Beyond Bureaucracy: The Effects of Policy Piloting on Citizens' Environmental Awareness in China

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Yue Guo
Post-doctoral Research Fellow
John F. Kennedy School of Government
Harvard University, U.S.
Email: jason.guoyue@gmail.com

Jie Wang
Master Student
School of Public Policy and Management
Tsinghua University, China
Email: wangjie15@mails.tsinghua.edu.cn

Zhilin Liu
Associate Professor
School of Public Policy and Management,
Tsinghua University, China
Email: zhilinliu@tsinghua.edu.cn

Abstract

Previous studies have made many contributions to developing the understanding of the role of policy piloting in the process of policy formation, implementation, and diffusion as well as the relationship between central and local governments. However, little research has focused on the role of policy piloting in affecting phenomena beyond bureaucracy, such as public opinion and behavior. This study attempts to go beyond the scope of bureaucracy and explore the unintended effects of policy piloting on public opinion and behavior based on evidence from China's environmental governance practice. We conduct a multilevel modeling approach to determine the effects of two different forms of policy piloting, experimental piloting and model piloting, on citizens' environmental awareness. The empirical results show that model piloting programs can significantly influence citizens' environmental awareness, but experimental piloting programs do not achieve the same effect. Given the cadre of the assessment system, local governments in China are highly motivated to have their cities identified by the central government as model cities for others to follow. Local governments of model pilot program cities frequently always adopt campaign-style enforcement and have local public involved in environmental governance practice. A policy-opinion nexus can be found in that model piloting in the environmental governance field requires citizens' participation throughout the entire process, from policy design to enforcement, so as to produce the effect of social learning among the local public.

Keywords: policy piloting, environmental governance, environmental awareness

In policy practice, policy piloting generally appears as a regional concept to implement new policy or realize policy innovation within the geographical scope of piloting. Designing policy pilots is an important form of experimentation undertaken by policymakers in that they allow major government policies and programs to be pretested before they are launched fully and on a wider scale (Heilmann, 2008; Mei & Liu, 2014; Nair, 2016; Volden, 2006; Zhu, 2014). Thus, researchers of prior studies have consistently regarded policy piloting at the local level as a kind of research object for making policy evaluations (Ettelt, Mays, & Allen, 2015; Nair, 2016; Sanderson, 2002; Swanwick, 2007). Hence, policy pilots can serve as treatment groups and be compared with untreated groups to test a policy's effects, thus allowing researchers to go beyond observational research or theoretical analysis (Mosteller, 1979). According to the traditional view, a federal system or decentralized power can help with policy innovation because the decentralized power of the central government allows a number of local (state) governments to conduct policy experimentation simultaneously. With the decentralized structure of the federal government, states can be seen as *laboratories of democracy* (Volden, 2006). However, some studies have argued that policy experimentation or piloting is more likely to be implemented in authoritarian countries. According to Cai and Treisman (2009), political centralization induces more policy experimentation because of strong learning effects and intergovernmental interaction, while information externality may result in policy innovation being viewed as a public good by other areas, thus weakening the impetus of local governments to carry out policy experimentation (Cai & Treisman, 2006; Strumf, 2002). In the past 10 years, policy experimentation in centralized countries has received increasing levels of attention. Heilmann (2008) stressed that special attention should be paid to the widespread innovation spirit, adaptability, and learning capacity formed in the unique policy process of the central authority-guided policy experiment in China, because it is the key mechanism behind China's

economic takeoff. Hence, in the past decade, the policy experimentation phenomenon in authoritarian states has attracted greater attention. In particular, Heilmann (2008) proposed that policy experimentation led by the central government could bring innovation, adaptation, and learning capacity to bureaucracy, which helped understand China's economic takeoff. Based on pilot programs, local policy innovation and central intervention can be integrated into already established national policies. This can help remove the barriers that hinder a country's economic development, thus fostering its ability to adapt to domestic and foreign political and economic situations, seize opportunities, break away from rigid ideologies, curb the interference of group interests, and constantly promote the innovation of the system and its policies (Heilmann, 2008).

It has been a common view that China's policy piloting plays an important role in the promotion of institutional innovation (Cao, Qian, & Weingast, 1999; Heilmann, 2008; Rawski, 1995; Roland, 2000). According to Naughton (2007), policy piloting undertakes the task of "establishing a new system outside the existing systems or between the existing systems," while also serving to break away from traditional systems and pioneer policy innovation. As a kind of governance instrument to achieve policy objectives, policy piloting can affect the policy process through different mechanisms. The first interpretation is that the policy piloting reflects Lindblom's incrementalist policy-making theory, which allows for the regional and departmental progressive reform that in turn drives new policy change (Heilmann, 2008; Mei & Liu, 2014; Roland, 2000). The second interpretation is that policy piloting can bring about new resource allocation, which results in competition and reinforces the right of jurisdiction between local governments (Montinola, Qian, & Weingast, 1995). The third interpretation holds that policy experimentation based on piloting is the efforts choice made by reformists to expand the political basis for reform, avoid ideological argumentation, and prevent factional strife (Cai & Treisman, 2006).

Previous studies have mainly focused on the intended effects of policy piloting within bureaucracy, such as formation of the policy plan, the effectiveness of promoting policy implementation, and competition among different local governments; to the best of our knowledge, however, little research has been conducted on the unintended effects of policy experimentation beyond the realm of bureaucracy, such as the effects of policy experimentation on how the public perceives and behaves toward a policy issue. Therefore, this study focuses on the unintended effects of policy piloting beyond bureaucracy based on evidence from China's environmental governance practice. We aim to answer the following research questions: As a kind of governance instrument, does policy piloting have some unexpected effects outside the scope of bureaucracy (besides the intended effects within the bureaucratic realm)? If so, how does policy piloting influence public opinion and behavior?

Policy Piloting in Environmental Governance in China

With the rapid development of the social economy and expansion of the scale of cities, the deterioration of the ecological environment has not only become a severe social problem but also an important policy issue in China. On the one hand, the central government has built a stronger environmental protection agency and put into place strict environmental laws and regulations (Li, Miao, & Lang, 2011). In addition, the principle of the environmental protection priority has been gradually introduced into national policies and laws to properly treat the relationship between economic development and environmental protection. Especially after the release the 11th Five-Year Plan, "energy saving and emission reduction" has been explicitly regarded as an obligatory index for social economic development to strengthen national commitment to protect environment. On the other hand, with the political and administrative decentralization since the 1980s, local governments have been given more autonomy and flexibility in environmental governance and are placed at the crucial position of sustainable governance. As the bond between the central government and

local public, local governments play a connecting role. Upwards, local governments must obey the administrative orders of the central government and implement expected indexes and tasks; downwards, they must build a closer and more direct relationship with the public by providing social services and implementing environmental policies. Although all local governments are controlled by the central government, their execution of environmental governance differs across various regions. In some cities, local governments have not only accomplished varied environmental indexes but also proactively conducted innovation in environmental policies, served as pacesetters in environmental protection, explored new means, and made great efforts to enhance their performance in environmental governance (Khanna et al., 2014; Kostka & Hobbs, 2012). If a local government achieves desirable performance, the central government may identify it as a model city with the group of *model piloting cities* (*mofan chengshi*). On the other hand, as environmental policy piloting becomes a new path in exploring environmental governance tools, the central government usually chooses some cities as pilots to conduct policy experimentation and test new policies under the name of "first implement, first test" (*xianxingxianshi*). For instance, cities such as Beijing, Shanghai, and Wuhan, which have been selected as pilots in the low-carbon pilot program (Chen et al., 2015; Su et al., 2012), are called *experimental piloting cities*. Model piloting is largely used to indicate excellent environmental governance modes, while experimental piloting is considered a contrast group to test the performance of environmental governance innovation. Model piloting programs are initiated by the central government to award and promote local performance in sustainability, whereas the experimental piloting programs championed by the central government typically aim to advocate certain policy goals or test specific policy measures. Considering their different functions, in this study we explore whether these two kinds of policy piloting differ in how they influence public environmental awareness and behaviors.

Policy-Opinion Nexus

When it comes to a policy-opinion nexus, previous studies on policy processes usually treat people's concepts as an exogenous variable that is independent from the policy system (Gusmano, Schlesinger, & Thomas, 2002). Recent research on policy feedback theory challenges this approach and focuses instead on the influence of public opinion on policy rather than the impact of previous policies on policy. Policy not only has the function of solving societal issues but also affecting people's thoughts and behaviors, thus formulating a feedback effect. So, just as institutionalism scholars have "opened the black box of management institution," policy feedback scholars have started dabbling in the so-called public policy black box, emphasizing that rules and institutions build political participants' concepts and behaviors (Pierson, 1993). Pierson (1993) explained that a government's policies can determine political elites' behaviors, organizational interests, and public opinion. These determinations could be made by two channels. The first is the interpretive effect, which is based on the information and meaning usually delivered by policy. The second is the resource effect, which has an additional impact on political understanding and attitudes that emphasizes public policies' ability to regulate rules, values, and attitudes; the resource effect provides means and incentives for political activities (Campbell, 2002; Mettler & Soss, 2004; Soss & Schram, 2007). Using the resource and interpretive effects proposed by Pierson, Mettler (2002) developed a model of a policy's impact on the public's abilities and enthusiasm in public affairs. The resource effect implies that policy influences public opinion through the resources it distributes, including salaries, commodities, services, education, and other material resources (Mettler, 2002). The interpretive effect emphasizes that public policies should establish rules and procedures for the public throughout the whole process of policy design and implementation—and further influence public opinion and behavior (Mettler 2002; Mettler & Soss, 2004). Specifically, feedback studies have discussed the

means of making citizens and influencing the public by policies (Mettler & Soss, 2004), and probed into the mechanism of the policy-opinion nexus. Campbell (2012) concluded that policy builds a citizen participation model by influencing the allocation of related political resources; public feelings about political participations regarding political efficiency, political interest, and so on; and possibilities of interest groups and other political enterprises to conduct political mobilization.

This study pays more attention to the interpretive effect. The interpretative effect influences political understanding and behavior in that policy usually conveys information and meanings (Pierson, 1993). Policy can confirm the member identities of public groups according to certain common characteristics as well as impose certain boundaries. Policy language and contents can label target groups with social or political stances no matter whether the outcome is deliberate or unintentional (Mettler & Soss, 2004). Thus, the appearance of specific groups can influence members' cognition of themselves and their relative value in participating in government activities (Mettler & Soss, 2004; Schneider & Ingram, 1993). Detailed policy design and execution can therefore affect individual and group cognition of citizen identities as well as their assessment of government bodies, which can affect citizens' decision to participate in political activities (Mettler & Soss, 2004).

Previous studies on policy feedback and the policy-opinion nexus can enlighten our understanding of the impact of policy on public concepts and behaviors, but these studies have remained confined to the influence of policy itself on public concepts and behaviors. Furthermore, previous studies have only focused on the impact of policy outcome on the public's opinions and behaviors. Thus, besides policy itself, do different ways and procedures of policy formulation make a difference in the public's opinions? If it is so focused on different policy piloting, how can differences in interactive models within bureaucracy influence public concepts and behaviors that are beyond the realm of bureaucracy? On this

basis, this study takes environmental policy as an example and explores the mechanisms in which different models of pilot programs in the environmental field influence public environmental awareness and behaviors.

Research Design and Methodology

This study aims to test the effects of policy piloting on citizens' environmental awareness in urban China. We used a multilevel modeling approach to investigate the effects of individual-level factors (level one) and city-level variables (level two) on environmental awareness. The main data source in our analysis came from the 2010 Chinese General Social Survey (CGSS). As one of the most comprehensive social surveys in China, the CGSS followed a multistage, probability-proportional-to-size, stratified sampling process using the 2009 national population data as the sampling frame. A nationally representative group of 11,783 respondents was drawn from 89 cities across 31 provinces in China, and a subsample of 3,644 respondents was randomly selected to answer questions in the environmental module. Considering that most environmental experimentation focuses on urban areas and keeps urban residents more in touch with the governmental environmental policies, for our purposes, we only retained urban samples and abandon rural samples.[1] In addition, samples selected from four cities[2] were excluded from our analysis because of missing data for city-level variables, leading to a final sample size of 2,284 respondents across 81 cities in our analysis.

Dependent Variables

Environmental awareness is a kind of dependent variable. We used two questions

[1] Four cities without urban samples are excluded: Songyuan, Jilin Province; Baicheng, Jilin Province; Yantai, Shandong Province; and Chongzuo, Guangxi Province.

[2] These four cities are En-Shi, Hubei Province; Da-Li, Yunnan Province; Lhasa, Tibet, and Kashgar, Xinjiang Province.

about individual attitudes and beliefs regarding environmental issues in China. Specifically, our dependent variable, environmental awareness, is based on one survey question measuring individuals' concern toward environmental problems ("How much are you concerned about the environmental issues?"). Responses were rated on a 5-point Likert-scale ranging from 1 (extremely unconcerned) to 5 (extremely concerned). As Figure 1 shows, 71.41% of sampled urban citizens reported themselves to be somewhat or extremely concerned with environmental issues. A total of 10.47% of urban respondents reported that they were extremely or somewhat unconcerned with environmental issues. We recoded the environmental awareness question into a binary variable of the three lowest categories (recoded as 0) versus the two highest categories (recoded as 1).

[Figure 1 here]

Environmental Experimentation Programs

As central government ministries in China have initiated various experimental programs as a means of incentivizing local engagement in programs for environmental protection, we would expect that different environmental policy experimentation models can help us explain the disparity in individuals' environmental awareness. We identified 13 sustainability-related experimental programs by central government ministries in China. As there might be a time lag regarding measuring people's reactions to environmental policies, we only drew titles that sampled cities during the period of 2006–2010.

After extensive review of policy documents, we further classified all policy experiment programs into two categories: model piloting programs (items 1–8 in Table 1) and experimental piloting programs (items 9–13 in Table 1). We distinguished between these two kinds of policy piloting through two criteria.

- *Implementation principles*: The central government identifies model cities so as to award and promote local performance in sustainability. Pilot-city programs, in

contrast, typically aim to advocate certain policy goals or test specific policy measures championed by the central government.

- *Application requirements*: A city has to meet strict evaluation standards to become an environmental model city candidate. For pilot-city programs, however, the application requirements are much looser. Representative cities are often designated as pilot cities by the central government, considering geographical location, economic level, and other political factors.

Previous research has found that different forms of policy design can generate different forms of policy feedback (e.g., Lockwood, 2015; Svallfors, 2010). Due to above differences between model-city programs and pilot-city programs, we would expect these two approaches have different effects on public opinion.

To test our hypothesis, we calculated the number of the policy-piloting titles for both model piloting and experimental piloting that are bestowed by central government to every city, which are two key independent variables in the statistical model. Specifically, model-piloting projects in this study included the National Water Conservation City, National Environmental Protection Model City, National Ecological Civilization Pilot-Demonstration City, National Human Settlement Award City, National Garden City, National Health City, National Forest City, and National Greening Model City, all of which provide us with a scale ranging from 0 to 8. Experiment-piloting programs in this study included the Soil and Water Conservation Demonstration City, Water-Saving Society Pilot Project, Low-Carbon Pilot City, Ecological Garden Pilot City, and Circular Economy Pilot Project, which run from 0 to 5. (Refer to Table 1 for the list of experimental programs and their responsible ministries.) Among all 81 sample cities in CGSS, 38 cities (46.91%) were honored by the central government at least once for their performance in sustainability; the maximum number of model-city programs in which a single city participated in is four: Rizhao of the Shandong

Province and Guangzhou of the Guangdong Province received the highest number of model-city titles among all sample cities. By contrast, 25 cities (30.86%) participated in one or more pilot-city programs, with a maximum number of three; these cities are Shenzhen of the Guangdong Province and the Chongqing Municipality. The average number of experimental programs is 0.9 and 0.4 for each category (Table 2). Figures 2 and 3 show the geographical distribution of model-city programs and pilot-city programs for selected sample cities.

[Table 1 here]

[Table 2 here]

[Figure 2 here]

[Figure 3 here]

Control Variables

Several control variables are included in the research models. For city-level determinants, we controlled for the effects of economic development and environmental quality. Data for these variables mainly came from the China City Statistical Yearbook, which was supplemented with local statistical yearbooks and statistics available from government websites. Following the postmaterialist hypothesis (Inglehart, 1995) and the prosperity hypothesis (Franzen & Meyer, 2010), we included per capita GDP in 2009 (yuan, logged value) to test if a positive association exists between a city's economic development and the environmental awareness of its citizens. We included three control variables to represent local objective environmental quality, all measured on annual averages from 2006 to 2010: industrial wastewater discharge (1,000 tons, logged value), measuring the level of water pollution, and industrial soot emissions (tons, logged value) and sulfur dioxide emissions (tons, logged value), measuring the level of air pollution. Higher scores on the above three environmental indexes indicate a greater level of environmental degradation and higher exposure to environmental risks, which would increase citizens' concerns about the

environment (Liu & Mu, 2016; Marquart-Pyatt, 2012). Therefore, we hypothesized that individual environmental awareness is higher in cities with more emissions of industrial wastewater and air pollutants.

In addition to country-fixed effects, we controlled for individual-level characteristics, including environmental knowledge and sociodemographic factors. The data source for the individual-level variables also came from the 2010 CGSS. Sociodemographic characteristics in our study are represented by (a) the respondent's actual age in 2010; (b) a dummy variable for gender, with 1 referring to female and 0 for male; (c) four dummy variables for the level of education—middle school (2), high school (3) and college or above (4), compared to the reference of primary school or lower (1); and (d) annual household income for the year of 2009 (yuan, logged value). Some previous studies have found correlations between the above four factors and individuals' environmental awareness (e.g., Holbert & Shah, 2003; Jones & Dunlap, 1992; Marquart-Pyatt, 2012; Mohai, 1992; Schahn & Holzer, 1990; Shen & Saijo, 2008; et al.). Further, environmental knowledge has been found to positively correlate with individuals' environmental attitudes (Xiao & Hong, 2012). The CGSS included 10 items with respect to various environmental problems that ask respondents whether they think the statement is "true" or "false" (see Table 3 for the list of statements). It is scored 1 if respondent has correctly identified the truth or falsehood of the statement, or 0 if not. We then took each of the individual mean scores for all 10 items as a composite measure of environmental knowledge (Cronbach's alpha = 0.79). Descriptive statistics of all control variables are listed in Table 4.

[Table 3 here]

[Table 4 here]

Empirical Findings

Using China as an empirical case, we investigated the extent to which different

sustainability policy experimentation models can explain the disparity in individual environmental awareness while controlling for city-level economic development and environmental quality as well as individual-level determinants. Considering that individuals inhabiting each city share the same city-level characteristics, we adopted a multilevel modeling approach to investigate the effects of individual-level factors (level one) and city-level variables (level two) on environmental awareness. The dependent variable is whether an individual reported being concerned with the environment. Overall, the null model implies that 13.7% of the total variance of environmental awareness could be attributed to between-city differences.

We first ran the individual model to estimate the relationship between respondents' attitudes toward environmental issues and their individual-level characteristics. Having controlled for individual-specific characteristics, we then analyzed the within-city estimated coefficients in terms of city-level factors in the full model. The individual model is nested in the full model.

The Effects of Different Policy Piloting on Environmental Awareness

The empirical results shown in Table 5 provide strong support for the significant and positive effect of model piloting in shaping public environmental opinion. The number of model piloting environmental experimentation programs is positively associated with the level of urban citizens' environmental awareness (significant level = 0.01, see full model in Table 5). Urban citizens are 30.4% more likely to be concerned about the environment if they live in cities that have been active pioneers in environmental policy as central-government-designated model cities. One unexpected pattern was revealed in Table 5: the nonsignificant effect of experimental piloting programs on urban citizens' awareness toward environmental issues. The coefficient is not only nonsignificant but also negative. Certainly, we have to wonder why such different outcomes of policy opinion feedback effects are presented

regarding these two kinds of environmental policy piloting.

What seems to be a plausible interpretation for the effective and positive policy opinion feedback effect brought about by model-city programs hinges on a policy's mobilization and propaganda mechanism for the general public. Policies can influence mass opinion directly through experience or indirectly through the information environment (Pacheco, 2013). We suppose that public participation is more encouraged by the model-city environmental policy experimentation approach, which could promote awareness of environmental issues. When the public participates in environmental governance, they are shaped by government policies as well. Furthermore, in the process of bidding to become a model, local governments tend to intensify propaganda work to enhance social awareness of environmental protection, thus leading to a more visible influence on individuals' perceptions. For instance, people exposed to public signs that frame a city's image as an environment-friendly area are more likely to be concerned about their environmental conditions. For pilot-city programs, on the contrary, the nonsignificant and negative policy-opinion link can be attributed to the fact that they are somewhat distant and invisible from residents. In that case, policy opinion feedback effects may not arise when people cannot perceive what the pilot-city policy does for them.

Effects of Individual-Level and City-Level Control Variables

Similar to findings from previous research (e.g., Marquart-Pyatt, 2012; Xiao et al., 2013), our research demonstrates that age is a significantly strong predictor of individual environmental awareness in all regression models. Older residents show higher levels of environmental awareness as compared to younger respondents (significant at the 0.01 level, Table 5). Besides age, education and environmental knowledge perform largely as expected in predicting environmental awareness. Chinese urban citizens with more education and environmental knowledge are more likely to express their concerns about environmental

issues. Anticipated effects of gender and family income are not confirmed by our study. Such results for individual variables are consistent in all models (see Table 5).

For city-level variables, although economic level was an evident determinant of environmental awareness in many previous studies, our results did not demonstrate a significant relationship between per capita GDP and environmental awareness of Chinese citizens. The lack of association between economic affluence and individual environmental awareness contradicts predictions by the postmaterialist or prosperity hypothesis. This could be because China as a country has not reached the tipping point for postmaterialist value transformation but rather remains in a developmental state.

Regarding environmental pollution factors, we found no significant effect of water pollution (measured by industrial wastewater discharge) on individuals' environmental awareness in all models. More surprisingly, coefficients of industrial soot emissions are consistently negative across all models, which we believe partly result because this indicator does not fully capture the level of air pollution in Chinese cities and because people cannot directly perceive pollution processes like industrial soot emission. As we expected, however, the amount of SO_2 emission, which is more widespread in China and more directly perceived by the public, is positively related to the likelihood of environmental awareness.

[Table 5 here]

Robustness Checks

We conducted three robustness checks to ensure that our major findings are robust to alternative specifications. First, we treated the dependent variable, environmental awareness, from binary variable to ordinal variables anchored by "not concerned at all" (coded as 1) and "very much concerned" (coded as 5). Higher scores imply higher exposure to environmental risks. The results of this robustness analysis are reported as Model 1 in Table 6.

Second, we extended the time baseline for when the title was awarded from 2006–

2010 to 2000–2010 to consider the long-term influence of policies in framing residents' perceptions about environment. Two more pilot-city programs were included in the dataset after the time expansion.[3] In that case, an average of 1.6 model-city programs and 0.7 pilot-city programs were awarded to the sample cities. The maximum number of experimental programs is six and three for each category (see Table 2).

Finally, the last column of Table 6 reports the results of regression based on subsamples that excluded cases from four municipalities (Beijing, Shanghai, Tianjin, and Chongqing) in China, leading to the subsample size of 1,777 urban residents from 77 prefecture-level cities. Despite the weaker statistical power due to reduction of sample sizes, the remaining samples were still elected randomly and thus retain their representativeness.

In all three robust regressions, local governments' active participation in model-city sustainability experimentation programs is confirmed to induce positive policy feedback on mass environmental awareness in urban areas, whereas pilot-city programs are found to be insignificant in shaping residents' perception of environmental threats. It is noteworthy that the coefficient and significance of the model-city programs drawn from 2000 to 2010 are relatively slight compared to those of 2006–2010 (see Model 2 in Table 6). We suppose that because these cities received the honorary titles earlier, the programs are more distant from urban residents' daily lives, thus leading to weaker policy opinion feedback. In addition, observations of other control variables corroborate the analyses in all three robust regressions. Per capita GDP, industrial soot, and industrial sulfur dioxide at the city level as well as age, education, and environmental knowledge at the individual level are robust predictors for individual concerns about the environment.

[3] The National Ecological Construction Pilot City award was initiated by the Ministry of Environmental Protection and designated from 1996 to 2004. The National Pilot City for Integration of Greening in Urban and Rural Areas award was initialed by National Greening and was designated only in 2000.

[Table 6 here]

Discussion

Model Piloting and Experimental Piloting: Two Functions and Two Paths

In the past 10 years, a great number of studies have discussed the role of policy piloting in policy formation, policy learning, and diffusion of the policy process. However, previous studies have mainly focused on the effects of policy piloting within the realm of bureaucracy. Few studies have explored the relationship between the government and society regarding policy piloting. Hence, this study pays attention to the unintended effects of policy piloting beyond bureaucracy and takes environmental governance as an example to explore the influences of different policy piloting programs, the model piloting program and experimental piloting program, on citizens' environmental awareness. As for experimental piloting, the central government directly selects pilot cities with a view to check and test new policies, such as the Low-Carbon Pilot City Program, and decides whether to promote these policy according to how they perform. As for model piloting, local governments apply for central pilot programs based on their excellent governance performance, and these programs may eventually be approved by the central government as a model for other cities to learn from and imitate. The empirical results of this study show that model policy piloting has a prominent impact on improving public environmental awareness, while experimental policy piloting fails to produce the same effect.

Although many studies maintain that China's policy experimentation is based on experimentation under hierarchy, which is controlled by the central government, policy piloting programs with different functions differ completely in their interactions between the central government and local governments. The interactive model between the central government and local governments behind experimental pilot programs explains current studies on China's policy experimentation. In other words, their experimentation under

hierarchy and the entire policy piloting process is led and manipulated by the central government, including which region can be selected as well as when and how policy experimentation is conducted. Local governments of experimental piloting cities carry out macroscopic policy instruction based on their actual conditions, typically following a top-down path. How local experiments are conducted, identified, and interpreted ultimately depends on China's entire political power system. In contrast, model piloting programs reveal a different interaction between the central government and local governments. The prerequisite of being a model city is the local government's performance. However, in the process of realizing specific policy goals, the central government does not have a clear policy design or solution. Therefore, local governments in model cities have greater autonomy to boost policy innovation through their pioneering spirits. The central government's following approval and establishment of the city as a model manifests its learning capacity in terms of accepting innovation at the basic level. In the environmental governance field, model piloting programs can effectively enhance citizens' environmental awareness because local governments have a strong desire to be identified as models by the central government, while public support and widespread environmental awareness among the public are significant conditions for central approval. Hence, enhancing public awareness through public participation is a common characteristic of all model pilot program cities.

Public Participation: A Way to Enhance Public Environmental Awareness

With the central and local interaction behind model piloting programs, local governments possess stronger initiative and flexibility in the design of environmental governance solutions and policy implementation. Accordingly, it provides an institutional space for model cities to pursue personalized development, go beyond existing policy restrictions, and build their own characteristics through awards such as the National Environmental Protection Model City, National Ecological Civilization Pilot Demonstration

City, National Human Settlement Award City, and National Garden City. Given the human resources management system led by governance performance assessment, local governments are highly motivated to have their cities identified as models by the central government, thus forming championship policy diffusion (Zhu, 2014). In such an institutional environment, model cities usually conduct campaign-style enforcement through political mobilization, which involves public participation in environmental governance. Campaign-style enforcement is a type of policy implementation involving extraordinary mobilization of administrative resources under strong political sponsorship to effectively address the decoupling problems in regulatory enforcement and compliance (Liu et al., 2015). For instance, in the process of applying for the National Environmental Protection Model City program, local governments are inclined to enhance public environmental protection awareness and improve their environmental protection behaviors through propaganda and education. All of these initiatives can serve as evidence of environmental governance performance, which influences the central government's assessment. Therefore, local governments of model piloting program cities are more active in making the public participate in the environmental governance process.

Environmental governance campaigns carried out by local governments in the process of trying to garner central approval encourages citizens to participate, which further brings about the unintended effect of enhancing public environmental awareness. Such a policy-opinion nexus demonstrates policy feedback theory in that it emphasizes political rule and system shaping participants (Pierson, 1993). Policy has the function not only of solving political problems but also of affecting human ideology and behavior, thus generating a feedback effect. As recent studies have pointed out, the policy feedback effect on the public is mainly demonstrated through the resource effect and the interpretive effect (Jacobs & Weaver, 2015; Mettler & Soss 2004; Soss & Moynihan, 2014; Wichowsky & Moynihan,

2008). Model piloting in the field of environmental governance imposes citizenship on citizens throughout the entire process, from policy design to enforcement, so as to produce the effect of social learning among local public. Unlike previous studies on policy feedback, the feedback effect in this study does not come from the policy itself but from the policy enforcement process. Campaign-style enforcement is a type of policy implementation involving extraordinary mobilization of administrative resources under strong political sponsorship to effectively address the decoupling problems in regulatory enforcement and compliance (Liu et al., 2015). In addition to resource mobilization and power redistribution (Liu et al., 2015), campaign-style enforcement can have a powerful social learning effect in terms of cognition and can bring about the unintended effect of shaping public opinions.

Conclusion

Previous studies have mainly discussed the effects of policy piloting as they relate to bureaucracy and have paid attention to the role of policy piloting in policy formation, implementation, and diffusion as well as the relationship between central and local governments. In this study, we have attempted to go beyond the scope of its effects on bureaucracy and utilize environmental governance to explore the impact of policy piloting on citizens' environmental protection awareness. Considering its function in governance, we classified policy piloting into experimental piloting and model piloting. Experimental piloting is aimed to test the new policies in pilot cities before they are implemented nationwide, whereas model piloting by the central government aims to set up models in pilot cities, considering their governance performance in the specific field; as examples, these model cities serve to mobilize other cities. According to empirical results of this study, not all pilot programs related to environmental governance exert obvious influence over public environmental protection awareness. Model piloting programs can apparently influence citizens' environmental awareness, but experimental piloting programs do not necessarily

achieve the same effect.

Policy piloting in China is a kind of governance instrument used frequently by the central government to achieve different policy goals. In addition to testing the effects of new policies, pilot cities perform the roles of being established as models by the central government and being imitated by other cities. Given the cadre of the assessment system, local governments are highly motivated to have their cities identified by the central government as models to be followed by other cities. As a result, local governments carry out campaigns, "striving to be the first and best" (*zhengxian chuangyou*), and tend to motivate public participation in environmental governance in the form of political mobilization. Driven by central approval, local governments of model pilot program cities give full scope to their creativity and initiative. They frequently adopt campaign-style enforcement means such as political mobilization to encourage the public to take part in environmental governance so as to be approved by the central government, which generates the unintended effect of enhancing citizens' environmental awareness.

Our study has several significant limitations. First, our findings and conclusions are constrained by the cross-sectional data. We cannot eliminate the possibility of reverse causality, even though we have employed local government actions from 2006–2010 to partially remedy this limitation. A longitudinal research design, when multiple waves of survey data are made available, would be particularly beneficial to discern the relationship between local sustainability policies and individuals' attitudes toward the environment.

Second, although our empirical analysis has effectively demonstrated the policy-opinion nexus, the precise mechanisms through which attitudinal policy feedback occurs in local sustainability programs remain unclear. Our ability to further identify the policy feedback mechanism depends on a careful analysis of specific governmental actions and actual personal experience from stakeholders involved in local experimentation. It follows

that case studies comparing how residents respond to local sustainability attempts in experimentation programs would sketch a more comprehensive picture of the effects presented in this paper.

Furthermore, we have evaluated only one of the most common and reliable measurements of individual environmental attitude (i.e., how much people are concerned about the environmental problems in China). However, the extent to which sustainability programs influence individual attitude may change when different predictors of environmental attitude are applied. Future research can thus extend our study by taking a broader look at types of individual environmental attitudes.

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Tables and Figures

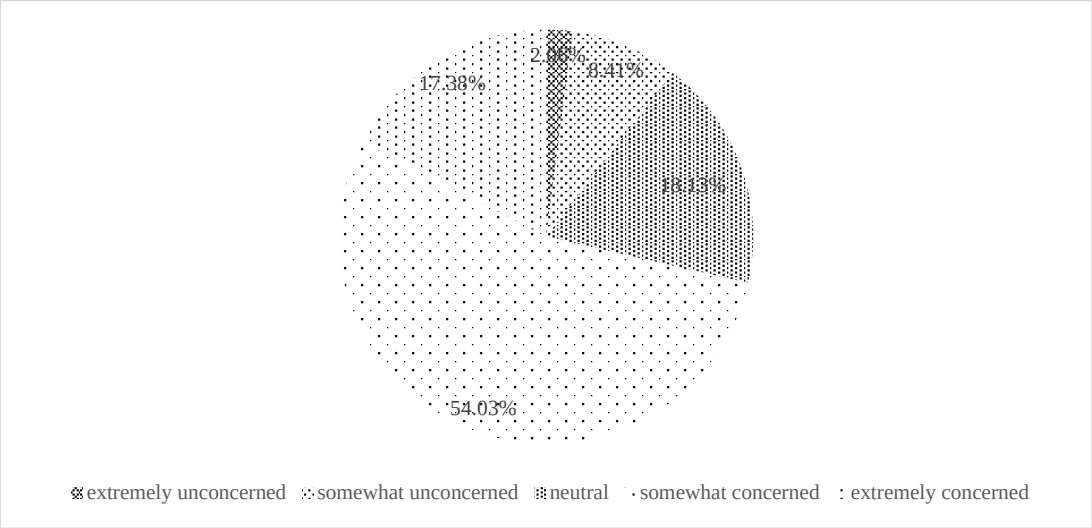

Figure 1. Environmental awareness of urban sample (*N* = 2,284) Notes: In general, how much are you concerned about the environmental issues? (Data source: The 2010 China General Social Survey)

Table 1 *List of Environmental Policy Experimentation Programs (2006–2010)*

Item	Experimental Programs	Responsible Ministries
1	National Water Conservation City	MOC/MOHURD NDRC
2	National Environmental Protection Model City	MEP
3	National Ecological Civilization Pilot-Demonstration City	MEP
4	National Human Settlement Award City	MOC/MOHURD
5	National Garden City	MOC/MOHURD
6	National Health City	PHCCO
7	National Forest City	NFA
8	National Greening Model City	NFA
9	Soil and Water Conservation Demonstration City	MWR
10	Water-Saving Society Pilot Project	MWR
11	Low-Carbon Pilot City	NDRC
12	Ecological Garden Pilot City	MOC/MOHURD
13	Circular Economy Pilot Project	NDRC; MEP

Note. MWR-Ministry of Water Resources; NDRC-National Development and Reform Commission; MEP-Ministry of Environmental Protection; MOC-Ministry of Construction; MOHURD-Ministry of Housing and Urban-Rural Development; NHFPC-National Health and Family Planning Commission; NFA-National Forestry Administration; PHCCO-Patriotic Health Campaign Committee Office

(Data source: Compiled by authors from governmental documents and websites)

Table 2 *Summary Statistics of Participation in Experimental Programs in 2006–2010 and 2000–2010 (N = 81)*

	Number of cities with titles	% of cities with titles	Average number of titles received	Maximum number of titles by one city
Model city (2006–2010)	38	46.91%	0.9	4
Pilot city (2006–2010)	25	30.86%	0.4	3
Model city (2000–2010)	48	59.26%	1.6	6
Pilot city (2000–2010)	37	45.68%	0.7	3

Note. Data source: Compiled by authors.

Figure 2. Geographical distribution of model city environmental experimentation policy programs in China (2006–2010). (Data source: Compiled by authors.)

Figure 3. Geographical distribution of pilot city environmental experimentation policy programs in China (2006–2010). (Data source: Compiled by authors.)

Table 3 *Ten Questions to Measure Environmental Knowledge in the 2010 CGSS*

No.	Questions
1	Automobile exhaust does not pose a threat to human health.
2	Excessive use of fertilizers and pesticides damages the environment.
3	The use of phosphorus washing powder does not cause water pollution.
4	Fluorine emission from fluoride refrigerator will destroy the ozone layer of the atmosphere.
5	The production of acid rain is not related to coal combustion.
6	Species depend on one another; the disappearance of one species will produce a knock-on effect.
7	In the domestic air quality report, Grade III air quality is better than Grade I air quality.
8	One single species of the forest is more likely to cause diseases and insect pests.
9	In the domestic water pollution report, water quality of V (5) is better than that of I (1) class.
10	The increase of carbon dioxide in the atmosphere contributes to global warming.

Note. Data source: Central governmental websites.

Table 4 *Summary Statistics of the Demographic Structure of the Urban Sample*

		Urban Sample	
		N	Pct.
Individual level *			
Gender	Female	1,228	53.37%
	Male	1,073	46.63%
Employment status	Unemployed	1,142	49.63%
	Employed	1,159	50.37%
Education	Primary school or lower	479	20.87%
	Middle school	649	28.28%
	High school	597	26.01%
	College or above	570	24.84%
Age [a]		Avg. 46.56 (16.10)	
Annual household income (1,000 yuan) [a]		Avg. 54.86 (125.66)	
Environmental knowledge [a]		Avg. 5.83 (2.65)	
City Level +			
GDP per capita (1,000 yuan)		Avg. 28.64 (19.61)	
Wastewater (1,000,000 tons)		Avg. 106.72 (147.20)	
SO2 (1,000 tons)		Avg. 77.60 (86.56)	
Soot (1,000 tons)		Avg. 25.71 (23.77)	

Note. [a] is the mean value of the sample (standard deviation in the parenthesis).

(Data source: * Compiled by authors; + China City Statistical Yearbook 2009)

Table 5 *Multilevel Model of Environmental Awareness in Urban Areas*

	Null Model	Individual Model	Full Model
City-Level Factors			
Model city			0.266***
(number)			1.304
			2.903
Pilot city			-0.049
(number)			0.952
			-0.364
GDP per capita			-0.217
(yuan, logged)			0.805
			-1.132
Wastewater			0.109
(1,000,000 tons)			1.115
			1.081
SO2			0.418***
(tons, logged)			1.519
			2.849
Soot			-0.485***
(tons, logged)			0.616
			-3.200
Individual-Level Gactors			
Gender (ref = female)		0.070	0.068
		1.072	1.071
		0.613	0.603
Household income		0.023	0.016
(yuan, logged)		1.023	1.016
		0.530	0.364
Age		0.010**	0.010**
		1.010	1.010
		2.482	2.549
Education (ref = primary school or lower)			
Middle school		0.285*	0.334**
		1.330	1.396
		1.771	2.080
High school		0.490***	0.529***
		1.633	1.697
		2.767	3.002
College or above		1.070***	1.103***
		2.916	3.014
		4.894	5.074
Environmental knowledge		0.129***	0.129***
		1.138	1.138
		5.283	5.312
Constant	0.923	-0.885*	0.386
	2.518	0.413	1.470
	9.073	-1.711	0.207
Log likelihood	-1317.872	-1053.420	-1043.298
City level variance	0.524	0.526	0.297

ICC	0.137	0.138	0.083
N	2284	1917	1917

Notes. Line one: Coefficient, flagged for statistical significance; line two, odds ratio; line three, *t*-ratio. *$p < 0.1$ ** $p < 0.05$ *** $p < 0.01$; Null model and individual model are based on the full sample.

Table 6 *Robustness Check*

	Model 1	Model 2	Model 3
City-Level Factors			
Model city	0.216***	0.117*	0.277***
(number)	1.242	1.124	1.319
	2.783	1.760	2.677
Pilot city	-0.090	0.115	-0.110
(number)	0.914	1.122	0.896
	-0.793	0.984	-0.653
GDP per capita	-0.227	-0.305	-0.220
(yuan, logged)	0.797	0.737	0.803
	-1.377	-1.510	-0.961
Wastewater	0.104	0.103	0.107
(1,000 tons, logged)	1.110	1.109	1.113
	1.180	0.984	0.985
SO2	0.321**	0.428***	0.404**
(ton, logged)	1.379	1.534	1.497
	2.573	2.843	2.562
Soot	-0.407***	-0.494***	-0.485***
(ton, logged)	0.666	0.610	0.616
	-3.115	-3.169	-3.042
Individual-Level Factors			
Gender (ref = female)	0.117	0.074	0.142
	1.124	1.077	1.153
	1.273	0.656	1.124
Household income (yuan, logged)	0.022	0.016	0.003
	1.022	1.016	1.003
	0.562	0.371	0.069
Age	0.010***	0.010**	0.010**
	1.010	1.010	1.010
	2.970	2.501	2.191
Education (ref = primary school or lower)			
Middle school	0.251*	0.316*	0.300*
	1.285	1.372	1.350
	1.813	1.969	1.714
High school	0.317**	0.518***	0.415**
	1.372	1.678	1.514
	2.106	2.935	2.161
College or above	0.851***	1.095***	1.151***
	2.343	2.989	3.160
	4.937	5.026	4.718
Environmental knowledge	0.106***	0.131***	0.131***
	1.112	1.140	1.140

	5.276	5.369	4.760
Constant	-	1.234	0.730
	-	3.435	2.075
	-	0.636	0.334
Log likelihood	-2277.233	-1044.949	-844.901
City-level variance	0.248	0.329	0.335
ICC	0.070	0.091	0.092
N	1917	1917	1522

Notes. Line one: Coefficient, flagged for statistical significance; line two, odds ratio; line three, *t*-ratio. *$p < 0.1$ ** $p < 0.05$ *** $p < 0.01$