a whole, this type of voting has been blamed for the adoption of bad economic policies and the resulting “growth tragedy” (Easterly and Levine 1997) and for more spending on patronage goods and less on public goods (Kimenyi 2006; Alesina et al 1999; Jackson 2013).

This previous research raises two issues that warrant further examination. First, when looking at government provided public goods, it is not diversity per se but differences in political power and access to government resources of various ethnic groups that leads to poor public goods provision. Ethnic voters may prefer targeted service provision or transfers instead of government provision of public goods for all ethnic groups. This chapter aims to be more precise in investigating not diversity but the extent to which public goods provision differs based on the political power of ethnic groups.

Second, the literature on diversity (or ethnic identity) and public goods in democracies relies on mechanisms that are unique to democracies – voting and electoral accountability. If these mechanisms explain public goods provision in diverse democracies, what pattern should we see in diverse countries where votes are not at stake? Certainly, ethnic dominance of government and favoritism of ethnic groups are not unique to democracies.¹² If elections and voting are key drivers of the relationship between diversity and public goods, why aren’t public goods more evenly distributed across ethnic groups in non-democratic countries?

¹² Regime type is infrequently studied as a main factor in ethnic favoritism and public goods. In one exception, Franck and Rainer (2012) find that countries with longer histories of democracy and more frequent multi-party elections have less ethnic favoritism in terms of female literacy but no difference in terms of primary education or infant mortality.

NON-DEMOCRATIC COUNTRIES: POLICY & IMPLEMENTATION

Previous work suggests that we will see two possible policies in non-democratic countries. In either of these cases, as in democracies, the presence of the politically powerful ethnic group will affect public goods provision. Furthermore, the capacity to effectively implement policy will also affect government provision of public goods and services, and differences in political power between ethnic groups can affect outcomes.

One option is that non-democratic regimes will use spending to buy the compliance and collaboration of non-dominant ethnic groups. Co-ethnics may already lend support to leaders even if they are not materially better off (Kasara 2007). The logic here suggest that public goods may be better for non-dominant groups, or at least they will be no worse than for the dominant ethnic group. Even with no voters to satisfy, public spending may be a relatively cheap way to coopt non-co-ethnics. Non-democracies must ensure the collaboration of opposition groups, usually through policy concessions or the distribution of spoils (Gandhi and Przeworski 2007). In particular, single party regimes often permeate into society further and most groups are under the umbrella of the Party (Gandhi and Przeworski 2006). In cases like this, ethnic groups represent one of the few identifiable groups that are not necessarily part of the state apparatus. If ethnic groups are heavily concentrated, they may represent a challenge to state authority – at least in that geographic area – even if they do not represent an existential threat to the state or the Party. The state can buy support through patronage spending and targeted provision of public goods to areas where there are many minorities. If this is the case, we will see government spending directed not toward co-ethnics but toward areas where minority groups are concentrated.

Alternatively, non-democratic regimes will provide public goods in a pattern similar to democracies, and the politically dominant ethnic group will get better public goods provision and more targeted support from the government than less politically powerful ethnic groups. As in democracies, the size and concentration of ethnic groups – not just overall ethnic diversity – plays a role in public goods provision patterns in non-democratic countries. Citizen satisfaction with government still matters in non-democracies. The government can gain support from the dominant ethnic group (or any group within society) by a mix of public and private goods (Bueno de Mesquita et al 2003). The benefits of having a co-ethnic in power may be limited to patronage goods for ethnic elites, not public goods for the whole group. However, if the dominant group is large enough that patronage goods are too costly to supply to the whole group, public goods will still be targeted at the dominant ethnic group in the same way we see in democratic countries.¹³

Variation in public spending may not be related to policy but instead to the ability of the state to effectively implement policy. While policy in China is made at the center, implementation is decentralized. Policy outcomes reflect not only the policy as written but also the implementation process. To understand outcomes, then, it is important to understand the process of implementation and the ability of the state to implement policy.

Outcomes often reflect not only the government's intention, but the relationship between the state and the population. Policy implementation is often less coordinated and cohesive than the government would prefer (Evans and Rauch 1999). This is not an issue of regime type but of state capacity. Where policy relies on networks of actors, governments cannot always impose

¹³ It is possible to view infrastructure projects – including those that ultimately provide public goods – as patronage goods. Either way, government funding for this type of goods is likely to go to the dominant ethnic group.

their will without collaboration from other political actors (Klijn and Koppenjan 2000).¹⁴ For example, in Sub-Saharan Africa, one reason tax rates are higher for the politically powerful ethnic group is that the government is capable of extracting more from co-ethnics than from other groups (Kasara 2007). In this case, extraction is easier because networks linking the population to the government are stronger among co-ethnics than non-co-ethnics. Similarly in rural China, where policy implementation relies heavily on local leaders, analysis should incorporate the relationship between these representatives of government and the local constituents.

While the evidence available is merely suggestive, I argue that the ability of the state to effectively implement policy, i.e. build drinking water infrastructure, depends in part on the collaborative relationship between the state and community. The strength of this connection is likely to be different for politically dominant ethnic groups and minority ethnic groups. Therefore, even if the government does not explicitly target one ethnic group over another, areas with more politically connected ethnic groups may be more likely to benefit from government spending on public goods provision.

3.3 ARGUMENT: PUBLIC GOODS PROVISION IN CHINA

According to both policy and state capacity rationales, government provision of public goods will be better for the dominant ethnic group in China than for minorities. Ethnic relations within China suggest that policy may not be the same for the dominant ethnic group and the ethnic minorities. In China, the Han are numerically superior to every other ethnic group combined (more than 90% of the population is Han) and are the main ethnic group of

¹⁴ The effect of community dynamics at the village level will be discussed more directly in Chapter 5.

government and the Party and are therefore the politically dominant ethnic group (Wimmer et al 2009).¹⁵ The Chinese government prioritizes unity among ethnic groups and is trying to reduce inequality. One way to do this is to target public services and funding for public goods provision to the areas that are poorest, minority areas, and places where conditions are especially difficult. This type of favoritism for minority areas in particular has been seen in tax policy (Wang 2004; Zhan 2013). The areas where there are more minorities are taxed less – regardless of wealth – because the government does not want to be accused of overburdening minorities or spark any kind of resistance among minority ethnic groups. Counties that are both poor and have large minority populations are likely to be priority areas for provincial governments. Wealthier counties may be less worrisome for higher levels of government and thus more reliant on local connections, ease of implementation, and ethnic identity to determine local policy priorities.

Lower tax rates may also reflect a capacity problem in minority areas or an unwillingness to interfere in local governance (for example, the need to use intermediaries rather than formal institutions of government, see Kasara 2007). Both taxing and spending may be easier in Han-dominated areas. This may be because communication with the community is easier and expectations about contributions and reciprocity is more certain within ethnic groups. The relative isolation of minority areas may also lead to higher risk of corruption by minor officials. Especially as minorities tend to live in more poor and remote areas of the country, access by government officials is more difficult (Asian Development Bank 2004). County and higher level offices may therefore be reluctant to spend money in minority areas.

¹⁵ In China, the Han make up the vast majority of the population. The other 55 ethnic groups are often referred to as “minorities” or “minority nationalities.” I follow this and use these terms to refer to non-Han ethnic groups within China, even if they make up a majority in a given locality.

Constraints on policy implementation certainly play a role in the provision of public goods in China. China as a whole has a capacity problem, especially in poor and minority areas (Zhao 2013; O'Brien and Li 1999; Bernstein and Lu 2000; Lieberthal 1995). The central government makes policy, but must rely on the local organs to implement the policies. Depending on the policy and how high a priority it is, the local organs have discretion in the way policy is implemented and in the degree of implementation. There is generally little oversight, especially for policies that are not high priorities, and thus there is a lack of accountability for policy implementation. Information also passes through these channels, and leaves room for some discretion in terms of information sharing and even accuracy (Zhao 2013). In addition, local governments rely on social networks and connections to get investment and financing from higher levels of government and to implement policies (Oi 1989).

I argue that government provision of public goods is more likely to go to places where policy is easier to implement. This means that government provision of public goods in China will primarily benefit the politically dominant ethnic group. While the data to test the effect of networks and state capacity directly are unavailable, I examine observable implications of this argument: rates of spending on public goods and on the number of people who will have access to government provided public goods.

H1: Funding: Among wealthy counties, public goods funding will be go to counties where a higher proportion of the population is from the Han ethnic group than areas with more ethnic minorities.

H2: Water users: More people will benefit from government provision of public goods in counties where a higher proportion of the population is from the Han ethnic group than areas with more ethnic minorities.

3.4 RESEARCH DESIGN AND METHODOLOGY

The broad purpose of this study is to explain the role of government in public goods provision. To do this, I focus on county level variation in spending on one public good provision program within one ministry in one province. By looking at the Ministry of Water Resources Safe Drinking Water Project in Guizhou, I isolate the factors of interest from competing explanations like competition between ministries, fragmented policy authority, and the structural and bureaucratic differences between provinces. Limiting confounding factors in this way enhances the validity of the findings. The results are illustrative of the issues and factors explaining government public goods provision. Here, I explain each design choice in turn.

MINISTRY OF WATER RESOURCES & NATIONAL RURAL DRINKING WATER SAFETY PROJECT

The Chinese political system is characterized by fragmented authority and decentralized policy implementation (Lieberthal and Lampton 1992). Policy goals are made at the center, but each level and region of government has some leeway to interpret goals and devise implementation strategies. Higher levels of government struggle to enforce implementation by lower levels, especially where the extent of compliance is difficult to measure (Lieberthal 1997). Environmental politics and water management specifically has long been the preferred issue area for China scholars to explain governance and policy in China. Despite this, rural water management remains understudied even though it provides a useful window not only for understanding public goods management but for exploring ongoing changes in rural politics in China (Magee 2013). This chapter looks at drinking water provision to illuminate the process of public goods provision in rural China.

To address concerns identification and measurement of outcomes, this chapter focuses on drinking water spending and the number of individuals benefiting from a specific public goods policy. Focusing on one water policy from one ministry helps simplify the study so that we can more clearly see what the government is trying to do when unhindered by competing bureaucracies, jurisdictions, goals, and mandates. Authority over water, as with governance in China generally, is quite fragmented (Lieberthal 1997; Liu and Speed 2009; Shen and Speed 2009). The Ministry of Water Resources (MWR), with its 12 departments and 7 river basin commissions, has primary responsibility for the management of water resources in China (Liu & Speed 2009). However, other ministries including the Ministries for the Environment, Health, Agriculture, and State Forestry Administration also have some responsibilities related to water (Shen and Liu 2008). In Guiyang city, the capital of Guizhou province, there are 42 different bureaus and offices that have influence over some aspect of water resources management (Zhang et al 2012). In rural areas, townships are officially responsible for drinking water provision, but are also heavily dependent on financial support from higher levels of government (Zhang et al 2004). Without financing from higher levels of government, few villages construct new drinking water infrastructure, especially if natural conditions are difficult and facilities are therefore expensive.

The focus on drinking water spending is appropriate for two reasons. Drinking water is a harder test of the theory that ethnicity affects spending because, unlike education, the issues related to providing public drinking water are not ethnically charged and there are no ethnically-based reasons to refuse drinking water provision by the state. Second, the focus of this study is on the policies of the government and the choices of where the government chooses to prioritize public goods provision. An analysis of spending shows patterns in government priorities and

action. In addition, data on drinking water provision outcomes are not available in disaggregated form. The only disaggregated data available are on spending.¹⁶

This analysis focuses on the National Rural Drinking Water Safety Project (全国农村饮水安全工程 *quanguo nongcun yinshui anquan gongcheng*). This initiative was launched with the 11th Five Year Plan (2006-2010). The initial goal was to resolve drinking water problems for some 160 million rural residents and bring access to safe and reliable water supply up from 40% of the rural population to 55% (MWR 2010). The 12th Five-Year Plan reports that the achievements of the 11th Plan exceeded expectations and resolved drinking water safety problems for 210 million rural residents at a cost of RMB100.9 billion (MWR 2012). Based on that achievement, the goals of the 12th Five-Year Plan (2011-2015) included providing water for another 298 million people and 114,000 schools in rural areas, bringing centralized drinking water access to 80% of the rural population by 2015.

Rural drinking water is mainly funded by the central government, but local governments are supposed to contribute 30% of infrastructure investments (MWR 2010). In the 10 years to 2010, the central government invested RMB 300 billion (about US\$48.3); the 12th Five-Year Plan includes another RMB 175 billion for rural drinking water infrastructure (Liu 2015). Providing infrastructure to rural areas is especially challenging because villages are often scattered, so each village needs a separate facility, and water provision systems cannot benefit from economies of scale. Infrastructure funding comes from higher levels of government, but villages are left to manage the facilities and water on their own. Many villagers are reluctant to

¹⁶ The data available on drinking water access are aggregated to rural and urban areas within all of China, not disaggregated by geographic or administrative area. While the government has undertaken a survey of drinking water availability, no results have been published. It appears that these data are classified.

pay for water as they do not have experience paying for something that is naturally available, but the main way to make sure there is funding for management and maintenance is to charge villagers fees for use.

The MWR reports that the villages that need water the most are the first to get Drinking Water Safety infrastructure investment. For the purposes of the project, ‘safe drinking water’ must meet the following standards: (1) water quality standards, (2) quantity of at least 20 liters per person per day, (3) time to retrieve water on foot must not exceed 20 minutes, and (4) water must be accessible from this source at least 90% of the time (MWR 2010).¹⁷ The highest priority places are those where water is high in fluorine or arsenic, brackish or polluted, where there are water-born diseases, and where water shortages are especially problematic. Minority areas received special priority under the 11th Five Year Plan but not under the 12th (MWR 2012). Despite 10 years of investment, at the start of 2015, 56.2% of rural residents still face water quality issues and 43.8% face water shortages (Liu 2015).

CASE SELECTION: GUIZHOU

This chapter focuses on a single region – Guizhou Province – and looks at the variation across counties within it. Reliable disaggregated data on access to drinking water are unavailable. In 2000 (the most recent data disaggregated by province), only 30% of households (21% of poor households) in rural Guizhou had reliable access to drinking water (Asian Development Bank 2004). This is lower than every province except Tibet.

This choice of within-province design addresses another concern of in the literature: the appropriate level of analysis. While there are cross-national studies, increasingly the literature

¹⁷ The focus for the 12th Five-Year plan is on areas with more than 2mg/L of fluoride, 0.05mg/L of arsenic and other microorganisms.

has tried to exploit within country variation in public goods and ethnic diversity to explore the effect of diversity while controlling for national context. Research should be disaggregated to the level of decision making wherever possible, otherwise the mechanism linking diversity and public goods is unclear, especially in democracies or decentralized states (see Stichnoth and Van der Straeten 2013 and Gisselquist 2014 for discussion). For example, it is appropriate for Alesina et al (1999) to study jurisdictions that can vote on their own taxing and spending because the variables of interest are measured at that level as is the mechanism linking them. Even if public goods are not provided by the local government, decisions will be affected by local choices and local pressure during elections (Jackson 2013). Spending decisions and implementation are filtered through the county level in China. While counties still rely on townships for implementation, decisions about government provisions are made at the county level. The provincial level approves spending, but rarely (if ever) conducts separate investigations into conditions. This study thus explores individual projects to see if there is variation at the county level of administration, where decisions on this issue are funded.

A within province design increases the comparability of units and mitigates the risk of omitted variable bias. Counties are critical to policy decisions and implementation in China and thus county divisions is appropriate for analysis. In addition, the county is the lowest level available for data on geographic concentration of ethnic groups and spending. Because Guizhou is relatively poor, township and even counties rely heavily on funding transfers from higher levels of government. This means that budget documents provided by the provincial office of the MWR are likely to have entries for a higher proportion of total rural drinking water projects than if the counties could afford infrastructure projects without which central government and provincial funding. While townships depend on the county to fund projects, provinces rely on

counties to provide information about the needs of townships and villages. The county level is thus a key link between money and water – government funding and public goods provision – and an appropriate unit of analysis to examine government provision of public goods.

Guizhou is poorer, more mountainous, and has more minorities than most provinces.¹⁸ However, Guizhou does not warrant special security concerns because it has no international borders or major separatist groups.¹⁹ This means that there is no major ethnic group in Guizhou that gets special treatment from the Chinese government. In the Autonomous Regions of Xinjiang and Tibet, there are single ethnic minority groups with active separatist movements and thus who are likely to be treated differently from the other minority groups in China. In those two regions in particular, coopting minority groups is likely to be a higher priority. Minorities in Guizhou are generally perceived as poor or backward and in need of government help but also generally non-threatening (Blum 2001).²⁰ Guizhou also has many minority groups. There are thus counties with high diversity as well as homogeneous counties that are predominantly either Han or ethnic minorities. This variance in both diversity and relative Han population size are necessary to test hypotheses related to both diversity and ethnic group dominance.

¹⁸ Despite immigration, as recently as 1800, the majority of inhabitants of Guizhou and Yunnan were still not Han (Giersch 2006). The Chinese state (with a government at times Han- or Manchu-dominant) expanded to incorporate the frontier areas only slowly over several hundred years.

¹⁹ Tibetan areas and Xinjiang are especially sensitive due to ethnic separatist movements. Spending and policy patterns are less likely to be generalizable in those areas than in Guizhou, where minority separatism has not been an issue for many decades.

²⁰ Guizhou did see its share of violence as economic troubles grew around the time of the Opium Wars and populations spread to areas already settled by minorities (Jenks 1994). While the main rebellion of the Qing period has been called the “Miao” rebellion, the extent to which it was driven by ethnic tensions is questionable. Indeed, it’s likely that Miao were only one of several ethnic groups involved and that a large number of local Han also participated. Violence that has occurred since 1949 has primarily been localized, not specifically related to ethnic identity or influence, and has not been viewed as a threat to state authority.

Ethnic Relations in China

Ethnic identity is closely tied to nation-building in China. Ethnic groups in China are defined by the government. Every individual is assigned an ethnic category, which is part of the individual's *hukou* registration. There are currently 56 recognized ethnic categories in China, 55 minority "nationalities" and the Han majority. Shortly after taking power, the Chinese Communist Party began the development of an ethnic classification system that is still used today (Schein 2000, Mullaney 2011).²¹²²

While there are cases of Party and government offices held by ethnic minorities, particularly in autonomous districts, the vast majority of leaders are Han and top positions are almost always occupied by Han (Starr 2010).²³ According to the Ethnic Power Relations dataset, Han have a complete monopoly of power (Wucherpfennig et al 2011). This measure of the proportion of the population that is Han therefore reflects the proportion of the dominant ethnic

²¹ One goal of the categorization process was to gain the loyalty of minority groups to the CCP relative to the local leaders, but the success of this – even 50 years on – is mixed (Kaup 2000). For example, Kaup finds that Zhuang today would prefer to have a local Han as a leader than have a Zhuang leader from outside the county (Kaup 2000: 176).

²² The classification process was based primarily on language, but census makers had to find a way to deal with dialects and families of languages. The classification process was done separately in each province, and therefore the groups did not come out the same. For example, Zhuang in Yunnan are the same as Bouyi in Guizhou (Mullaney 2011). The creation of the minority classifications roughly followed criteria developed in the Soviet Union, but was adjusted for the Chinese context. While language was one of the main dividing lines for the original classification of ethnic groups, many minorities, especially those who live in urban areas, only speak Chinese (*Putonghua*) (Blum 2001). Most young people are now bilingual as education is in Chinese. In some of the more isolated villages of Guizhou, this means that minorities speak their local language and standard Chinese, but not the Guizhou dialect.

²³ In China, there are cases where the party and government offices are held by ethnic minorities, particularly in autonomous districts. However, top positions are almost always occupied by Han Chinese and decision making is autonomous only in theory, not in practice (Starr 2010). Even if an individual official is from a minority ethnic group, the majority of those making policy decisions are likely to be Han.

group at all levels of government and in the CCP. The dominance of Han in the government and Party reflect the overwhelming dominance of Han in the population. Almost 92% of the Chinese population is Han. However, in Guizhou only about 60% of the population is classified as Han (China Census 2005). The largest minority groups in Guizhou are Miao (12%, self-described and known in the US as Hmong), Bouyi (8%) and Dong (5.6%).

Government policy towards minorities can be favorable. The government transfers more money to provinces with more minorities, regardless of the level of economic inequality between provinces (Wang 2004). Wang suggests that this is part of an effort to build unity and that providing money for minority areas is a higher priority than rectifying the growing inequality between provinces. The same policy can be seen in taxation. Local governments in minority areas tax at a lower rate because extraction from minority areas – especially isolated and border areas – is politically sensitive (Zhan 2013).

Especially in the Southwest China, including Guizhou and Yunnan provinces, minority areas tend to be relatively poor and less developed (Diamond 1995; Asian Development Bank 2004). In part, this situation is due to the remote and inhospitable environments where many minorities live. The official discourse also blames the difficulty of access and “the cultural backwardness and conservatism of the minorities themselves” (Diamond 1995, p113-4). Minorities are often perceived by Han and the government as being less advanced and, in the official discourse, look to Han for guidance in the process of modernization and economic development (Blum 2001). These policies reflect the perception of Han as the “elder brother” (Schein 181) who will bestow technology and wealth on the “backward” and “primitive” minorities (Blum 2001, 8). Alternatively, these policies – especially lower tax policy – may reflect less government involvement and less governance in minority areas. While it is possible

that public goods provision will be higher in minority areas because the government targets spending toward minority areas as a means to buy allegiance and promote unity with the state, it is also possible that the government will simply neglect minority areas, especially where minorities are less politically active.

DATA SOURCES

Data for this study come from several sources within China. Ministry of Water Resources projects are nested within counties. Project data were collected by the author from the Ministry of Water Resources in Guiyang while data on county-level variables are from publicly available census and county data.

Data from the Ministry of Water Resources Safe Drinking Water project comes from the Ministry of Water Resources in Guiyang. This dataset includes the outcomes of interest. The dataset includes information on every infrastructure project constructed by the MWR during the course of 2010-2013. While the budget for these projects may have been made earlier, the information is on money spent and projects completed. For this reason, there are a few projects with funding of \$0 or that benefited 0 people because their construction was planned but not started or completed during the year. Timing is also the reason for the cutoff of 2013. When the data was collected, in 2014, the list of projects built in 2014 had not yet been completed.

For each project, the MWR dataset lists the project name and location, the number of beneficiaries broken down into either villagers or school students (many projects were specifically for schools), the total funds invested in the project and the source of those funds – the central, provincial, or city government. In total, the data cover 13,377 MWR projects in 82 counties of Guizhou Province. Because I look at trends across counties, I also aggregate data to

the county level and look at the total number of beneficiaries within a county, total spending within a county, and the total number of projects within each county.

Data on the characteristics of each county comes from the Chinese census. The data cover all the counties of Guizhou from 2000-2012. Data include the total population, GDP, and the revenue and expenditure of the local county government. Some counties and years include rural income and the rural population. While most of the data are over time, data on the ethnicity breakdown of each population was only attainable for the 2000 census.²⁴ As migration in and out of each county is not limited to certain ethnic groups, it is unlikely that the level of diversity changed significantly over this short period of time.²⁵

DATA RELIABILITY

The reliability of data is a concern for scholars who study China. Generally speaking, the standards for data in Political Science are very difficult to meet in China (Lieberthal 2010). The data used here are the best available. While it is nearly impossible to know with certainty which issues are politically sensitive in China (Tsai 2010), one reason to select Guizhou for research is that issues of ethnicity and water provision are less likely to be sensitive here than in other

²⁴ While some ethnicity data are available after 2000, they are aggregated to the prefectural level. Because the county level is more important for spending decisions on drinking water provision, I prefer to use the slightly older but appropriately disaggregated 2000 census data.

²⁵ It would be preferable to have diversity data for every year, but this is unavailable, so I make do with one measure of diversity for each county. Some cross-national datasets also use static measure of diversity (for example, the Ethnolinguistic Fractionalization (ELF) index uses data based on a Soviet dataset from 1964). Ethnic diversity can change over time, but given the *hukou* system and the lack of political or economic upheaval during the period under study, it seems unlikely that diversity would change enough to affect the spending patterns studied here. During a period of political upheaval (1989-2002), ethnic diversity changed quickly in formerly communist states, but linguistic and religious diversity did not (Campos and Kuzeyev 2007). It seems unlikely that we would see dramatic changes within Guizhou. While static measures are not ideal, I have no reason to think that diversity has changed so dramatically that it will affect my general findings.

provinces where water is more limited or ethnic groups have separatist claims. Data quality is especially problematic for surveys in China and for data that have been processed (Xi Chen 2010). There are tradeoffs with data in China. While data from higher levels of government tends to be more comprehensive, and higher levels have better resources and facilities to produce data, many also simply aggregate data from below, without checking the sources, quality, or methods of collection. The new data for this analysis are from the MWR office in Guiyang. The data used here have only been aggregated by the author; the original data is disaggregated documentation of the spending for each individual project. While the data are published internally and theoretically public, they are not available online or published for wider consumption. This should help minimize bias.

To the extent that most of the funding for water provision projects comes from sources outside the county, all counties have an incentive to exaggerate their needs and ask for more money for investment. Given that Guizhou is already a relatively poor province, it is widely acknowledged that conditions in the village are relatively difficult. It appears that there is no reason *not* to ask for more money from higher levels of government. However, since the issue here is not how many people have access to drinking water provision but how many people the government reports to help and how much money the government reports spending, this incentive does not distort the outcome of interest. Even if corruption at the county or township levels does not lead to the actual construction of the projects, this does not bias the analysis. After all, this chapter investigates patterns in government plans and priorities, not whether the spending was used effectively. The data tell us about how the government reports spending money earmarked for building infrastructure in the most needy villages.

VARIABLES & MEASUREMENT

Dependent Variables:

This study looks at both funding and outcome. Some studies conflate government spending with public goods provision, but these are not the same thing. The first can be measured directly from MWR data, but the later requires approximation. While it might be informative to measure the number of people with access to electricity, clean water, immunizations, or the number of years of schooling, these are not always available – especially in developing countries – nor are they always disaggregated to appropriate within-country districts. Proxy measures of the number of hospitals or schools do not capture the outcome of interest if teachers and doctors do not attend work regularly just as power lines and water pipes do not supply public goods if there is not electricity or water running to customers (Banerjee et al 2007). When we are looking at government provision of public goods, public spending can be an appropriate measure for looking at government response to electoral preferences (as Alesina et al 1999 do). While this still leaves open the question of whether the spending translates into outcomes, exploring spending focuses the research on government priorities and effort to provide public goods and isolates the analysis from confounding local factors affecting results. The difference between spending and outcomes can be especially pronounced in developing countries, but understanding spending is an important first step to understanding the relationship between diversity and *government provision* of public goods and the extent to which there are policy options that may change that relationship. By looking at spending, we can assess the extent to which the government tries to buy the support of some groups and areas over others.

Therefore, the outcomes of interest for this study are government spending and the number of people who benefit from government water projects. For the first hypothesis (related

to funding), the dependent variables measure funding for drinking water provision. Government funding for drinking water infrastructure is measured both by project and by county. Each infrastructure project is a single year entry into the government budget. Most projects serve one village, but there are villages with multiple drinking water projects and there are also projects that serve 3 or more villages. Because project density and size can vary together, at the project level, I look at the meaningful variation between projects, funding per water user. Projects range in cost from 0 RMB to 15,600,000 RMB (US\$2,515,953), with an average of 408,963RMB. Average funding per capita is 0.047RMB.²⁶

For county-level analysis, those projects are aggregated to the county level for each year. The amount of money spent on MWR projects varies by county and year, with an average of 17,820,000RMB. I look at funding per water user – similar to the project level – but also look at the funding per capita for the county population. This second measure explores whether some counties get more money than others relative to the size of their population.

The second outcome of interest is the number of people who benefit from government water projects as a proportion of the total county population. This is an approximate indicator for public goods access. Ideally, we could measure the proportion of the population that has access to public goods overall, but these data are not available. Projects vary widely in size and thus the number of people each is designed to serve. The average project is designed to provide safe drinking water for 832 people, but the range is between 5 and 29,963 people. At the county level, the total number of people benefiting from a project ranges very widely, from 275 to

²⁶ For ease of interpretation, I use funding per 1000 people in regressions.

492,327. At both the project and county levels, funding and population benefitting are highly correlated (.977 and .994, respectively). Summary statistics are presented in appendix B.²⁷

Independent Variables

Ethnic diversity:

This study uses two measures of ethnic makeup. For both, I use government assigned and recognized ethnic classifications because these are the categories that the government will potentially incorporate into spending and policy decisions.²⁸ The primary measure is the proportion of the county population that is Han, the ethnic majority group (*Percent_Han*).

The alternative measure is the concentration or fractionalization of ethnic groups in each county (*Diversity*). The index ranges from 0 to 1, and is computed as one minus the Herfindahl Index.²⁹ This measures the probability that two random people meeting on the street are of the same ethnic group. As the concentration of one ethnic group is higher, the probability of

²⁷ The cost of project construction and number of beneficiaries may be inflated across all counties. The proportion of the population that is reported to benefit from drinking water projects ranges from almost zero to more than one (1.36), meaning that the MWR built drinking water infrastructure to serve more people than actually live some counties. As mentioned in the *data reliability* section above, this is likely due to misrepresentation of the size of the population in need of water and the size of the population benefitting in order to get more money. One possible reason for this is that some projects report to benefit both students and villagers, and overlap in those categories may lead to some beneficiaries being counted twice. What is more likely is that townships and counties overstate the number of people who will benefit from each individual project in order to get more money for the project. I thus expect exaggerations in benefits to be systematic (there is no real oversight and no incentive to underestimate the number of people who will benefit from a project) and not bias the overall analysis.

²⁸ It is possible that other racial, religious, cultural, or linguistic differences are important socially and even affect collective action. However, the focus of this study is government policy and whether it focuses on government-recognized groups. For this study, government categories are therefore most appropriate.

²⁹ This is the same measure used to calculate other common diversity measures, such as the Ethnolinguistic Fractionalization (ELF) index.

meeting a counterpart of the same ethnic group grows, and the diversity index moves closer to 0. More diverse counties have higher scores.

Control Variables

*GDP per capita*³⁰

The census provides the GDP per capita for each county and year. Richer counties can expect to have better water supply already and can afford to spend more on water and other public goods. Rural areas tend to have worse public goods and water provision than urban areas and poor rural areas have worse public goods than rich rural areas (Nitikin et al 2012). Rich provinces like Beijing can expect water access for over 90% of the population while Guizhou and other poor provinces have much lower access rates (in 2000: 30% in Guizhou overall, 21% among poor households) (Asian Development Bank 2004). This wealth-related discrepancy has been documented across the rural-urban divide and across provinces. I also include GDP as a control within Guizhou province.

Natural Conditions: Karst Geography

The natural conditions of each village affect the ease of finding reliable drinking water sources and managing water for year-round access. Rainfall in Guizhou is sufficient (between 1000 and 2000mm annually), but geology is more important in determining water availability (Baker and Groves 2008). As Zhang et al note, “Having rain is not the same as having usable water” (2012). Guizhou’s relative poverty has been blamed in part on the difficult geological conditions (Circle 2014).

Guizhou is part of one of the South China Karst belt, which covers some 200,000 square miles (larger than the state of California). Karst landscapes are made of soluble rock that

³⁰ For ease in interpreting coefficients, I use per person for some regressions and per million people for others. These coding changes are noted in footnotes.

dissolves in irregular patterns, creating sinkholes and underground caves and rivers (Circle 2014). In karst areas, much of that rainfall either evaporates from the rocky karst terrain or becomes inaccessible. Karst landscapes pose a unique problem for drinking water provision because precipitation flows quickly into underground streams and becomes inaccessible from the surface. Guizhou's rainfall is highly seasonal, and drinking water sources dry quickly in karst areas. More difficult conditions may affect the size or cost of building effective infrastructure for water provision. I control for the difficulty of natural conditions by including a measure of the proportion of the county that is classified as karst rock formation. The area covered by karst landscape varies between 28% and 93% of each county.

3.5 STATISTICAL EVIDENCE

Does ethnic makeup affect government provision of public goods within non-democratic countries? The following sections explore two conceptualizations of public goods provision by the government: the population that benefits from government spending and the amount of money spent. To analyze each of these outcomes, I use statistical tests at two levels of analysis. Data are available at the project level and the county level. To examine project-level variation, I use a two-level hierarchical model that explores the characteristics of each individual project and demonstrate that funding per capita vary systematically with ethnic identity and income. At the county level, I look at averages across counties over time to see if aggregate spending and populations benefiting follow similar patterns in counties with different characteristics. I find that at the county level, it is the number of beneficiaries, not the amount of funding, that changes with the ethnic makeup of the population.

PROJECT-LEVEL ANALYSIS: FUNDING PER CAPITA

Where does the government spend the most money on providing public goods? Total funding per project varies closely with the number of people the project serves (corr = 0.977). This is not surprising as bigger projects and projects that provide drinking water infrastructure for multiple villages will be more expensive to construct than projects that only serve part of a village. However, there is still some systematic variation in funding *per water user*. To explore this, I use a 2-level hierarchical model with projects nested within counties.³¹ For this analysis, data are available on 10561 projects in 68 counties. There are an average of 157 projects per county with a range of 10 to 437. Table 1 displays the results.

Table 1: MWR Project Analysis

<i>Independent Variables</i>	Model 1:	
	Funding Per Water User	
	Coef.	(Std.Err.)
Percent Han	-210.42***	(51.96)
GDP per million people (100m yuan)	-2.22***	(0.303)
Percent Han * GDP per million people	2.56***	(0.460)
Percent Karst	41.35	(77.018)
Constant	620.43	(56.390)
Observations/Groups	10561/68	
	Wald chi2 = 55.45	
	Log likelihood = -76923.668	
p<.05, *p<.01	Prob chi2 =0.00	
Variance (constant)	7706.28	(2140.87)
Variance (residual)	122423.8	(1695.60)

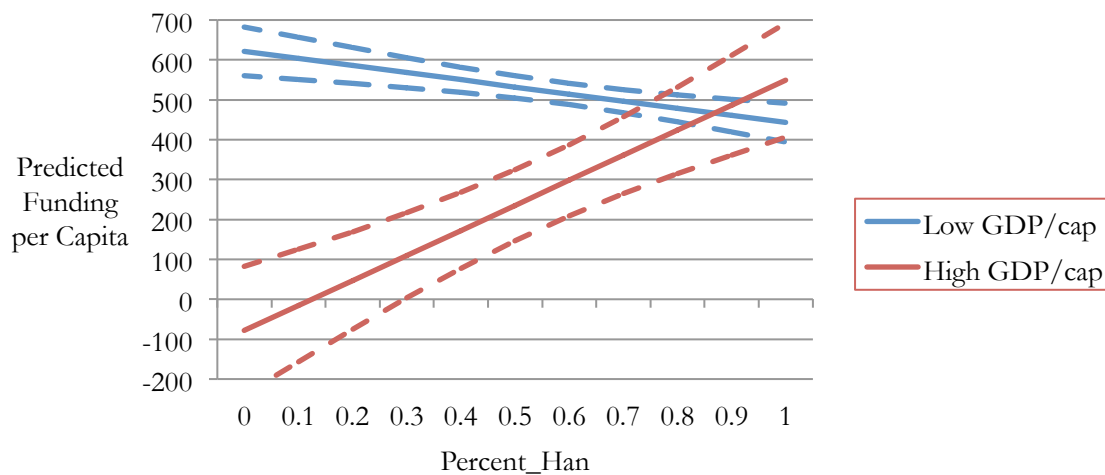
The explanatory variables are measured at the county level.³² While *Percent_Han* and the proportion of the county that is karst are static over time, county population and GDP per

³¹ As discussed in the next model, the projects are distributed across years (2010-2013). However, alternate specifications that include time or Five Year Plan do not affect the outcomes in the hierarchical model.

³² The results do not vary when using random or fixed intercepts. For simplicity, the results presented shows fixed intercepts.

capita vary annually. I control for the amount of karst because if funding per capita is determined by the difficult of providing water, we would expect karst to be significant. However, at the project level, karst landscape does not affect funding.

Graph 1: Effect of Percent_Han on Funding per Capita



Percent_Han, GDP per capita, and their interaction are all significant. Where GDP per capita is high, the relationship between *Percent_Han* and funding per capita is positive. If a favorable policy toward minorities were the main driver of per capita funding, the relationship between *Percent_Han* and funding would be negative, even for wealthy counties. Instead, places where there are more Han get significantly more money on a per capita basis than places where most of the population is of minority ethnic groups. In contrast, in poor counties, funding per capita is slightly higher where there are fewer Han.³³ The graph below (Graph 1) displays the

³³ While in China on average minorities are likely to be poorer than Han, at the county level within Guizhou, *Percent_Han* and GDP per capita are not highly correlated (-0.199). GDP per capita has an even weaker correlation with ethnic diversity (-0.045).

relationship between *Percent_Han* and funding per capita for high and low income counties with 95% confidence intervals.³⁴

The project-level analysis is useful for assessing the first hypothesis – that funding varies – but not the second – the number of beneficiaries. There could be multiple projects in a village, so the number of beneficiaries from any individual infrastructure project does not give us real information about either the total population affected by new MWR drinking water infrastructure or the proportion of the county population benefiting.

COUNTY-LEVEL ANALYSIS: POPULATION & FUNDING

In addition to project-level variation, funding and population benefiting from drinking water infrastructure construction vary by county. As it is possible for the government to provide for public goods not only through large expensive projects but through multiple small projects in a single area, I also look at aggregate spending on infrastructure. MWR projects are assigned through the county branch of the MWR. The provincial and central levels of the MWR may provide the funding but requests for project support and responsibility for implementation all pass through the county-level offices. Which counties are most likely to receive support from the MWR? This section explores county-level variation in the number of beneficiaries and funding provided for increasing drinking water provision.

Projects are distributed across years (2010-2013) and counties. Each project is a single entry, but spending and people benefiting in counties could be affected by the previous year.³⁵

³⁴ For this visualization, “Low GDP per capita” is set at the 25th percentile cutoff value of 12.25 and “High” is set at the 75th percentile value of 327.79. All other variables are held at their mean.

³⁵ The projects in this dataset are all listed only once, indicating that they are at least designed and funded within one year if not also completed within the year.

The county-level data is thus time series cross sectional.³⁶ I follow De Boef and Keele (2008) and first estimate a full ADL model with fewer restrictions, then follow to test more restrictive models from there.³⁷

There are three dependent variables of interest at the county level. First, the share of the population benefiting from drinking water provision projects. This is calculated as the benefiting population divided by the total population to measure the percent of the county population who have gained access to water each year due to new infrastructure projects. Model 2 in Table 2 shows that a larger proportion of the population gains access to new drinking water facilities in counties with higher *Percent_Han*. Simply put, in terms of beneficiaries, the MWR favors counties with higher *Percent_Han*.

The second and third models examine the amount of money spent, but in terms of the number of beneficiaries (Model 3) and in terms of the total county population (Model 4). Here, *Percent_Han* is not significant. In terms of per beneficiary, it is richer counties where funds are higher. Recall that at the project level, it is these richer counties where the effect of ethnic identity on per capita funding has the largest magnitude. However, once funding and users are aggregated to the county level, ethnicity no longer plays a role. In terms of total population, it is the natural conditions – the proportion of the county that is karst landscape – that determines spending. The results are presented in Table 2.

³⁶ Recall that not all of the independent variables change over time. Percent Karst, percent Han, and diversity are all static measures.

³⁷ The F tests show that lagged GDP and lagged population are both indistinguishable from 0, so using a Partial Adjustment model will not bias estimates. According to De Boef and Keele (2008), this model is only appropriate when the restriction $b1 = 0$ is valid.

Table 2: County Level Analysis

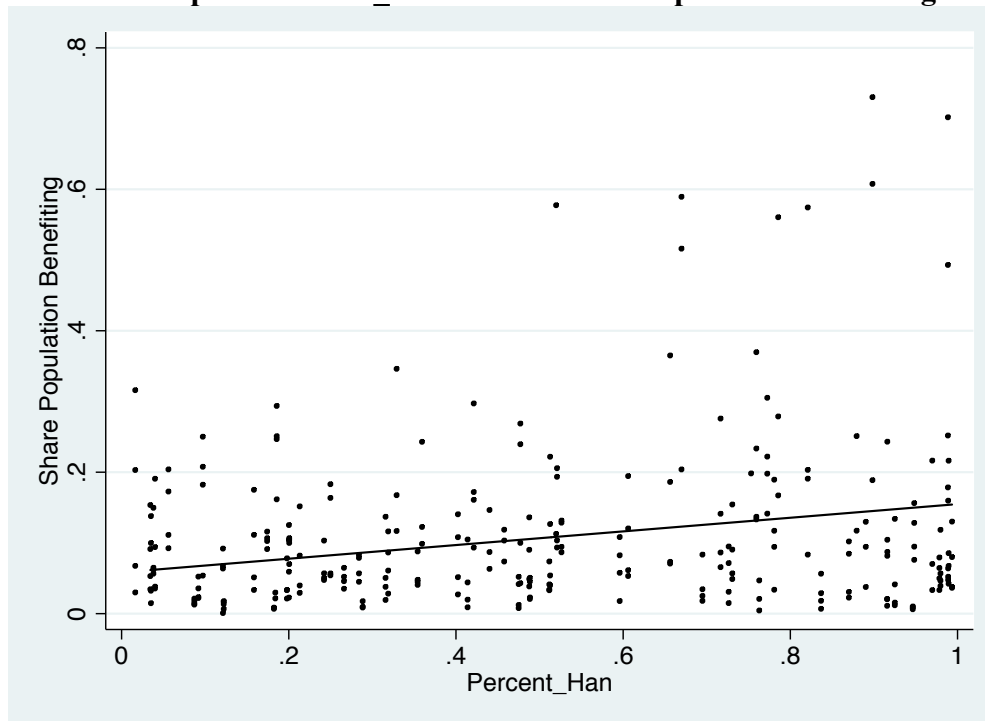
	Model 2:		Model 3:		Model 4:	
	Share Population Benefiting		Funding per Water User		Funding per Capita (County total population)	
<i>Independent Variable</i>	Coef.	(Std.Err.)	Coef.	(Std.Err.)	Coef.	(Std.Err.)
Lag DV	0.94***	(0.11)	0.12	(0.12)	0.10	(0.08)
% Han	0.07**	(0.04)	-17.42	(16.56)	-25.54	(19.24)
GDP per capita	33.36	(216.32)	0.20**	(0.10)	-0.08	(0.12)
% Karst	-0.03	(0.07)	16.25	(30.06)	75.16**	(35.20)
Constant	0.01	(0.05)	407.81	(61.07)	-7.38	(24.95)
N	171		173		173	
Adj R-sq	0.319		0.039		0.02	

*p<.1, **p<.05, ***p<.01

This analysis shows support the second hypotheses proposed here. Model 2 shows clear support for *hypothesis 2* – that more individuals will benefit from government water provision where there are fewer minorities. Counties where a higher proportion of the population is Han have gained access to drinking water infrastructure at a higher rate than those with more minorities. If counties with more minorities had higher rates of drinking water provision before the project began, this pattern might be due to government targeting areas with poor conditions. However, it is unlikely that minority areas within Guizhou are better off than Han areas. Especially given that minorities often live in more remote areas of rural Guizhou, this relationship does not seem like it could be due to high levels of drinking water access among minority villages at the beginning of the project. In addition, year-on-year more people in Han areas gain access to government provided drinking water each year. The graph below (Graph 2) shows the relationship between the total share of the county population benefiting from new MWR infrastructure and *Percent_Han*. While the relationship is significant, the magnitude is not large.

The county-level analysis confirms that the relationship between percent Han and beneficiaries is not due to government building more small projects in minority areas. Instead, the total number of beneficiaries in the county is higher in areas with higher Han populations, regardless of the size of the project. The number of beneficiaries is not affected by the wealth of the county, the ethnic diversity, or karst geography.³⁸

Graph 2: Percent_Han and Share of Population Benefiting



In terms of funding per person, the Model 3 shows that ethnicity does not play a role when we aggregate projects to the county level. The funding per water user – the funding per

³⁸ The models presented here control for the wealth of the county as measured by GDP per capita. An alternate specification controls for the wealth of the local government as measured by local (county level) revenues and expenditures. This specification lowers the confidence level to 90% (proportion Han is still significant at the $p < 0.1$ level). The results are the same with and without the inclusion of karst as a control and with and without controlling for the county population.

person who is reported to be a beneficiary of the projects, including both villagers and students – increases as incomes rise. Richer counties spend more on water infrastructure per beneficiary. Given that communities and local governments are supposed to contribute to the total funds of the project, this is perhaps not surprising. Local governments with more money from a wealthier tax base may be more able to cover their part of the total cost. If the overall policy is to reduce inequality and improve infrastructure in especially needy places, however, this analysis shows that policy implementation falls short.

In addition, counties with more karst landscape spend more money per total county population. The amount of karst landscape does not affect the number of people benefiting or funding per user, but does affect the total funding per capita spent in each county. If projects in karst areas were more expensive, we would expect to see funding per user change with the landscape. However, this is not the case. Instead, it is counties where conditions overall are difficult that spend the most money on drinking water infrastructure, regardless of the number of beneficiaries.

These last two models show that there is no significant relationship between ethnic identity and funding at the county level. It is only at the project level that funding per capita varies significantly. The county level analysis thus supports *hypothesis 2* but not *hypothesis 1*. At the county level it is only in terms of the number of people – not the amount of money – that counties with larger Han populations differ from those that are primarily populated by minorities.

Ethnic diversity overall, however, is not significant in any of these. These findings demonstrate that it is not diversity per se that affects public goods spending but the relationship between the dominant ethnic group and the government. The result may be similar to that found in previous works on democracies – diverse provinces as a whole are worse off than

homogeneously Han ones because the funding within heterogeneous provinces is not distributed evenly. However, across counties, funding is not allotted differently based on the level of diversity but on the proportion of the population from the dominant ethnic group.

Together, these analyses demonstrate mixed support for the two hypotheses. At the county level, the number of people who benefit from drinking water infrastructure projects is higher when the Han population is greater. At the project level, counties with Han get more money per water user than counties with smaller Han populations. Government provision of public goods is not equal across ethnic groups.

3.6 DISCUSSION & CONCLUSION

Based on an analysis of Ministry of Water Resources infrastructure projects in Guizhou Province, this chapter shows that the government focuses on providing public goods for areas where the majority ethnic group, the Han, are more heavily concentrated. This finding is similar to research done in both developing and developed democracies worldwide. In democracies, public good provision reflects voter preferences (Alesina et al 1999) and the need to provide for key electoral blocks (Weber 2009). These mechanisms do not explain why government provision of public goods in non-democratic China follows a similar pattern.

There are two reasons non-democracies would provide to dominant groups at higher rates. First, the policy may be to favor the dominant group. There may simply be bias on the part of government officials or the government may need to buy support only from the politically powerful ethnic group. This seems unlikely, especially given that provincial level transfers are targeted toward minority provinces as a means of promoting national unity (Wang 2004).

Second, public goods provision reflects government capacity. The relative ease of governing co-ethnics is not unique to autocracies (Kasara 2007). In China, minority areas tend to be more politically sensitive and more likely to resist or protest high extraction rate (Zhan 2013; Wang 2004). Both taxing and spending may be easier in Han-dominated areas. As one village leader explained, minority villages simply do things in their own way and in their own time, and the government tends not interfere (20140426.TS.01). County and higher level offices may therefore find it easier and more convenient to focus policy implementation on majority Han areas. In addition, the strength of networks may play a role in government spending patterns. The most developed networks between townships, county, and provincial level governments are mainly made up of members of the largest ethnic group. Networks are especially important for getting access to government funding in China (Oi 1989). If networks within ethnic groups are stronger and more developed than across ethnic groups (as Habyarimana et al (2007 and 2009) find in Africa), the relationship between ethnicity and public goods spending is likely not a reflection of deliberate ethnic bias but of the role of networks among government officials.

While this chapter does not address water access outcomes, if government infrastructure matters, this study suggests that minorities will be worse off. One of the key reasons to look at project-level funding and not just county-level aggregate is that previous research shows that larger and more well-funded projects are more likely to be successful (Tian et al 2013). That is, bigger water infrastructure projects are more likely to actually provide water than those that are small or not well funded. As this chapter shows, bigger and better funded projects are more likely in areas where Han are more dominant. Since there are more people benefiting from water projects in Han counties and the individual water projects are better funded, we can expect that Han areas have higher rates of access to drinking water. If the policy goal is to remedy this

inequality among ethnic groups and thus promote national unity, spending should be higher in counties with more minorities. In fact, this study finds the opposite relationship. Especially given that minorities in China are already more likely to live in remote areas and suffer more poverty (Asian Development Bank 2004), targeting government spending toward the majority ethnic group is likely to perpetuate existing socioeconomic differences between minorities and Han.

CHAPTER 4: MIGRATION AND PUBLIC GOODS PROVISION IN RURAL CHINA

4.1 INTRODUCTION

What is the effect of out-migration on public goods provision? Previous research suggests that at the local level, collective action is important for common pool resources management and for public goods provision. In rural areas and where the reach of the state is limited, the ability of the community to organize is especially important. Labor migration from rural areas to the cities causes the population in the village to change, sometimes dramatically, at least on a temporary basis. While previous research suggests that population instability hinders the collective action needed for public goods provision, a statistical analysis of migration and drinking water provision in rural China shows that villages with higher rates of out-migration are more likely to have good public drinking water access than those with low rates of migration. This chapter explores the counter-intuitive finding that migration away from rural areas brings higher rates of water provision to villages.

Labor migration is common in developing countries, as people move from rural agriculture to find better paying jobs in urban areas (Mendola 2012). Recent work focuses on the benefits of migration – both internal and international – for household income and for the economic growth in developing countries. While the effect of migration on individuals and households in source communities may be positive, the possible benefits to the community as a whole – particularly on the ability of the community to manage local resources effectively – has not been adequately studied. The lack of research is especially apparent in the developing world, where the health of source communities is too often ignored (Toyota et al 2007). This chapter addresses the gap by turning the focus on the source communities and by linking migration to public goods provision.

Although labor migration is often associated with development, source communities still need public goods provision. In China, high rates of water provision to the cities obscure the fact that some 52 million people in rural areas still lack access to safe drinking water (Liu 2015). Even with ongoing urbanization, almost half of the population still lives in rural areas.

This chapter begins discussing role migration plays in public goods provision. I argue that the increase in connections outside the village is beneficial for public goods provision, and these benefits outweigh any disruption in collective action within the community caused by labor migration. External support, including from the government, is more likely for villages with external connections. Thus, villages that are less isolated are more likely to have public goods provision. After presenting the argument, I explain the research design and methodology used. The following section presents the evidence gathered from ten months of fieldwork in rural Southwest China. Finally, the chapter ends with a discussion of the findings.

4.2 EXPLAINING PUBLIC GOODS PROVISION

Although coordination within the village is important for public goods provision in China, collective action alone does not explain public goods provision. Both the government and local community have an effect on public goods provision, and recent research focuses on the links between them for explanations of public goods provision. Especially in the developing world, there has been a focus on collective action processes and the local conditions that facilitate or hinder it as key explanations of public goods outcomes. While part of the systematic variation across communities can be explained by collective action, the state as an actor outside the community also plays a role in public goods provision. Top-down and bottom-up

mechanisms are not exclusive or alternatives but complementary and interacting explanations of the variance in public goods provision within countries (Banerjee et al 2007).

Theories of collective action explain variation in public goods provision, especially in developing countries and absent government provision. Research on public goods provision focuses on the types of community dynamics. As discussed in Chapter 3, public goods have repeatedly been shown to be worse in ethnically diverse places (Easterly and Levine 1997; Alesina et al 2003; Posner 2004), at least in part because networks that are needed for monitoring and rule enforcement are stronger within ethnic groups (Habyarimana et al 2007, 2009; Miguel and Gugerty 2005). In addition, villagers embedded in strong social networks are more likely to care about their reputation and benefit from norms of reciprocity, which can then help ensure collective action (Ostrom 2000b; Putnam 2002).³⁹ In developing countries and rural areas with weak state presence, little external investment, and minimal help with public goods delivery, collective action is especially useful. However, the overall variation in of public goods provision – both across countries and within them – should not ignore the role the government plays in public goods provision.

While “bonding” social capital among villagers can help explain collective action, government success relies on social connections that provide a “bridge” between villagers and those outside the village (Woolcock and Naryan 2000). Government policy, state capacity, and organization can affect public goods provision directly and indirectly through easing or hindering local collective action. The ability of the government to implement policy related to public goods varies (Diaz-Cayeros et al 2013; Olken 2006; Denizer et al 2013). Similarly, community activity can affect policy implementation (Andersson et al 2009). Policy outcomes are more likely to

³⁹ These norms of reciprocity are also inherent to the development of *guanxi* in China (Chen and Chen 2004; Fan 2002).

succeed when government and community actions are complementary (Evans 1995). Thus, the range of variation in public goods provision in rural villages is best explained by looking at both government and communities as potential actors and at their interaction. The following section explains the effect of out-migration on public goods provision by the government and community collective action. It concludes by arguing that it is through increasing connections outside the village and access to external resources, including government intervention, that out-migration leads to better public goods provision.

MIGRATION & PUBLIC GOODS

The interaction of local communities and government explain public goods provision (Banerjee et al 2007; Woolcock and Narayan 2000). Labor migration changes the makeup of the community and the extent of the population's connection outside the community. Based on the logic of "bonding" social capital and collective action, the expectation is that out-migration would hinder the collective action needed for village public goods provision because migration weakens social capital, leads to population instability, and weakens monitoring and sanctioning mechanisms. However, I argue that the increase in connections outside the village – the increase in "bridging" social capital – outweighs any disruption in local community caused by high rates of out-migration. As a result, the less isolated villages – those with higher rates of out-migration – are better able to mobilize resources and expertise to ensure drinking water provision.

Internal labor migration is a pervasive feature of development (Mendola 2012). While there is a growing body of research on the effect of migration on individual households or on individuals – both the migrants and those left behind – there are still only a few studies of the effect on source communities as a whole or on public goods provision (Qin and Flint 2012 is the

notable exception). This section discusses the effects of migration on social capital and argues that migration decreases village isolation and therefore increases the likelihood of public goods provision.

Migration & Collective Action: Ties Still Bind

While migration may disrupt some aspects of community, it does not hinder the participation, monitoring, or sanctioning needed for collective action. Migrants retain close ties to source communities while also gaining access to social networks and resources outside the village. Migration in China is usually temporary and villagers are tied to their home communities through their *hukou* registration and the family members they leave behind.

Because temporary and circular migration does not weaken the ties between migrants and the villagers left behind, migration does not hinder collective action. There are three main reasons for concern about the effect of migration, but none prevents communities from organizing collectively for public goods provision. First, monitoring the behavior of others in the community and enforcing norms of participation or contribution could be harder when part of the population leaves the village for at least part of every year. Communities that overcome the collective action tend to have monitoring and sanctioning mechanisms, strong social networks, and stable populations (Ostrom 1990). If migration hinders monitoring and sanctioning and destabilizes the population and social networks, villages with high rates of out-migration could be less likely to have public goods.

Second, when individuals are gone longer, it may be more difficult to convince them that the benefits of participation outweigh the costs, even over the long term. The reputational costs of non-participation might lower when there is an exit option – migration. Even the elderly who

are left in the villages may find the calculation to participate no longer makes sense because the benefits of participating in collective action may not accrue to future generations.

Third, determining how many people can participate in communal activities and how many individuals and households need to share public goods is more difficult when people come and go at uncertain intervals and for undetermined lengths of time. Inconsistent residence may increase the incentive to shirk responsibilities because they have an excuse – they are away from the village.⁴⁰ The potential benefits of a smaller group size don't outweigh the costs of losing skilled young adults.⁴¹ Research shows that out-migration increases the amount of time those who are left behind must spend on farm, non-farm, and domestic work (Chang et al 2011). While this is not surprising, it may lead to less time for community activities.

Despite concerns about potential disruption, migration does not break the community ties needed for collective action. Temporary migrants are still accountable to source communities. Recent research suggests that out-migration does not necessarily hinder the ability of villagers to participate in community activities (Qin and Flint 2012). When it comes to participation or benefits, temporary migrants are often still considered part of the source community (Flora 2006 in Qin and Flint 2012). Migrants may be expected to return to participate in communal service obligations, as is the case in Mexico (Diaz-Cayeros et al 2013).

Temporary labor migration is common throughout the developing world, but especially prevalent in China because of the *hukou* system of residence permits. The *hukou*, or Residence

⁴⁰ In terms of Ostrom's framework, unstable populations are less likely to have a reliable set of appropriators (in this case water users) and providers (those who take action to ensure the sustainability of the resource) (1990: 30-31).

⁴¹ Even if public goods provision is more likely with a smaller group (this is uncertain: see Esteban and Ray 2001), those who are left behind are generally the very old and the very young – the least likely to participate in the physical labor needed to construct public goods infrastructure – and the least skilled and educated (Zhu and Luo 2010).

Registration System, ties citizens to specific locations within China and limits an individual's access to social benefits and public services based on the classification (Ha et al 2009).⁴² Those who are born into rural households and designated as peasants (*nongmin*) are only rarely able to change their official designation to city residents (*jumin*). While official residence is not a major barrier to temporary labor migration, the registration system does reinforce cross-national trends that make labor migration temporary and circular (Du et al 2005).

The strength of family ties and *hukou* registration system combined with the temporary nature of migration may mean that the social ties within rural communities remain strong. The challenge for public goods provision through collective action may be arranging an appropriate time to work together and make joint decisions, not identifying participants and beneficiaries. As a result, it is still possible for villages with out-migration to overcome the collective action problem and that migration may not hinder public goods provision.

Migration is a household decision, not one made at the individual level (Mendola 2012; Taylor et al 2003). Temporary migrants maintain ties to their source communities and leave family members behind to continue to farm household land (Taylor et al 2003; Zhao 1999). This is one way to ensure that the household as a whole retains rights to that farmland (Zhao 1999). Households divide their labor – some migrate to the cities to earn cash while others stay at home in the villages in order to avoid losing the only safety net most families have – their agricultural land.

⁴² The *hukou* classification determines where individuals can get access to government medical care, education, and other social services. Individuals registered to the village can only get these services at government subsidized rates in the village. For this reason, it seems reasonable to expect that a lack of water provision in the village is not a motivation for migration. Indeed, individuals who migrate without changing their *hukou* are moving from more to fewer public services. Previous studies find that one of the main causes of migration is income levels and income inequality between source and destination locations.

Migrants leave the village primarily to make money and usually send remittances back to their families in the village. Migrants are usually relatively skilled and educated compared to non-migrants (Zhu and Luo 2010). Households with out-migrants benefit in terms of a rise in income (Du et al 2005) or at least income per capita (Taylor et al 2003).⁴³

Previous research shows that the economic gains from labor migration first go to consumption – taking care of basic needs and getting out of poverty – before going to longer-term investments (de Brauw and Rozelle 2008). This finding suggests that villagers prioritize their short-term benefits from migration, not their longer-term ones. Successful common pool resource management requires a long-term strategy rather than immediate gratification (Ostrom 1990). While there are benefits to migration, added investment in the future – including collective benefits – is unlikely to be among them. At the same time, villagers do not stay away long. Previous research finds that the average time villagers stay away from home is as little as 9 months (Zhao 1999) or as long as 5 years (de Brauw and Rozelle 2008). While these villagers may not be available to help the village on a daily basis, their intention to return and ties to family members in the village suggest that their time horizons may not be shortened, and they may remain invested in the long-term development of the village. On balance, the logic of collective action does not convincingly show that migration has a negative effect on public goods provision. When it comes to public goods provision, the benefits of connections outside the village outweigh any added challenges for collective action.

⁴³ The effect of labor migration on inequality within the sending villages has not been resolved. Some research shows that poor households do not have the means to send migrants out to work and thus remain relatively poor (Du et al 2005). Other research suggests that poor households are more likely to be the beneficiaries of labor migration and thus household inequality declines when there is high out-migration (Zhu and Luo 2010; Ha et al 2009). None of these studies suggests that worse public goods or access to services is a factor in the decision to migrate.

4.3 ARGUMENT

The government plays a role in public goods provision in China. Some villages are capable of organizing public goods without funding or expertise from officials outside the village, but many cannot. Where infrastructure or investment is needed or where public goods provision is complicated due to natural conditions, government involvement is needed. Migrants can affect government provision of public goods by increasing ties outside the village and by increasing the accountability of local government. Migration can weaken the strength of traditional networks like lineages (He et al 2009), but also strengthens networks outside the village. While bridging social capital does not come at the cost of bonding social capital, any weakening of bonding social capital or ability to act collectively is outweighed by greater access to expertise and resources. On balance, adding social capital helps improve government accountability and access to outside resources and, thus, makes it more likely villagers will have access to public goods.

Governance outcomes are rarely explained by only one attribute. In explaining the provision of drinking water, causal heterogeneity is likely. This chapter explains two intersecting and complementary ways that migration improves water provision. I argue water provision is more likely where the village has greater access to external funding and expertise and where the government is more accountable to villagers. Migration increases the likelihood of village drinking water provision because it increases accountability and access to funds and expertise. For this argument to stand, not every village must increase accountability or have external funding, but on average I argue migration will – through one of these causal paths – improve access to drinking water.

MIGRATION & GOVERNMENT RESOURCES

Migration increases the likelihood that villagers will gain access to government and outside resources through two channels. First, migration increases the chance of creating connections between migrants and individuals outside of the village who have access to infrastructure funding. Second, outsider funders often prefer to work with villages where migration is high. Together, these two channels increase the access to resources and thus the likelihood of public goods for villages with higher rates of out-migration.

Villages rely on external resources for most public goods provision funding. Villages suffer acute fiscal constraints and thus rely on the township to fund public goods provisions and fulfill other responsibilities (O'Brien and Han 2009; Wang and Yao 2006). Especially without external support, most villages only have the funding to carry out small projects (Wang and Yao 2006). While remittances may also increase the wealth of villagers, the ability to attract outside funding is especially important. Larger and more complicated projects rely on township and county government transfers. The amount of funding devoted to each infrastructure project has a significant effect on the quality of the outcome (Tian et al 2013). The boost in outside investment that can come from migration improves the likelihood of public goods provision.

Migration helps gain the attention of officials by creating more ties between the township and the village. Especially when it comes to competing with other villages for set amounts of funding, high rates of migration can help draw attention. Officials in county-level offices may pay more attention to villages where there are left-behind children and elderly. These individuals cannot be expected to build their own public drinking water facilities, and therefore the government will step in and provide extra support. In the village of Ping Ba, the government

took over drinking water provision for three of the natural villages because officials felt that the village would not be able to operate a facility without external support.

Connections (including *guanxi* connections) can help officials decide where to locate water facilities. In China, perhaps even more so than in other countries, the quality and extent of connections affect access to funding for village projects (Oi 1989). The government has funding to provide infrastructure, but must decide among villages. Government officials and even NGOs would prefer to provide funding to a people they know and therefore expect to spend the money appropriately. In these cases, there is more chance of success and official recognition of work done well than with an unknown village. Those with connections outside the village are better placed to get more involvement from people who can help with funding and expertise – higher levels of government, companies, or individuals outside the village – than those who have not worked outside the village or don't have family working outside the village.

Even aside from connection issues, funding organs and organizations may prefer to work in villages where migration rates are higher because of the experience villagers have had outside. There are two main reasons for this. First, villagers who have been exposed to city life often tend to be perceived by urban residents as active and ambitious in their efforts to improve their lives and the lives of the village (20140604.GY.03). Those who are lazy or content with the status quo are unlikely to leave their homes for work, so migration is not only a sign of economic need but of the will to take measures to improve the individuals life and the life of their family. These are the active kind of people who NGOs and higher-level government officials from urban areas prefer to work with.

Second, villagers who have been exposed to the world outside the village may be more willing to work with individuals and organs from outside. Bonding social capital can have the

detrimental effect of leaving groups isolated while bridging social capital can make it easier for individuals to cooperate across groups (Woolcock and Narayan 2000). Instead of being wary of outsiders and reluctant to cooperate, the more experienced individuals may be more active in collaborating with those who can help improve life in the village, regardless of whether the funding or expertise comes from within the village or outside it. For these reasons, funding for infrastructure projects is likely to go to villages with high out-migration, and these same villages are more likely to take advantage of the extra resources.

MIGRATION & GOVERNMENT ACCOUNTABILITY

Accountability is also an important piece of public goods provision. First, migration improves government accountability increasing information about conditions in the village to township officials and others outside the village. Second, villagers with information about conditions outside their home village due to direct experience in other places or contact with others who have worked outside the village are more likely to demand government provision of public services.

Migration helps officials may receive more information about the conditions in the village and more pressure to address village needs if the village population is more mobile. Connections outside the village increase top-down monitoring and accountability of village leadership. Given that township leaders and village Party secretaries are appointed, the system promotes accountability to higher levels of government, not the community (Zhao 2013; Tan and Xin 2007). Punishment for misusing funds or inadequately supplying public goods comes from higher levels of government, so increased connections between those who monitor and observe outcomes (villagers) and those with the power the sanction (higher-level officials) matter. While

we know that village leaders can be held accountable if they are embedded in social networks of lineages (Tsai 2007), migration disrupts lineages networks (He et al 2009). Instead of relying on within-village networks for accountability, increased connections and social networks outside the village help with external accountability. When villages are less isolated, more accurate information can pass to the people and organs with power, and local governments can be held accountable.

Less isolated villages may demand more and better public goods and be more aware and vocal when their demands are not met. Those who have been exposed to better public goods in other areas – particularly in urban areas – have a better understanding of what is possible in the village. In particular, migration can also help boost awareness of the ability and responsibility of the government to resolve village problems. Exposure to public services in other areas of the country may make them realize what is possible and demand better services from the government. If local conditions do not meet the standards that they expect or desire, those with migration experience or at least exposure to better government provision outside the village are the most likely to demand better public goods.

Some villages are able to overcome the collective action problem and provide their own drinking water. Those that have not and have only weak connections outside the village will have a more difficult time attracting the attention and therefore funding and support of higher levels of government. Once a water system is built, collective action is easier and in some cases unnecessary for the provision of public drinking water. Thus, despite the apparent difficulties for collective action, the net effect of out-migration on public goods provision is positive.

4.4 HYPOTHESIS

I argue that villages with higher rates of out-migration are more likely to have public goods. Even where natural resources are available, either collective action or government action is needed to get water to the villages. Since temporary labor migration does not sever ties between migrants and the village and instead enhances ties outside the village, collective action is still possible. Even when it is not, the government is likely to be more active where populations are not isolated. The result is that out-migration from rural areas leads to higher rates of water provision in villages.

Temporary migration does not sever links to the village. Population changes are temporary and limited. Lasting family and *hukou* ties ensure that migrant laborers are still invested in their home villages and interested in improving conditions and public goods provision. Upon returning home, these villagers may demand more from their government and be more capable of contributing to common goods both financially and in terms of expertise. Migration may weaken bonding social capital but will also provide an opportunity for building bridging social capital. Higher levels of government outside as well as businesses, NGOs, and charities outside the village are more likely to support local efforts because of increase ties to the village. Where the migration rates are very high but migrants are active, township officials may feel the need to step in and provide services even without the efforts of local collective action.

This chapter thus tests one main hypothesis: *villages with more out-migration are more likely to have dependable drinking water provision than those without*. This hypothesis does not exclude the possibility that other social and natural factors affect water provision in rural areas, but suggests that, all else being equal, a high rate of out-migration improves the chance of public water provision.

4.5 RESEARCH DESIGN AND METHODOLOGY

In order to document the relationship between out-migration and drinking water provision, this study draws on ten months of intensive fieldwork in Guizhou province, China. Guizhou is a relatively water-rich province. According to officials at the Ministry of Water Resources, there are only 2.8 million people in Guizhou without access to water (about 8% of the total population) (20140604.GY.02).⁴⁴ However, only 57% of the villages surveyed for this study have public access to drinking water.⁴⁵ This begs the question: why do villages in this area still lack public drinking water provision?

In this section, I first explain the sources of data used for this study. I then discuss the case selection. I follow this with an explanation of internal migration in China generally and the case of Shi Bing County specifically. Finally, I elaborate how I conceive and measure the variables used in this test.

DATA SOURCES

This study uses a quantitative analysis of villages to explain the effect of migration on public drinking water provision. The main test for this hypothesis relies on data gathered in two townships of Shi Bing County in Guizhou Province. This research design incorporates data from multiple sources, levels of governments, and research sites. This design is especially useful—and therefore common—in studies on China because it helps overcome the added challenges of

⁴⁴ Interviews are cited according to the date and location. A full list of interviews is in appendix C.

⁴⁵ Data on access to safe drinking water at lower levels of aggregation are not publicly available.

conducting research in a difficult context (Heimer 2006).⁴⁶ Data come from two main sources. First, I gathered official government data about each village. These data came from village officials – village leaders, Party secretaries, and accountants – and from township officials.⁴⁷ These official data include the village population, the average income and number of poor households, and the portion of the population working outside the village. These are only available aggregated to the administrative village level.

Second, I visited a random selection of 56 natural villages within Shi Bing County. In each one, I interviewed 1-3 villagers and/or the village leadership – either the Party secretary or the village leader. I asked about the water sources, the community involvement in water management, the involvement of the government – township, county, and Ministry of Water Resources – and the results for drinking water availability.⁴⁸ Whenever possible, I also toured the water provision facilities and water sources for each village. The coding is thus based on researcher observation and informant accounts.

To supplement these two main sources of data on the villages and corroborate my quantitative findings, I also conducted interviews with experts on water management and village

⁴⁶ Many of these challenges are admirably explained in Heimer and Thøgersen's excellent book *Doing Fieldwork in China* (2006). They include the gaining access to data and informants in a non-democratic country, gaining trust and cooperation from local collaborators and informants, accessing documents and data that are only nominally public, as well as the more usual language challenges and cultural barriers to successful fieldwork.

⁴⁷ Village leaders and Party secretaries know their specific villages better than township officials. I therefore do not rely on official townships exclusively for quantitative data but did interview officials about the process of water provision, funding for water infrastructure projects, and other aspects of water provision they were directly involved in.

⁴⁸ Township leaders in particular tend to conflate water infrastructure with water provision. For this study, the distinction between these two is critical. I code water provision only where I observe facilities and infrastructure in use. Village leaders and villagers were clear about the difference as infrastructure without water does not help them.

governance. These included government employees for the Ministry of Water Resources and the Ministry of Environmental Protection. Both of these agencies have roles in drinking water management. Other interview subjects included academics and NGO employees who regularly study water issues and conduct research and development projects in rural villages.

CASE SELECTION

This study looks at rural villages in Guizhou, China. Villages in this area vary widely in the rate of out-migration, the management system for water, and the outcomes of water provision. This study provides insights into the interactions between and among villagers, village leadership, and the natural world in the context of rural China. The findings provide insights into the way development—and its accompanying urbanization—affects rural communities.

While general policy goals are made mainly at the center, governance in China is decentralized and fragmented. Higher levels of government struggle to enforce implementation by lower levels, especially where the extent of compliance is difficult to measure (Lieberthal 1997). There are five levels of government: national, provincial, prefectural, county, and township. Below the lowest official level—the township—there are both administrative and natural villages. Administrative villages are led by a village leader (sometimes called a village chief) and a Party secretary. Natural villages are communities that are usually physically separate and distinct from the other communities in the administrative village. They may historically have been independent villages.⁴⁹ Authority over water, as with governance in China generally, is quite fragmented (Lieberthal 1997; Liu and Speed 2009; Shen and Speed 2009).

⁴⁹ Natural villages were submerged into communes during the collectivization period (1950-1980s). When household farming reemerged in the 1980s, communes became townships, production brigades became administrative villages and production teams became small villages (Oi 1989). This reshuffling has been somewhat irregular and ongoing.

Townships are officially responsible for drinking water provisions, but the reality is that in rural areas public goods such as drinking water provision are the responsibility of the village officials (Zhang et al 2004).

Understanding rural public goods provision must incorporate an understanding of the village-level characteristics because governance requires at least some degree of village participation to implement policies and maintain infrastructure in the rural areas. During this study, most township officials did not know whether the natural villages in their jurisdiction had water provision or not; they relied on the village leaders and village Party secretaries for all information about the state of the village. A government official working for the Ministry of Environmental Protection simply explained, “the Chinese government has a capacity problem” (20140127.GY.01). The township and higher levels of government may lack information about conditions in the village or simply not be able to effectively enforce policy without local support. The village leader and party secretary are thus critical to guaranteeing water provision. But because villagers need to participate in construction and maintenance of government-funded infrastructure, even these village officials need community participation to implement policy. It is therefore appropriate to look at village-level factors to understand rural water provision in China.

Shi Bing County, Guizhou Province

This study compares villages within one county of Guizhou Province in China’s Southwest. I randomly selected Shi Bing County from the 82 county-level administrative units below the prefecture. I randomly selected two townships, Ma Hao and Bai Duo, from the four

town (镇 *zhen*) and four township (乡 *xiang*) administrative units within Shi Bing.⁵⁰ Due to time and resource constraints, I conducted most of my research in two townships, but also visited villages and conducted interviews across Guizhou in order to corroborate my findings and ensure generalizability. In total, this study draws on data from 56 natural villages and more than 86 interviews.

Internal migration within China has grown as restrictions on the movement of people have loosened since the 1980s. Estimating the number of migrants within China is difficult as official statistics do not capture everyone and most migrants are temporary. However, research suggests that between 120 million (Mendola 2012) and 230 million Chinese currently work away from their home villages (Ye et al 2013). In the process, some 58 million children, 47 million wives, and 45 million elderly have been left behind by household members seeking work (Ye et al 2013).

The worry of endogeneity problems has been addressed by previous research explaining the motivation for labor migration in developing countries. Poor public goods provision is not a driver of out-migration. The *hukou* system ensures that migrants give up access to many public goods when they leave the village. Schools, clinics, and retirement benefits are tied to the location where individuals are registered. This means that migrants often give up access to these public goods when they are outside the village. Alternatively, they pay higher rates to receive similar benefits in the city. In the developed world, individuals may move to where they can get

⁵⁰ To randomly select areas of study, I alphabetized and numbered the 82 counties in Guizhou, then selected two numbers between 1 and 82 using <http://www.randomnumbergenerator.com/>. I had originally hoped to compare townships within two counties, but only had time to conduct a survey of villages in one county. The second county selected was Zhen Feng – the location of several villages discussed in Chapter 5 – but due to time constraints, I did not conduct interviews and did some research but could not systematically survey villages there. I began surveying villages in three townships of Shi Bing County (Ma Hao, Bai Duo, and Ma Xi), but again due to time constraints, only have full data on two townships.

better access to public goods such as schools and education, but in developing countries decision to move are rarely driven by public goods (Banerjee et al 2007). The imperfections in land markets in the developing world in general and China in particular make it difficult for households to sell rural land and gain the money needed to move permanently (de Brauw and Rozelle 2008). As Banerjee et al confirm, “stark differences in public goods access in many poor countries have not resulted in much permanent migration across rural communities” (2007: 3128).

Instead, the main driver of migration is relative income – villagers leave home to find higher paying work elsewhere in the country (Zhang and Song 2003; Zhu and Luo 2010). Labor migrants leave their farms to find work and make money in the cities. Migration is a household decision. Not all villagers migrate as they might if public goods were the driver. Those who will be able to make the most money outside the village and thus contribute the most cash to overall household income are the most likely to leave (Ha et al 2009; Mendola 2012; Taylor et al 2003). It is usually the young adults who leave the farm in search of work and send remittances to family members still in their home village (Zhang and Song 2003; Zhu and Luo 2010). These remittances improve family incomes and sometimes village inequality (Du et al 2005; Taylor et al 2003; de Brauw and Rozelle 2008), but also leave more agricultural and domestic work to be done by those left behind (Chang et al 2011).

In the villages in this study, the majority of migrants were between the ages of 18 and 35. Almost all are under the age of 60. Migrants thus tend to be young adults, done with their schooling, capable of manual labor, organization, understanding the constraints of the village and the government, and above all to participate in local decisions and collective activities like building water facilities. Village leaders report that these are the villagers they want to rely on to

undertake village construction projects and community activities (20140826.MH.16). The villages in Shi Bing County, Guizhou are thus a likely place to find that migration hinders collective action and thus hurts public goods. Similarly, the natural conditions in Guizhou require local and collective resource management. This case selection therefore poses a hard test of whether high rates of out-migration lead to better public goods provision.

VARIABLE CONCEPTUALIZATION & MEASUREMENT

Public Drinking Water: Scope and Reliability

This study conceptualizes the public access to drinking water in terms of the both the *reliability* and *scope* of safe drinking water supply. The outcome of interest is public access to tap water. Do households have piped water available year round? Carrying buckets of water from natural springs is common in villages without water provision systems. In this study, the concern is not that individuals will not have sufficient drinking water from any source—I know of no cases where individuals died of thirst—but the way they get access to drinking water.⁵¹ I measure water provision along two dimensions – reliability and scope – dichotomously. For each natural village, I code the two dimensions separately then combine them. In order to have public drinking water access, a village must have tap water provision that is both reliable and broad in scope.

In addition, I code for water access, not just for facilities or infrastructure. This distinction is important. Simply measuring physical facilities may result in overestimation of public goods provision (Banerjee et al 2004; Chaudhury et al 2006). Schools without teachers do

⁵¹ This coding thus reflects provision concerns for public goods generally, not just water. Individuals can educate themselves, visit private doctors, or save for their own retirement, but these are not indicators that public goods are available. This chapter focuses on water specifically but has implications for the joint provision of non-excludable goods generally.

not provide education. Hospitals without medical staff or equipment cannot provide healthcare. Water tanks, pipes, and taps without water do not provide drinking water access. This chapter looks at outcomes as measured by broad and reliable access to drinking water access, not just the presence of facilities.

In terms of *reliability*, drinking water must be available year-round. The quantity of drinking water can vary seasonally, as Guizhou has a monsoonal climate. In almost all cases, this weather pattern means that gaining access to water is easier during the summer months. Village water supplies may be generous during the summer but run dry in the winter. This may be due to either a limited supply or poor management of the resources available, for example if villagers waste water during the summer months. Common pool resources like water are by definition rivalrous. When one villager uses the water, others cannot. The extent to which all villagers are able to gain sufficient drinking water all year round tells us whether the village is capably managing their water resources. Water provision that is only useful seasonally or that regularly fails to provide sufficient water is not considered reliable.

The *scope* of water supply refers to the proportion of the village that shares access to a common source or water supply system. Water supplies vary in scope because some of the natural sources and some of the water provision facilities only supply water to parts of a village. Both management issues and quantity issues may be linked to scope. Where water quantity is limited, one of the ways to make it last is to limit the number of villagers who are allowed access to that water. In this case, the quantity for some villagers is enough but the scope of supply is limited. However, common pool resources like water and public goods like drinking water provision are by definition non-excludable. One way to manage resources is to privatize or divide management, but this is no longer public goods provision. Where there are multiple

sources that are used by distinct and exclusive groups of villagers, the water is supplied as a club good, not a common pool resource. When there is not one common system of supply for all villagers in a natural village, this is no longer a common resource and cannot be counted as successful public goods provision. While there are cases where villagers opt out of a common system, if they have the choice to use a water source or system that is available to everyone in the village, I consider water provision as broad in scope.

There are thus four possible values for the scope and reliability of village drinking water supply: reliable and broad scope, not reliable but broad scope, reliable but narrow scope, and not reliable and narrow scope. Of these, I consider only villages with both broad scope and reliable water supplies to have public goods provision. Villages where water is only accessible to a portion of the village or where water is not supplied year-round do not have effective drinking water provision and thus lack public goods provision.⁵² The table below illustrates the coding of villages that fall into each of the categories.

Table 4: Does this village have public drinking water provision?

	Reliable	Not Reliable
Broad scope	Yes	No
Narrow scope	No	No

Among the villages studied here, leaders reported 72% had water provision systems (infrastructure systems) but only 58% of natural villages have water supplies that are both broad in scope and reliable.

⁵² This is coded for a typical year according to the villagers' reports, not an abnormally wet or dry year.

Migration

To measure the number of people temporarily away from the village, I use data provided by village leaders, party officials, and village accountants. These officials provided data on the village population and the number of people who were working away from the village in the summer of 2014. I measure out-migration as a proportion of the total population. While these individuals all still have *hukou* registered to the village and are on the official list of residents, they are, according to government officials, not regularly present in the village. This variable ranges from as little as 5% of the population in Shi Jia Wan village of Bai Duo township to more than 40% in Jin Zhong village of Ma Hao township. On average, village leaders report that 22.6% of villagers are away working. Overall, Shi Bing County mirrors previous research findings that income drives labor migration (Zhu and Luo 2010). Villages with higher income have less migration (corr = -0.5).⁵³

Control variables

Water Source Characteristics

Each village faces unique challenges in accessing drinking water supplies because of the different characteristics of the available water sources. In exploring the effect of migration, I therefore control for the ease of providing drinking water by incorporating a measure of the source favorability. Sources that are appropriately located, large, and stable are considered

⁵³ It would be useful to also measure the social capital of villagers and the extent to which migration grows bridging and shrinks bonding social capital. However, social capital is dynamic, multidimensional, and difficult to measure (Woolcock and Narayan 2000). Quantitative network data or alternative measures of rural social capital are still unavailable. This measure is indirect. Migration provides the *opportunity* to build bridging social capital, which villagers who stay in the home may not have.

favorable for village drinking water. Of the 56 villages surveyed, 25 villages or 45% have favorable water sources.

There are three key characteristics that determine the ease of using the water supply as a reliable drinking water source for a broad population: the location of the source, the size and number of sources, and the stability of the source. First, sources that are located in the middle of a village or above a village are easier to access than those that are below. The location determines whether piped water supplies require pumps or can use gravity and determines whether the whole village or only part of the village can easily use the water.

Second, the size of the water source and number of water sources is important. Where there is one large water source, it is likely that the whole village will share that drinking water. Where there are many small sources, drinking water provision does not need to be centralized or coordinated among all the villagers but can be more easily split into smaller groups or households. Single sources require cooperation across the village in order to guarantee drinking water access for everyone.

Finally, the stability of the water source is important. The most stable water sources are reservoirs, but these are not commonly constructed for village drinking water use in rural areas of Guizhou (20140604.GY.02). Most villages use local springs, but some of these have more consistent flow than others. Seasonal springs may be great water sources in the summer but during the dry season the villagers need other sources of drinking water.

Average Income

The model includes average income as a control variable. Average income varies depending mainly on whether the village is able to grow cash crops like tobacco. Villages in Bai Duo and Ma Hao Townships range in average income from 1200 RMB to 6500 RMB, with an

average of 3427RMB (\$553USD). Villages with higher incomes may be able to coordinate more easily or contribute money to communal infrastructure. Average income is available at the administrative village level.⁵⁴

As discussed earlier, the main driver of migration from the villages is income. Most villagers leave in order to find higher paying jobs in the cities. According to previous research, income inequality between cities and rural areas is one of the main drivers of internal migration across China (Zhang and Song 2003). The households that are most productive locally are less likely to migrate (Zhu and Luo 2010). Leaders report that villagers in tobacco growing areas are unlikely to leave the villages for the cities because they can earn cash by selling tobacco and other cash crops. The poorer villages tend to only be suitable to grow rice and other necessities. Including average income helps control for the selection effect of migration.

Alternative explanations

Two alternative explanations were also tested. The first is the remoteness physical distance between the natural village and the township center. Villages range from 0 to 30 kilometers distant from the center of the township, but this has effect on outcomes or on the likelihood of villages to migrate out of their villages. The second is ethnic makeup of the village. As Chapter 3 demonstrates, ethnic makeup at the county level affects the likelihood of government spending. However, ethnic identity does not affect the likelihood of migration or drinking water provision. While there are overall higher rates of out-migration from villages in

⁵⁴ For reliability, I also asked village leaders to provide the number of households below the poverty line. Village leaders are partly responsible for ensuring those households get government financial support and are therefore more likely to know the number of households in need than to calculate average income. The correlation between the percentage of households that are below the poverty line and the average income is high: (-.82). However, this measure is available for slightly fewer villages, so I include average income here.

Shi Bing where the minority population is larger, this is due to the relative poverty to minority villages. For reference, Table 3 presents the Percent_Han and the distance to the township center for the administrative villages where village leaders could provide reliable data. Natural villages in Guizhou are almost all single-ethnic-group, but a few administrative villages have minorities from both the Dong and Hmong ethnic groups. Bai Duo township is almost entirely Han, while Ma Hao is predominately Hmong.

Table 3: Administrative Villages				
Township	Village	Distance to Township	Percent_Han	Percent Out Migrant
Bai Duo	Bai Duo	0	0.98	0.09
Bai Duo	Ban He		0.95	0.07
Bai Duo	Gu Ding	13		0.06
Bai Duo	Sheng Xi	15	0.96	0.06
Bai Duo	Shi Jia Wan	10	0.96	0.05
Bai Duo	Wang Jia	10		0.06
Bai Duo	Xin Guan	30	0.94	0.28
Ma Hao	Bing Dong	12	0.00	0.21
Ma Hao	Bing Xi	19	0.00	0.37
Ma Hao	Huang Gu	28	0.00	0.37
Ma Hao	Jiang Yuan Shao	11	0.37	0.20
Ma Hao	Jin Zhong	0	0.12	0.42
Ma Hao	Lao Xian	6	0.16	0.21
Ma Hao	Liu He	17	0.01	0.20
Ma Hao	Lou Zhai		0.30	0.30
Ma Hao	Ping Ba	27	0.00	0.28

4.6 STATISTICAL EVIDENCE

The statistical results demonstrate that villages with higher rates of out-migration are more likely to have public access to drinking water. I estimate the effect of migration on drinking

water provision using hierarchical logistic regression. The initial results are presented in Table 2, below. The percentage of out-migration and source favorability are both significant at the .05 level; the Wald chi-squared is 8.45.⁵⁵

The data used for this test are available at two levels of analysis: the natural and administrative village levels. Data on income and migration are only available at the administrative village level. Water source favorability and the dependent variable of public drinking water access are coded at the natural village level. While neither natural nor administrative villages are official levels of government, the administrative village does have responsibilities including data collection for the township. Government-provided data is therefore aggregated to the administrative village level. In this sample, there are between 3 and 19 natural villages in each administrative village. While I have data on 56 natural villages, missing data at the administrative village level drops the number of observations to 39 natural villages clustered within 9 administrative village groups.

For ease of interpretation, I convert log-odds into predicted probabilities for natural villages with favorable and unfavorable water sources and holding average income at the mean. There is a clear positive relationship between out-migration and the probability of public drinking water. For villages with favorable water sources and average income, the probability of having public drinking water increases from .55 to .97 as migration increases from 10 to 40 percent of the population. Even just a 10 percentage point increase in migration from 10 to 20 percent increases the probability from .55 to .79. I include a table of predicted probabilities in appendix D.

⁵⁵ When income is not included as a control, percent out-migration is significant at the .1 level.

Table 5: Explaining Village Water Provision

Variable	Logit
Percent out-migration	11.5097* (5.6285)
Source favorability	31.1173* (.4318)
Average Income	.0004 (0003)
Constant	-3.5799 (2.1779)

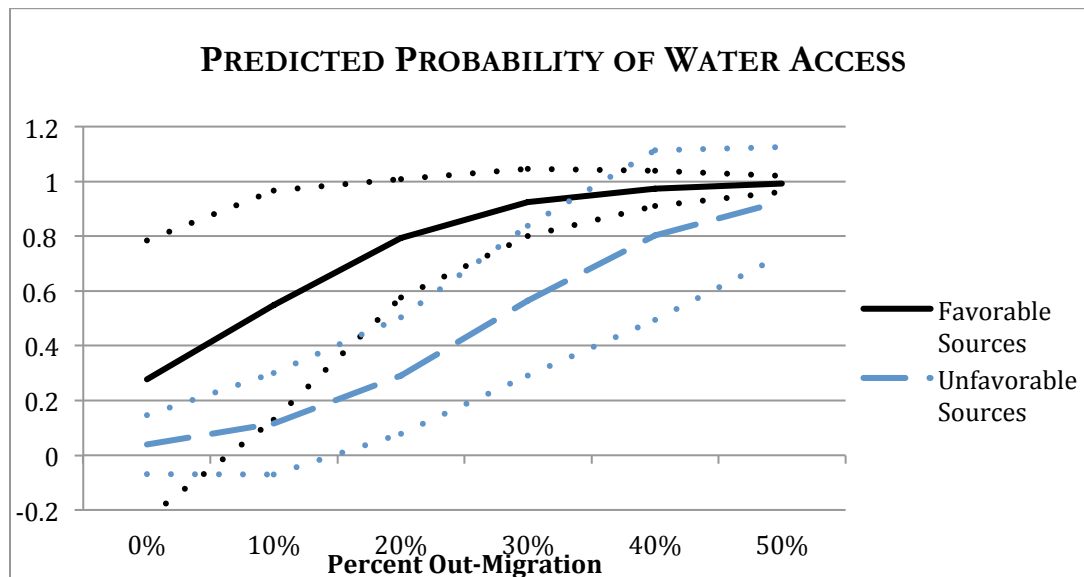
N = 39, groups = 9

Standard errors in parentheses

**p* < .05

Wald chi2 = 8.45

The graph below shows the predicted probabilities of water access and 95% confidence intervals. The two lines are the predicted probabilities for favorable and unfavorable water sources, holding average income at the mean. There is a clear positive relationship between the rate of out-migration and the probability of public water access.



If migration disrupts village water provision through collective action by destabilizing the population and all drinking water relied on collective action, we would see the opposite relationship – villages with higher rates of migration should have lower probabilities of public

water provision. These findings are not in keeping with an explanation based on only bonding social capital and its effect on local collective action. Instead, it seems that connections outside the village increase the likelihood of finding other ways to guarantee public goods provision.

4.7 DISCUSSION

The statistical evidence demonstrates that villages with higher rates of out-migration are more likely to have public access to drinking water than those with low migration rates. While some villages have drinking water provision primarily because they have been able to set up independent and self-organized water provision systems, this is not common. Migration can help get the local government investment and improve accountability of local government.

The two administrative villages of Jin Zhong and Ban He illustrate the observed statistical relationship. Only 7% of 1428 villagers registered to Ban He are labor migrants. While officials report that all 19 natural villages have water provision systems, only 1 of the 4 surveyed had reliable and broadly provided drinking water. The administrative seat of Ban He has a large drinking water provision system that was meant to provide water not only to the central village of Gan Ma Ping, but also to the surrounding villages (201040731.BD.11, 201040731.BD.12). The system briefly supplied water as designed, but the neighboring villages of Lao Zhai and Gao Ao no longer can get water from the Ban He system (201040731.BD.14). There is no recourse for these villagers. Several villagers simply explained that the leaders change from time to time, but they are not active (主动 *zhudong*) enough to make a difference (201040731.BD.16) and instead of resolving village problems, only follow orders from higher-ups or take care of themselves (201040731.BD.18). This is in keeping with the literature on village leaders and especially Party secretaries – they are accountable to higher levels of

government more directly than to the village population (Zhao 2013; Tan and Xin 2007).

Villagers in Ban He do not feel that their leaders are accountable to them and therefore did not make changes to failed water provision systems. The head of water, forestry, and agriculture for Ma Hao township emphasized that the quality of the leader is the main cause of the difference between villages that manage their water effectively and those that do not (20140825.MH.12). I do not claim that the only reason for a lack of accountability and good governance observed here is a low rate of migration, but the isolation of this village from outside investments and the related lack of local government accountability has not helped these villagers overcome their water provision challenges.

In contrast, Jin Zhong village has high out-migration and high rates of drinking water provision. Jin Zhong administrative village has a total population of 4606. Of those, 1947 people – more than 40% - are working outside the village. Still, 16 of the 17 natural villages within Jin Zhong administrative village have reliable and broad access to drinking water. Most of the water supply systems were built by MWR or funding organizations outside the village. For example, Long Jing village has two water cisterns, one built with investment from the MWR and the other using investment from the MWR and an Australian charity (20140825.MH.14). A third water system to serve a difficult to supply section of Long Jing village was under construction during my fieldwork in 2014. These systems were only built because the village leader was able to attract outside investment and construction support. As the party secretary acknowledged, the villagers didn't know how to built a system that would work without leaking and didn't know how to assess the quality of materials. External help was critical for water provision outcome.

The design of the water provision system plays a role in its longevity. While some of the water systems in Long Jing and other natural villages of Jin Zhong leak, they are still able to be used. In part, minor repairs and upkeep is possible because most of these systems were built with water meters or designed to require water user fees. These help ensure that the village can afford maintenance and guarantee usability of the system longer than those without water fees or meters.

The challenge for ongoing water supply systems is that the purchase of water meters makes the initial construction of a water provision system more expensive and thus demands external investment. Water meters that allow the village to collect fees for water use and continue to provide each village with funds for maintenance and repairs are especially important. Xi Kou village raises around 2500 RMB every year and uses the money to cover repairs to the water provision system (20140826.MH.17). Neighboring Bing Dong village does not have water meters and therefore has been unable to pay to repair recent damage to the water provision system caused by the construction of a high-speed rail link near the village (20140826.MH.16). Part of the Party secretary's appeal for funding to MWR and township officials is that the village cannot resolve its water problem alone because so many (40%) of the villagers are away working. Partly because village finances are increasingly strained, the ability to convince external funders that they should invest in the village is critical to public goods provision. Even those within the MWR admit that the selection of projects for funding is related to relationships (关系 *guanxi*) and not just need (20140825.MH.12). However, villages with high migration rates have both a need for help from government planning and investment and potentially more connections with those in influential positions outside the village.

Those who fund infrastructure projects are more willing to spend money in villages where they are confident money will be well spent and projects will result in water provision. Ministry of Water Resources officials and environmental NGO workers in the provincial capital of Guiyang prefer working with villagers who have previously worked in the cities (20140604.GY.03). They prefer to work with people who have experience outside the village because they are easier for those from urban areas to work with and thus funding organizations expect them to be more reliable partners. They perceive villagers who have gone to the city and then returned to be more active in community life and more capable of leading and managing projects. These interviews suggest that isolated villages where individuals have little exposure or experience in the city are more of a challenge and a risk for NGOs and MWR projects. All else equal, these funding organizations prefer to provide investment to villages where they can be confident of success and find working with the villagers easier – villages with high rates of circular migration.

4.8 CONCLUSION

This chapter has addressed the effect of migration on drinking water provision. The relationship and interaction between communities and government best explains the observed variation in drinking water access. While it seems likely that village collective action would suffer when out-migration is high, migration has a positive relationship with public goods provision in source communities. Migration helps increase the likelihood of public drinking water access because it provides an opportunity for villagers to make connections outside the village. These connections in turn lead to higher levels of government investment and local leadership accountability. Migration is not only beneficial because it helps raise households out

of poverty. This research demonstrates that out-migration can also help increase the state's ability to meet community needs.

CHAPTER 5: INFRASTRUCTURE DESIGN AND COMMUNITY MANAGEMENT

5.1 INTRODUCTION

Why do water-rich villages sometimes lack drinking water access? What can water-poor villages do to gain drinking water access? From previous chapters, we know that government spending on infrastructure is not evenly distributed among counties and that the connections created through labor migration facilitate public goods provision. However, not all government funding and infrastructure construction in rural villages leads to effective drinking water provision. While public spending, migration, or source characteristics play a role, they do not determine governance outcomes in all contexts. In our efforts to understand public goods provision, the local context, community relations, and project design are often critical components.

Governance outcomes are best explained by looking at a combination of government policy, local institutions, and cooperation and accountability among actors in the governance system (Andersson et al. 2009). Governance outcomes like drinking water provision are not the outcome of only government institutions or policy, but instead is the product of the interaction of local communities and the government. This chapter focuses on the role that local communities play in determining drinking water provision outcomes.

Neither government nor community-focused approaches explain the full range of variation in public goods outcomes. In developing democracies, institutional configurations alone do not explain the full range of variation in collective resource management (Andersson et al. 2009). Resource-related and community-related factors affect the likelihood of collective action to provide public goods, which are especially important for public goods outcomes when there is a lack of government (Ostrom 1990). Previous chapters have focused on the role of government in drinking water provision, but these explanations are incomplete without an

examination of local contexts and the ability of community dynamics to affect governance outcomes. This chapter turns the focus to local community dynamics and their influence on governance outcomes, generally, and drinking water provision, specifically, even where the government is not responsible for the outcome.

THE PUZZLE

Two villages in Zhen Feng County, Guizhou illustrate the need for more than just favorable water sources and shared infrastructure. In these villages, the degree of involvement of villagers and the design of the water provision systems determine water provision. These two villages are both remote, relatively poor, and in a dry area of Guizhou. They are both near to an internationally owned gold mine, one of the largest in Asia. However, Jin Shan has no shared drinking water access while Ni Luo does.

Jin Shan village uses water pumped from a river by the mining company, at no cost to the villagers. There are also several wells and springs located throughout the village that were the main source of water before the gold mine provided water.⁵⁶ Water is abundant because of the mine company. However, in Jin Shan, water is syphoned off of the main pipes and wasted at such a rate that the community water taps have run dry.

In contrast, Ni Luo village does not receive any water from the company. There is a small centrally located spring in the village and a larger spring located in a valley a few kilometers from the village. The government designated money to build a water system to pump water from the spring in the valley to the village, but the money was not sufficient to build a

⁵⁶ One of the springs has been dry for the last 2 years, probably because of a lack of rain (20140227.JF.01). Interviews are cited based on the date of the interview, location, and interview number. I include a list of interviews cited in the works cited section.

large enough tank or a strong enough pump to serve the entire village. The village added private funds to the government's investments in order to complete a water provision system. Had the village used only government funding to build a water provision system, only the lower houses in Ni Luo village would have reliable drinking water access. Ni Luo has more difficult circumstances but, unlike their neighbors in Jin Shan, residents of Ni Luo have reliable drinking water provision.

The experience of two villages suggests that in some cases something more than a favorable water source and government funding is needed to guarantee the provision of drinking water. For these two villages, the design of the project has a great influence on water access. Project design refers to physical characteristics and their appropriateness for the context. More specifically, the physical design characteristics include the location of the water storage, the presence of meters or taps that can be turned on and off for the whole village, and pumps. Community design characteristics refer to the extent of community involvement in process of designing, building, and creating rules for drinking water facilities. Certain physical characteristics of project design make the management of infrastructure and water quantity easier for the community to sustain. In particular, water meters help limit over use and assess fees that can help pay for maintenance. In Jin Shan and Ni Luo, project design affects the ability of the communities to manage both the infrastructure and the quantity of water and thus the ability of these common systems to provide reliable access to drinking water for the whole village.

Why aren't all investments in drinking water infrastructure effective at providing access to drinking water? While villages can create their own infrastructure and drinking water management systems, this chapter argues that projects that are designed to ease community

management of infrastructure and water quantity are more likely to have a lasting and positive effect on drinking water provision.

5.2 THE LOCAL CONTEXT

Drinking water provision in Guizhou is a local issue. Even when there is external investment, the demands of the local community and their ability to act collectively have a direct effect on drinking water provision. Infrastructure can make water more easily accessible, can provide storage for intermittent supply, and help access sources that are less conveniently located. Not every community needs collective action or formal management systems; the needs of different villages depend in part on the natural conditions and infrastructure needed for water access. While both water source characteristics and external investment in infrastructure can influence drinking water provision, neither determines outcomes. The dynamics within the community can ruin infrastructure and waste favorable sources or can overcome poor infrastructure and unfavorable water sources. Community relations and the ability of the community to act collectively matter for public goods outcomes.

Source characteristics vary by village and make it easier to manage drinking water in some villages than in others. Resource-specific factors include the feasibility of improving the resource and its predictability. Where sources are large and flow year round, there is no need for water quantity control mechanisms such as water meters or restrictions on water use. Alternatively, when there is less water, villagers must either find a way to limit water withdrawals or face shortages in the dry season. The characteristics of the water source determine the ease of guaranteeing consistent access for all villagers without any kind of coordination or management. The ease or difficulty of access can affect the likelihood of creating

water management systems but also affects the infrastructure needs of the community. Where water is abundant, controlling the quantity used it is not likely to be a salient issue and villagers may devote less effort to creating water provision systems. Where water is scarce, free riders may be detrimental to a water provision system, where they may only be a slight hindrance if water is so abundant that per capita needs are met even if some individuals free ride (Banerjee et al 2007).

Community factors affect the likelihood of collective action and thus the management that is sometimes needed for drinking water provision. For example, trust among villagers, leadership accountability, social capital, and previous experience with collective action can all play a role (Ostrom 1990; Tsai 2007; Banerjee et al 2007). Leadership also helps communities work together and develop systems to manage resources effectively and enforce the rules of those systems. Villages that can manage one type of public project effectively are also likely to see success in other public works projects (Tian et al 2013). Villages that are able to cooperate and work together will manage even difficult drinking water conditions. In contrast, villages with poor governance will have difficulty providing drinking water, regardless of natural conditions or external investment.

While the dynamics of the local community play a role in collective action and community management of water resources and infrastructure, outside funding does not always take these dynamics into account. Partly for this reason, spending and infrastructure construction do not necessarily lead to public goods outcomes (Banerjee et al 2004). However, project design can make management easier and thus more likely even in villages that do not have a history of collective action or cooperation (Khwaja 2009). Inclusion of local knowledge of social and geographic constraints improves the likelihood of designing appropriate resource management

solution (Hilton 1992; Andersson and Ostrom 2008). Especially over the long term, project design can help communities compensate for poor leadership, social capital, or challenging natural conditions. For public goods outcomes, both good villages and good projects matter.

5.3 ARGUMENT

Water management refers to village-specific rules or procedures that relate to the process of drinking water provision. There are two areas of water provision that require local community cooperation on management: the maintenance of facilities and controlling the quantity of water used. Not all villages require either quantity control or shared infrastructure to get water, but in the cases where either of these two challenges exist, cooperative management is needed.

Infrastructure designs that ease community action around the issues of quantity and maintenance will be more likely to result in public drinking water access, especially over the longer term. Most specifically, projects that include water meters are more likely to lead to effective drinking water provision. These are not the only way to resolve problems of maintenance and water quantity nor do they completely obviate the need for village coordination, but water meters can help even villages where collective action seems unlikely to provide public drinking water access. In addition, community input on the location, use of pumps or taps, and rules of operation help make infrastructure projects more successful and help ensure that water meters are used effectively.

First, over time shared infrastructure requires maintenance. Government investment can provide water in the short term, but do not include money for repairs or improvements after the initial construction. Government infrastructure without maintenance quickly falls into disrepair. In China, villages have the responsibility and autonomy to develop their own maintenance

schemes. Therefore, after the initial investment, unless investment is accompanied by locally coordinated management, villages that receive government investment are no better off than those that do not get government funded infrastructure. Some facilities are built with water meters, which eases management by providing a means collect fees to use for maintenance. While the village must still define responsibility within the village for collecting fees and arranging repairs, this is significantly easier when there is away distribute responsibility for fees in a way that is transparent. Villages that have mechanisms for infrastructure maintenance are more likely to have drinking water provision.

Secondly, while water source favorability plays a significant role in drinking water provision, communities can overcome difficult natural conditions by coordinating drinking water systems. External funding can provide the infrastructure needed to access water that is at a lower altitude than the village or not centrally located. If the water source is below the village, fees for shared water pumps and pipes are necessary. In addition, where the water supply is insufficient, villages need systems to guarantee there will be sufficient water in the dry season. Clearly, villages with unfavorable water sources face complex circumstances in providing drinking water, but water meters can ease management by incentivizing villagers to limit their water use and assessing fees to cover maintenance and electricity for water pumps. Government infrastructure without water meters can still provide water, but the hurdle for effective collective action will be met by fewer villages than if the infrastructure design eases management. The process of design must include villager input, however, as only the villagers have the local knowledge to know the reliability of water sources, where water systems should be located, or what operational regulations they will be willing to follow.

5.4 RESEARCH DESIGN

This chapter uses qualitative evidence to test whether project design affects access drinking water in villages with shared infrastructure, unfavorable water sources, or both. The research design compares villages in two counties of Guizhou. As discussed in the previous chapter, the data are drawn from 10 months of fieldwork, visits to 56 villages, and interviews with more than 80 villagers and village officials. These interviews allow me to assess not only whether water is currently provided as coded for the quantitative dataset used in the previous chapter, but also the history of water provision in the village, the challenges villagers have faced, and the extent to which management is an issue. This is particularly important because I argue that management is necessary for *long-term* water provision. Villages that have water today will not tomorrow if the water system breaks down or source dries and there is no system in place to address these challenges.

There are many systems to manage water and distribute responsibility for facilities maintenance and no single, easily measurable factor that generates or disrupts community management. Therefore, this chapter draws on qualitative methods to exploring causal heterogeneity (Mahoney and Goertz 2006). In an effort to illustrate the role of project design and management, this chapter focuses on the exceptional cases – villages where we would expect to see drinking water provision but do not. The cases are not meant to be representative, but demonstrate where collective action and the insights gained from collective action research are especially applicable. However, this chapter is not simply a structured comparison of off-the-line cases. The brief description of Jin Shan and Ni Luo illustrate the phenomenon in a direct comparison, but I draw on all 56 villages to illustrate a broad range of locally determined needs and means of drinking water management.

Infrastructure facilities in China do not have an expiration date, but can quickly fall apart.⁵⁷ There are a variety of ways to organize management and determine responsibility for maintaining water systems; each village has its own history and legacy of cooperation or conflict. Qualitative methods and interviews help explore long-term concepts instead of just looking at whether there is water today or a pipe has broken this week (Pierson 2005). I do not explicitly measure different types of community management, rules, or the duration of systems, but assess whether management systems are designed to address future problems by defining responsibility for maintenance that is not yet needed, collecting fees for future repairs, or rules that will be used to organize potential repairs. This section begins with an overview of the types of water sources and provision systems most common in rural Guizhou before proceeding to variable measurement.

VILLAGE WATER PROVISION IN GUIZHOU

The natural environment varies significantly within Guizhou. As we know from the previous chapter, water source favorability affects provision outcomes. Source characteristics also affect the need for management and the type of infrastructure needed to provide broad and reliable access to villagers. In order to understand village water conditions and the context in which community management takes place, this section explains the most common types of water provision systems in rural Guizhou.

WATER SOURCES

The most common source of drinking water is a local spring. More than 90% of villages surveyed here got at least some of their regular drinking water from a natural spring in or near

⁵⁷ For example, some infrastructure projects in rural China are called “tofu project.” They look nice when first constructed, but are easily smashed.

the village. Springs are common in karst areas. However, while some springs are large and reliable year round, often the amount of water available varies – sometimes dramatically – between the wet and the dry seasons. Karst land formation complicates gaining access to water because few underground rivers have been mapped (Baker and Groves 2008). For this reason and because of the price of drilling, there are few wells.⁵⁸

The other possible sources of drinking water are rivers and reservoirs. The most stable water sources are reservoirs, but these are not commonly constructed for village drinking water use in rural areas of Guizhou because they are expensive to build (20140604.GY.02). Reservoirs are more common for cities and large urban centers. There is one reservoir in Bai Duo township that serves 3 natural villages in Bai Duo administrative village. There is another reservoir in Ma Xi township, but it only serves one of the eight natural village within Tang Tou administrative village. Rainwater is sometimes collected, in particular on the flat roofs of villagers in Zhen Feng County and in the west of Guizhou. This water is rarely used for drinking but is collected on each roof during the summer rains partly to keep the houses cool during the summer.

Residents prefer to drink water from springs because they trust the quality of the water more than water from reservoirs and rivers (20140823.MH.01, 20140817.BD.33, 20140724.BD.05). There are a few small villages that use water from a river for washing, but residents are reluctant to drink river water because they are concerned about pollution. None of the water systems surveyed had any kind of filtration or purification system to deal with pollutants. Residents in Bai Duo township center have tap water from the reservoir, but many households buy bottled water to drink instead of using the government-provided tap water.

⁵⁸ Only one of the villages surveyed used wells. Lao Xian is located on a sandy plain where the water table is just below the surface. Almost every house has a hand pump in the yard, but villagers prefer to use this only for backup. The main water source is a spring located in the hills outside the village.

Residents say this is because the water is slightly yellow, especially after heavy rains when the river is not clear, but the village leaders suggest that the ability to buy bottled water (at 8 RMB per tank) is a sign of the wealth of the villagers (20140918.BD.03).

WATER ACCESS SYSTEMS

The size, location, and cost of infrastructure varies between villages and between water sources, but there are several commonalities. Any spring that is used for drinking water is improved, either by groups of private citizens or, more often, by the government. Villagers can either use these improved springs to collect buckets of water or connect pipes to bring running water to their houses. No one goes thirsty in Guizhou.⁵⁹ Lack of access to water means the village has no piped water. In these villages, residents must carry water either from local springs or from more remote sources outside the village. This section discusses the different kinds of improvements made to water sources to make them accessible and useable as public drinking water supplies for each village.⁶⁰

⁵⁹ During droughts, the government has brought in trucks of water to provide to villages where water sources have gone dry.

⁶⁰ Individuals do not have private water rights in China. The Chinese state owns all land and natural resources, including water. However, there are instances in the villages of de facto private water rights. In villages where there are multiple small springs but there is no common system of tap water provision, individual families or groups of families can build the infrastructure improvements to the natural springs. In some villages, this is often easier for individuals or self-selecting groups of households to organize their own water supply instead of relying on the village as a whole to cooperate. The families that organize and pay for the improvements to the water source have rights of access to this water source. The family that has the right to improve the water source is determined on a first-come, first-serve basis. If other individuals or families want to gain access to that water supply, they must pay those who originally improved the source a portion of the original cost. There are also instances of springs located on “private” land. This land is, of course, only de facto private, not de jure. The other semi-private access to water is through private water pumps. Private pumps can be placed in public basins as long as the water is sufficient for everyone’s use. Often, these are removed in the dry season. This way, everyone has equal access to limited common water supplies.

Public Water Basins

The simplest form of public drinking water access is a basic cement basin to collect and provide easy access to spring water. In every village with an improved spring, there is a cement pool built to collect the water, usually directly on top of the spring and always with a cement roof. Water can be drawn from the pool and then the spring will refill the basin. Overflow from this covered spring flows either into other basins or into the ground away from the spring following the spring's natural runoff pattern.

Springs with sufficient flow have a series of pools linked together. The more basic and simple springs have an initial basin for collecting drinking water, then overflow from that goes into a basin for washing vegetables. The bigger the spring, the more pools can be constructed and the bigger the pools. For example, Shuang Jing (双井), whose name refers to its twin springs, has four basins flowing from each of its large springs. The first basin, as in all villages, is for drinking water. The second is for washing vegetables or things for human consumption, the third for washing food for animals, and the fourth for washing clothes. The pools closest to the source are for activities that require cleaner water, and as the water gets farther away from the source, it is used for what are considered to be less clean activities and activities that do not require clean water.

The rules governing the use of spring water from public basins are generally self-enforcing. Indeed, there is no incentive to misuse any of the pools. The pools for drinking would be inconvenient to use for washing because of they are covered, or at least water would need to be removed from the basin before being used for washing of any kind and the runoff would therefore not be returned to contaminate the drinking-water basin. This keeps the drinking water as clean as possible.

Tap Water

The most common infrastructure to provide running water is a simple cement cistern to gather and store water drawn directly from a spring. The water from these cisterns is then distributed to common taps, or more often, taps in the yard of each household or group of houses. These appear simple in their construction and maintenance, but many are still poorly constructed and leak. Some are in such disrepair that they can no longer be used.

Getting water from the cisterns to the villagers is easiest when the spring – and thus the cistern – is located at a higher altitude than the village. In this case, gravity brings the water from the collection point to the villagers. Where the source is at the same level or is below the village, the villagers who want tap water need to coordinate to purchase a pump to get the water from the source to the houses. In villages where there is a pump, there are always fees for water, either a flat fee or a metered fee for the amount used, which are used to pay for the electricity for the pump. These village systems require maintenance and ongoing coordination or the water supply will no longer be accessible. In most cases, water fees cover the costs of monitoring and maintenance.

VARIABLE CONCEPTUALIZATION & MEASUREMENT

Dependent Variable: Drinking Water Scope and Reliability

As explained in more detail in the previous chapter, the outcome of interest is public access to drinking water in each natural village. This is a dichotomous measure determined by the scope and reliability of drinking water. Across all the villages surveyed, 58% of natural villages had water systems that were both broad in scope and reliable.

Key Independent Variables:

Project Design

Infrastructure projects can be organized by the community or initiated by external funding organizations such as NGOs and county governments. Infrastructure projects are usually very similar – large cement cisterns with pipes for access. The key difference between projects is whether there are water meters at each villagers' point of access. There are other aspects of project design that can affect drinking water outcomes. For example, the location of the facilities can limit water access to only part of a village. Water access points can be communal taps or individual taps outside each home. The complexity of the project can also vary, as some systems require pumps. However, the main measurable variation in infrastructure is between projects with and without individual water meters.⁶¹

Community Management

Community management in rural China refers to a number of different schemes to monitor and enforce rules guiding water use and facilities maintenance. The means to achieve the two goals of controlling quantity of use and maintaining facilities can be achieved through separate systems, but both are necessary. According to Ostrom (1990), design principles that make common pool resource institutions long-lasting and effective include (1) clearly defined boundaries, (2) congruence between users and those who contribute to provision, (3) collectively agreed rules, and (4) monitoring and enforcement mechanisms. In the context of Chinese villages, every water user must agree to participate in the system and contribute to its upkeep, rules must be publicly agreed, and there must be monitoring and enforcement mechanisms. In terms of defining boundaries, every household in the natural village must either participate or

⁶¹ Project construction quality should also be a concern, but cannot be assessed with the data currently available.

choose to opt out. Excluding households who want to join the public water system is not effective provision of public goods.

Because every village develops its own context-specific and context-appropriate system, management can be thought of dichotomously – either a village has a water management system or it does not. Indicators of a management system include (1) an individual, household, or group of individuals have responsibility for system maintenance for a designated time period, and (2) water availability is controlled as needed. Effective water management does not mean that water must be available 24 hours a day, 7 days a week. It should simply be available in sufficient quantity for household use at predictable intervals.⁶² As this chapter uses qualitative analysis, I discuss the details of a range of management systems in the analysis below, but reference these two characteristics to identify whether water is communally managed or not.

Other Independent Variables:

Water Source Favorability

As explained in the previous chapter, the favorability of water sources varies between natural villages. Sources that are appropriately located, large, and stable are considered favorable for village drinking water. Among the 56 villages surveyed, only 25 villages (45%) have favorable water sources.

External Investment in Infrastructure

The Chinese government has devoted billions of *renminbi* to developing rural infrastructure. As discussed in Chapter 3, the MWR in particular has focused on the construction

⁶² Predictable intervals can mean at specific hours throughout the day or specific days. This can vary seasonally, but villagers must know when they can expect tap water. A general standard for quantity is at least 3L per person per day, but I do not measure this. Instead, I rely on villagers' reports of "sufficient" and "insufficient" quantity.

of water provision facilities in rural villages. In addition to MWR funding, other organs of government, city work units (*danwei*), businesses, and international development and funding organizations have all contributed to rural infrastructure projects. Water systems that provide tap water have four main costs: (1) cistern construction, (2) pipes to get water from the cistern to the villagers and taps to control its flow once it is in the village, (3) pumps to get the water from the source to the cistern where necessary, and (4) water meters. Not all systems require pumps or have meters. Not all funding fully covers all of these, but external support helps villages trying to build water supply systems. Financing from these sources are one-time contributions to infrastructure construction. No money is set aside for operating costs or maintenance.

In addition to external investment, most village drinking water projects require at least some village investment. In some villages the government provides all funds and contracts the labor to an outside company or outside laborers to complete the system. However, this is more common in urban villages or very large villages, not in the remote areas of Guizhou.⁶³ More often, the government provides the funds for the construction but the villagers must provide labor. The village leaders or Party secretaries organize labor provision, generally requiring an equal contribution from each household. If tap water systems are going to be set up, government funding may cover the whole system or may only fund the construction of the cistern. In this case, villagers are required to buy and maintain their own pipes.⁶⁴

⁶³ Larger, urban, or “priority” villages can gain water supplies through a government-financed company. In these cases, the villagers are not asked to contribute to construction and all construction and maintenance is organized by the company. Only one of the villages surveyed was a “priority” for this type of system. In this village, the whole water system was set up without villager involvement because the village had just suffered a major fire. The village hadn’t had enough water stored and available to fight the fire.

⁶⁴ Villagers can opt out of using the system and thus not contribute labor or not purchase pipes to connect their houses to the common supply system.

5.5 ANALYSIS

Community management cannot change the water sources available to each village, but can help overcome unfavorable circumstances so that villages have public drinking water access. From the previous chapter, we know that water sources have a significant effect on outcomes. Villages with good water sources do not need to manage their water as carefully as those with limited supplies, but poor management can waste even favorable water supplies. This section highlights why water source favorability and external funding are not necessary or sufficient to explain the full range of observed variation in drinking water supply. Instead, villages need water management systems to deal with two types of problems: maintaining facilities, including cisterns and pipes, and ensuring quantity by preventing water waste.⁶⁵ I argue that because project design affects the ease and likelihood of collective management, government-initiated projects that incorporate meters or local solutions to quantity and maintenance issues into the project design are more likely to result in long-term water provision. Table 1 below presents the values of each variable for Jin Shan and Ni Luo villages.

TABLE 6: COMMUNITY MANAGEMENT & PROJECT DESIGN IN JIN SHAN & NI LUO			
		NI LUO	JIN SHAN
PROJECT DESIGN	Physical: Water meters in use	Yes	No
	Community input in design	Yes	No
COMMUNITY MANAGEMENT	Maintenance responsibility	Yes	No
	Quantity control	Yes	No
OTHER VARIABLES	Source favorability	No	Yes
	External infrastructure investment	Insufficient	Yes
OUTCOME:	Provision is broad in scope and reliable	Yes	No

⁶⁵ Water quality ought to be a concern, especially since recent shortages across China have been blamed on “quality-induced scarcity” (*shuizhixing qieshui*) (Magee 2013). However, this is not an issue that these villages are currently equipped to test or address. Most villagers think any water that comes from a spring is likely to be safe for drinking, but quality testing isn’t widespread.

Why doesn't Jin Shan have tap water despite investment and sufficient supply from the gold mine? The company built four communal taps to provide free water to all areas of the village. The water is still being pumped, but is used by a small group of villagers whose houses are nearest to the company. Those with houses closest to the water source have (illegally) diverted water from the pipes bringing water to the village. There are over 130 irregular taps off the main water pipe (out of a total village population is only 1085 people) (20140425.JS.01). By siphoning water away from the main pipe, these villagers have reduced the water pressure so much that the water no longer reaches the communal taps, and most of the villagers no longer have access to company water (20140520.JS.03; 20140520.JS.05). Because there is no system of management, monitoring, or punishment for illegally tapping into the communal pipes, some villagers are washing their cars with a convenient hose or even irrigate their fields while others have to walk 20 minutes to carry drinking water to their homes (20140227.JF.01; 20140425.JS.01). The villagers interviewed were all aware of the problem – they readily admitted to their illegal behavior – but there is no system of to deter this type of behavior and no punishment for transgressions.

In contrast, Ni Lou was able to overcome adverse circumstances through collective action. In Ni Luo, the Party secretary took out a private bank loan to add to the government funds (20140426.NL.01; 20140524.NL.02; 20140521.NL.01). The extra funds mean that the village is able to purchase a strong enough pump and large enough tank to supply everyone in the village. This loan is being paid back over time through the collection of water use fees. The pump is turned on every two to three days to refill the village tank. Every household has a water meter to monitor use and ensure that villagers are paying for the water they use. Fees cover

paying back the loan, electricity for the pump, salaries for three individuals elected to monitor the water system and coordinate repairs, and for routine maintenance. The villager leader designed this management system and representatives from each household voted to approve it (20140426.NL.01).

These cases demonstrate that favorable water sources and external investment alone are insufficient to explain the full range of variation in drinking water provision observed among villages in Guizhou. Generally, villages with infrastructure and favorable water sources are more likely to have drinking water access. However, Jin Shan and Ni Luo demonstrate that a lack of management in villages with favorable conditions can inhibit drinking water provision and good management in villages with difficult conditions can result in drinking water provision. Where there is shared infrastructure or problems of water quantity, management practices trump other factors to explain public drinking water provision.

Jin Shan and Ni Luo: Project Design

What can be done to change conditions in Ni Luo and Jin Shan and villages like them? The local conditions appear to determine the success of water provision, leaving little room for government, NGOs, or other external actors to improve Jin Shan's lot and making little difference for the success of Ni Luo.

History, social dynamics, and leadership clearly play a role in drinking water outcomes in Jin Shan and Ni Luo. The Party secretary in Jin Shan is not well respected or well liked. He and the village leader do not get along, so there is no cohesive leadership to spearhead the creation of a management system. However, older villagers report that even before the current leadership, the village had trouble coordinating and working together. Conflicts have been common and

long lasting. The water system was also built with minimal villager input and no sense that the villagers would be responsible for its upkeep. The gold mine took responsibility for maintenance, so villagers are passive in the face of increasing water conflicts.

In Ni Luo in contrast, the Party secretary is well respected and very capable. The village leader plays almost no role in leading the village but instead defers to the secretary.⁶⁶ The party secretary in Ni Luo played a critical role not only in gaining access to funds for infrastructure but designing and implementing the project. The villagers collaborate on a management system with the guidance of leadership in one village while the lack of leadership and social discord inhibit any chance of creating a management in the other. Ni Luo is lucky enough to have a history of successful collective action, a capable leader, and cohesive social interactions.

The factors that can be controlled or changed from the outside include the funding quantity, the project design, and responsibility for maintenance and management. First, in terms of funding quantity, neither village received enough from external funders to pay for water meters. Ni Luo overcame this with the help of a private loan to the village Party secretary. Policy makers should not expect every secretary to copy this example. Second, the project in Jin Shan was not designed to meet with needs of the villagers. They wanted individual taps that were easily accessible from their homes, not shared points of access. The system that was set up had no water meters and no way to limit the use of houses that illegally tapped into the common pipes. Ni Luo designed a project that was appropriate to their needs, even though it was more

⁶⁶ While having a strong secretary is good for governance in Ni Luo, it does not help the other natural village under the same leadership. Ting Shang village elects a separate leader to represent them, but is part of the same administrative village and therefore shares a Party secretary with Ni Luo. The Party secretary here is mainly engaged with Ni Luo. The result is that water and other governance outcomes in Ting Shang are worse than Ni Luo, although not necessarily worse than Jin Shan.

expensive than they could afford with only government funds. The water meters help pay for the extra loan and for the pump that allows water access. Without meters, Ni Luo would not have reliable water access. Finally there is the issue of ownership and responsibility for the water system. In Jin Shan, there is no designated authority to enforce rules, collect fees, or repair pipes. In Ni Luo, there is a clear and transparent system of maintenance and responsibility for management. The water meters help cover the cost of this.

Lessons about Project Design & Management

What lessons about the success of water infrastructure projects can we generalize to other villages? Comprehensive water management systems address both water quantity and responsibility for maintenance, even where water seems to be abundant. Water meters help address both concerns. While meters are not the only possible solution, they are the one that can most directly affect the management of these two issues and one that can be implemented by external funding organizations and the government, regardless of social conditions.

Not every village needs coordinated management, nor does every village rely on external funding for drinking water infrastructure. In places where infrastructure is not shared and water is abundant (for example, Sheng Xi natural village), management is not necessary for water provision (20140918.BD.01; 201040802.BD.32). Similarly, Tang Tou Shang has a large and reliable water source located above the village. There is so much water that the main tap in the center of the village is never turned off. Here, supply is reliable and provision is broad in scope even without management. These are exceptional villages, however. Most water provision comes through shared infrastructure that requires at least some maintenance and sometimes

needs quantity management. In these cases, external investments will be more successful if they include funding for water meters to ease ongoing management.

Water Facilities Management

Even though most of the facilities that provide communal water for villagers are quite simple in their construction, over time, they do require some maintenance. Maintenance of facilities built with external funds is also the responsibility of the village. Immediately after facilities are constructed, they are likely to provide water (as they are designed to do). However, poor maintenance can shorten the lifespan of facilities. The statistical analysis in the previous chapter measures access at one point in time (the summer of 2014). Most of those facilities have been built recently, however. How long they will last and whether villages will continue to be able to use them for water provision depends on management.

If there is a management system created at the time of construction, government investment in infrastructure can successfully change the drinking water conditions in a village. Xin Guan Cun is very poor and remote. Six of the 12 natural villages received MWR funding for cisterns, pipes, and water meters (20140918.BD.02). These villages did not have dependable water access before the government invested, but it is only with maintenance that these cisterns are able to continue operation. In these villages, one person from each group is in charge of ensuring that the pipes, cisterns, and sources are all in good order. This management requires 2-3 days of work per month. Associated costs are covered by fees for use. Villagers who are away working do not pay for water they are not using but if they return, the system can incorporate them because each house has a water meter. The water meters thus provide a transparent and consistent system that makes facilities and quantity management easier. Despite no track record

of collective action, this village is better off because of the government investment in water infrastructure, but also because the villagers coordinated a management system as soon as the facilities were constructed.

For villages with high rates of out-migration, meters are especially helpful. Xi Kou village has high out-migration but does not worry about water provision because the meters provide funding and help the person responsible assess fees fairly even though water use varies widely depending on how much time residents spend in the village (20140826.MH.16; 20140826.MH.17). Leaders here suggest that without the meter system, water supplies would be short and repairs neglected, as they are in the neighboring Bing Dong. There, the leader cannot change the system to add meters because of the houses where migrants are away. He must wait for villagers to return to put meters on their houses. These leaders suggest that Bing Dong would be better off if the original project design had included meters.

Of course, project design does not necessarily solve the problem of management when villagers do not participate in the project. In the case of Lou Zhai village, the lack of maintenance and subsequent disuse of a common system has resulted in limited scope of water provision. The water source is plentiful, but without a system of pipes and pumps, only the lower portion of the village can use it (20140824.MH.10). Getting public water for the whole village requires a pump, which requires electricity fees and more maintenance than a simple, centrally located cistern. The government built a supply system that functioned for about a month before it fell into disrepair (20140824.MH.09). The system – including pipes, taps, and water meters – remains in the village, unused and slowly rusting. There was no system of management or plan for maintenance so even minor problems led to the abandonment of communal water provision facilities.

In rural areas of China, villagers are opposed to paying for water because they do not expect to see any benefits from the fees (Nitikin et al 2012). According to previous research, when local water users directly participate in management of water resources, they reported increased confidence that their fees would actually produce benefits. In this case, the difficulty of water provision has more to do with the trust in the design process and governance than the physical provision system. In Lou Zhai village, the houses in the upper portion of the village have now coordinated to build their own supply system, including a pump (20140824.MH.11). From their experience with the government's water facility, they learned that they need to designate maintenance responsibility to individuals or households. However, even if this new system is completed, it will only serve part of the village. The village now lacks broad and reliable access to drinking water not because of a lack of investment or water quantity but because the villagers did not feel responsible for the previous system.

While external investment can be helpful, especially in villages with unfavorable water sources, villagers that build their own system of water provision may be more likely to continue the upkeep than if the government invests without input or contribution from the community. In the case of Huo Ma Shan, the villagers have both a government-built system and one that the community organized without government involvement. The government system sometimes run dry, so the villagers use their own older system as a back up. They report feeling more responsibility (*ziren gan*) for the system they built themselves (201040730.BD.10). To maintain it, responsibility rotates among the villagers. Responsibility rotates every year among groups of five households. The villagers' system is more reliable because they manage and maintain it. In cases like this, it becomes clear that the villagers must buy into the need for the water project. When there is no village ownership, input or responsibility, management is less likely.

Water Quantity Management

In addition to villages with shared infrastructure, villages without favorable water sources need day-to-day quantity management. The simplest system to limit water shortages is through household water meters. For example, Xia Dong Tian village uses water meters as a measure to limit waste because the source is not large enough to provide for everyone if they are not careful about water use. The fees incentivize villagers to limit use but also cover the costs of maintenance (20140826.MH.17). When the quantity of supply is not sufficient because the water source is either too small for the village or it is seasonal, the construction of a cement cistern – especially without any means to limit overuse – does not alleviate drinking water shortages. Only controlling water use can make small water supplies last and provide for the whole community.

Villagers know their area and water source better than external actors, and projects that take local knowledge into account are more likely to succeed (Hilton 1992; Andersson and Ostrom 2008). The village is usually charged with finding the water source for MWR projects (20140523.LNG.02). If the preferred source is too far away or expensive, the government will use a smaller and less reliable water source. For example, in Lan Ni Gou village the villagers want to use a large river within sight of the village for water provision. Because pumping from the river is more expensive than building a cistern near the seasonal spring, the new system won't have river water. Instead, villagers in Lan Ni Gou will only have a seasonal supply for running water. If there is not enough water, collecting it in one place without restrictions on use or some other type of management does not change the public accessibility. When projects do not take local knowledge of water sources into account, even meters cannot necessarily guarantee water supply.

Without water meters, the burden of management is much higher. While Xin Guan Cun and Xi Kou both report that maintenance and management demands 2-3 days of work each month (20140918.BD.02; 20140826.MH.17), other quantity management systems are much more labor intensive. In Da Qing, the community has a small source, so the village has designated a person to turn the supply on and off throughout the day (20140801.BD). The village taps run for 8 hours every day – 3 hours in the morning, 4 in the afternoon, and 1 in the evening. This way, villagers have access to water when they are cooking, but there is no way for taps to run unnecessarily and few opportunities to waste water. Similarly, during the dry season, Ba Tuan village only has water every few days (20140825.MH.13) and part of Huang Gu only has access to water every other day (20140923.MH.01). When the taps are turned off, the cistern can refill. When the cisterns are full, there is enough pressure in the water pipes for water to get to every household. If the cisterns were not allowed to refill, only those houses near to the cistern would have tap water. This type of management is more complicated and requires more man-hours than systems with water meters, and therefore more challenging to arrange and maintain.

5.6 IMPLICATIONS & CONCLUSION

The findings of this chapter are important both for policy makers and for political scientists. First, if government investment is not directly related to public goods outcomes such as water provision, it is important for policy makers to understand why and better direct government spending. The most effective government investment will take local conditions into account and tailor policies and investments to the local conditions in each village. Development policies should be appropriate to the context – both the natural conditions and the socio-

economic situation. This context, of course, is not just the province or the county, but the local conditions in each natural village.

Governments may struggle to change the local management or the social dynamics in the village. Still, projects can succeed in providing drinking water to villages that are unlikely to overcome collective action problems by incorporating features that make management and coordination easier. In terms of water, this means including water meters and ensuring that the project is appropriately designed for the needs of the village.

Related to this, the amount of funding can make a difference. Projects that get enough funding to cover only pipes and cisterns are harder for villagers to manage. Where funding is sufficient to cover water meters for every household, management is easier for the village to organize and water is more likely to be provided over the long term. From Chapter 3, we know that project funding per capita is higher in counties with fewer minorities. This should raise concerns that the burden of managing water projects is higher in minority areas as funding per capita is lower and may not cover meters. The possibility that it is not only funding but the effectiveness of funding that varies with ethnic makeup warrants further investigation.

Second, there remain missing variables that scholars of public goods provision have not yet captured in quantitative models. Local factors often come in bundles and individual factors are not easy to parse out. Management schemes vary widely as to the need for them. This is no reason to ignore the local context or its effect on outcomes (both directly and indirectly through the other variables in our models). Because the goal of this dissertation is to understand governance and governance outcomes in particular, it is especially important to understand the way local conditions influence government capacity to affect drinking water provision. In many cases, investment in infrastructure is ineffective over the long term without local resource

management. This is an important constraint on government capacity that too many studies ignore.

This chapter demonstrates that when there is shared infrastructure or unfavorable water conditions, only villages with water management systems will have drinking water provision. This is particularly true over the long term as facilities need repair and communities need to adjust to changes in water conditions. Especially for externally initiated project, the design and inclusion of input from the local community and meters to help ease quantity management and maintenance make water projects more likely to succeed over the long term.

CHAPTER 6: CONCLUSION

Public goods like drinking water are important for human development and an important measure of the ability of the government to meet the needs of its citizens. Why is there variation in access to public drinking water and in government provision of drinking water in rural communities within China? I have argued that the variation in public goods outcomes is best explained by looking at the interaction of the government and local communities. This interaction helps explain the capacity of the state, its accountability, responsiveness to local community needs, and the success of drinking water provision. Here, I summarize the findings and discuss the implications from this study for policy and future research.

SUMMARY OF FINDINGS

This dissertation tested the effect of three key factors on public goods provision. The first empirical chapter addressed the effect of ethnic identity on government provision of public goods. Diversity does not affect public goods spending in rural China, but the ethnic makeup of the community does. In counties where there are fewer minorities and larger Han populations, the government provides more money for drinking water infrastructure. The relative ease of implementing policy in majority areas explains the pattern of government public goods provision. While this type of relationship has been observed in democracies, officials in China are not responding to voter preferences. The dominant ethnic group of government receives more support and higher levels of public goods provision not because of policy preferences or response to voters but simply because of variation in government capacity to implement policy.

The second chapter addressed the effect of labor migration on water provision. Labor migration increase the likelihood of water provision through complementary and sometimes overlapping mechanisms – increased accountability and access to external funding. The

government is more accountable to local demands for public goods provision where villagers have experience and connections outside the village. Township governments and Party organizations are not accountable through elections, but when rural villages are less isolated, the government is more likely to provide infrastructure funding and effectively provide drinking water access. While we might expect migration to disrupt local communities' ability to work together to overcome collective action problems like public goods provision, the beneficial effects of increased connections to outside sources of funding and expertise outweigh any disruption.

Finally, the last empirical chapter demonstrates that local dynamics and management can determine the effectiveness of infrastructure provided by the government, especially where natural conditions are less favorable. Communities must manage the quantity of their own water supply and maintain infrastructure in order for government investments to be effective. Design features such as water meters and community input on location and rule of water use matter. Externally initiated water projects are most likely to be effective if they take community needs and capacity into account. Here, we see that it is not just government spending that changes public goods outcomes, but the relationship between governments and communities.

LOOKING FORWARD

The findings from this research have policy implications, especially for developing countries. First, public spending and governance capacity are not only related to government policy and institutions, but the relationship between organs of government and constituents. Even for the same policy in the same province of the same country, outcomes vary depending on the community characteristics. The institutions of the state may play a role in outcomes, but

even within the state, ethnic makeup and the participation of the community in local design can affect drinking water outcomes. One problem that arises from this finding is that minority areas are likely to have lower rates of water provision and less government investment and involvement. While many communities will prefer the lack of government interference, government provision of public services are lower for minorities, which will perpetuate inequality in health, education rates, and wealth between minority and majority ethnic groups. Resolving these differences will require more government accountability to the local community, willingness to invest, and local participation.

Second, migration is beneficial to the community at least when migrants remain tied to the community and invested in its long-term well-being. Previous research demonstrates that migration benefits individual households and can sometimes help inequality, but this research confirms that labor migration does not disrupt the community and instead increases its governability and governance outcomes.

It is easier to adjust the design of an infrastructure project than to change long-standing social dynamics in a rural village. This research signals the need for the government of China to consider community involvement in project designs and take local conditions into account. Many of the water projects surveyed for this research were almost identical in design. Future projects would benefit from sufficient funding for water meters and the development of local management plans. While many villages were supposed to have these, the requirement was not enforced and there was no follow up on effectiveness of new infrastructure projects. In addition, some villages received investments in new water projects despite already having water provision. Incorporating the community would reduce this wasted investment in ineffective drinking water projects.

Future research is needed to address how local communities can gain access to public spending and can hold the government accountable for meeting community needs, even without elections. Migrant connections help, but are there other ways local communities can grow these important networks and change the accountability of their leaders? It is likely that some connections outside the village are more useful than others. For example, most migrants from Guizhou leave the province to find work whereas labor migration from rural Yunnan generally stays within the province (Donaldson 2011). Do these migration patterns have an effect on local governance?

The limitations of this research project are primarily due to data availability and the difficulty of getting candid interviews with county officials. While officials in Guiyang and in townships were willing to talk to a foreign researcher, county level offices were often closed, too busy, or simply unwilling to help with this research. The county level of government is heavily burdened with responsibility for rural governance, despite the administrative, cultural, and geographical distance between the county seat and the villages. Future work would benefit from deeper understanding of county-level policymaking, priorities, and procedures.

This project, while focused on drinking water, sheds light on the process of governance in rural China. In rural areas, governments face challenges as diverse as high poverty, environmental degradation, and low levels of education, health, and human development. It is areas with greater government capacity, accountability, and responsiveness to the needs of local villagers that make changes in rural communities. The implications of these findings are not limited to China. Instead, these patterns of interaction between governments and communities and the strong effect of the interaction on public goods outcomes are common in developing

countries. Thus, addressing local contexts and incorporating community input are likely to improve government efforts to improve development outcomes across the developing world.

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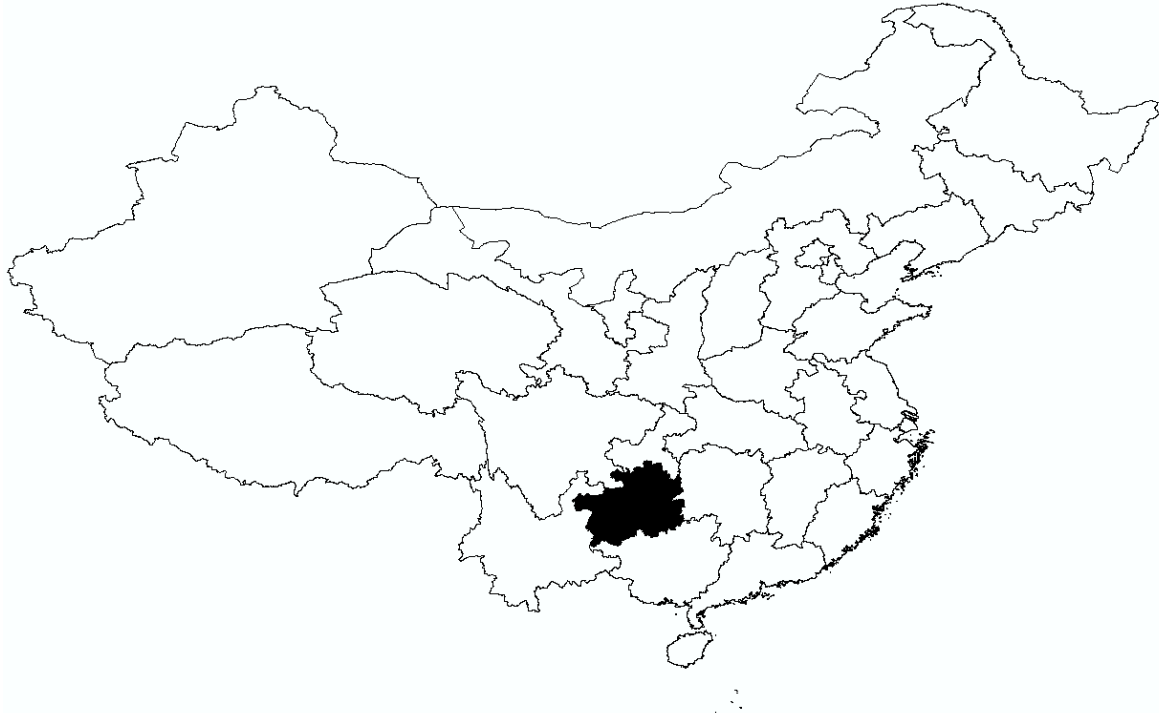
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APPENDIX

APPENDIX A: *MAP OF GUIZHOU, CHINA*



APPENDIX B: *SUMMARY STATISTICS FOR CHAPTER 3*

Table 1: Summary Statistics					
Project Level Variables					
Variable	Mean	Std. Dev.	Min	Max	N
<i>Total Fund (project)</i>	40.896	63.075	0	1563	13377
<i>Total Population (project)</i>	831.243	1181.803	0	29963	13377
<i>Funding per Capita</i>	0.047	0.032	0	3.35	13374
<i>Percent Han</i>	0.563	0.304	0.016	0.993	13170
<i>Diversity</i>	0.425	0.210	0.013	0.782	13170
<i>Percent Karst</i>	0.709	0.147	0.279	0.935	11916
<i>Log County Pop</i>	12.760	0.517	11.035	14.230	12017
<i>GDP per million people</i>	64.35	56.24	11.69	360.41	12014
<i>No. Projects per village</i>	1.240	1.027	0.228	5.493	12027

County Level Variables					
Variable	Mean	Std. Dev.	Min	Max	N
<i>Total Funds (county)</i>	1788.85	2414.10	14.71	29040.71	307
<i>Share of Population</i>	0.112	0.136	0.0008	1.358	289
<i>Total Population (county)</i>	36370.08	44932.67	275	492327	307
<i>Percent Han</i>	0.502	0.312	0.016	0.993	300
<i>Diversity</i>	0.448	0.213	0.013	0.782	300
<i>Percent Karst</i>	0.698	0.156	0.279	0.935	260
<i>Log County Pop</i>	12.75	0.52	11.85	14.18	289
<i>GDP per million people</i>	64.57	57.75	12.31	327.79	289

APPENDIX C: INTERVIEW LIST

Interview codes were created by listing the date, the initials for the township, and the interview number for that specific date and location. Thus, interview 201040730.BD.06 was the 6th interview conducted on 30 July 2014 in Bai Duo Township. Only interviews cited are listed here. Where applicable, I have listed the natural village specifically. I also include the title or place of employment for interviewees other than villagers. All interviews were conducted by the author.

Interview Code	Details
201040730.BD.07	Wang Jia Zhuang village
201040731.BD.11 201040731.BD.12	Gan Ma Ping, Ban He village
201040731.BD.14	Lao Zhai village
201040731.BD.16	Gao Ao village
201040731.BD.18	Da Tang village
201040801.BD.25	GaoSanYu village
201040802.BD.32	Sheng Xi village
20140127.GY.01	Ministry of Environmental Protection Employee, Guiyang
20140227.JF.01	Gold mine staff
20140425.JS.01	Jin Shan village former Party secretary
20140426.NL.01 20140521.NL.01 20140524.NL.02	Ni Luo village and village Party secretary

20140426.TS.01	Village leader, Ting Shang village
20140507.GY.01	Ministry of Water Resources employee, Guiyang
20140520.JS.03 20140520.JS.05	Jin Shan village
20140523.LNG.02	Lan Ni Gou village leader
20140604.GY.02	Ministry of Water Resources employee, Guiyang.
20140604.GY.03	Group interview. Ministry of Water Resources employee, environmental NGO worker, Guiyang
20140722.GY.04	Group interview. Ministry of Water Resources employees – county and provincial offices, Guiyang
20140724.BD.05	Bai Duo village
20140730.BD.10	Huo Ma Shan village
20140801.BD.24	Da Qing village
20140801.BD.25	GaoSanYu village
20140802.BD.32	Sheng Xi village
20140817.BD.33	Hou Jia Tun village
20140823.MH.01	Sha Wan village
20140823.MH.03	Ma Hao township official
20140823.MH.03	Ma Hao township official
20140824.MH.09 20140824.MH.10 20140824.MH.11 20140731.BD.14	Lao Zhai village
20140825.MH.12	Head of water, forestry, and agriculture for Ma Hao township
20140825.MH.13	Village leader, Ba Tuan village
20140825.MH.13	Ba Tuan village leader
20140825.MH.14	Party secretary, Jin Zhong village
20140826.MH.16	Party secretary, Bing Dong village
20140826.MH.17	Village accountant, Xi Kou village
20140827.MH.18	Group interview. Head of water, forestry, and agriculture for Ma Hao township; village leader, Ping Ba Cun
20140918.BD.01	Group interview. Village leader and Party secretary of Xin Guan Village, Bai Duo Township
20140923.MH.01	Huang Gu village

20140924.MH.01	Jiang Yuan Shao village
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APPENDIX D: *PREDICTED PROBABILITIES* (Chapter 4)

Predicted Probability of Public Water Provision

Source		
Percent out- migration	Favorable	Unfavorabl e
0%	.28	.04
10%	.55	.12
20%	.79	.29
30%	.92	.56
40%	.97	.80
50%	.99	.93