

# Local Discretion and Environmental Policy Making in South Korea: Three Models and a Test

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**Abstract:** In South Korea, policy tools and priorities are set at the national level and are controlled through both budget allocations and audits conducted on an annual basis. I look at the degree to which local officials adapt their budget allocations to address local rather than national concerns in securing better air quality, using three different theoretical models: principal-agent, representative bureaucracy, and democratic responsiveness. I raise questions about the degree of control a unitary state can exercise over local problems and how this is reflected in local policy choices, especially in areas where the national government's zone of indifference is large, such as environmental policy. Panel data across 5 years (2007 to 2012) and from 9 geographically and socioeconomically diverse areas within South Korea indicates that local officials respond to local environmental conditions by allocating more resources when needed. I discuss the implications for autonomy in a local policy space.

**Keywords:** Local autonomy, Korean environmental policy, principal-agent theory, representative bureaucracy, democratic responsiveness.

## RESEARCH OVERVIEW

The environmental policy-making process at the national and local levels in South Korea is generally considered a model of centralized government, with the national government setting standards, controlling funds, and auditing local activities to ensure optimal levels of compliance with national policy (Kwak, Yoo, & Shin, 2002). However, after decades of rapid industrialization and the advent and success of heavy

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industry and manufacturing, local governments often find themselves on the forefront of responses to environmentally hazardous conditions, such as high levels of air pollution, water pollution, or soil contamination. While these conditions may be important at the local level, they have not enjoyed attention at the national level of policy.

Since 1991, local officials have been locally elected and therefore must respond in some fashion to local needs and demands. Despite the advent of local elections, South Korea maintains a unitary form of government, under which local governments still serve as the administrative arm of the national state. This tension between conflicting loyalties (national versus local) and different incentives (local economic growth versus public health) may lead to difficulty in consistently explaining why local officials in South Korea behave the way that they do.

This article examines these tensions by first outlining the unique history of the development of environmental policy in South Korea, which helps show how environmental policy offers an expanded discretionary space in which local officials can make decisions. Next, I examine the relationship between central and local governments through three distinct theoretical lenses: principal-agent theory, representative bureaucracy, and democratic responsiveness. This generates three distinct sets of hypotheses to be tested to determine a theoretical framework that may help to better predict local behavior within the Korean context. Using budget data from the national government and a representative sample of local governments, this study determines whether local governments “follow the leader” by using their budgets in accordance with national priorities, and if so, to what degree; or, whether they instead vary their policy responses according to local conditions, actual pollution levels within their jurisdictions, and in response to local interest groups. The results of a fixed-effects ordinary least squares analysis of panel data yield the conclusion that although local governments do “follow the leader” in South Korea, the leader’s voice can be muted to a degree by local conditions and the strength of local interest groups.

## **THE EMERGENCE OF ENVIRONMENTAL POLICY IN SOUTH KOREA**

The story of South Korea’s rapid rise from a primarily agrarian society to an industrial and manufacturing powerhouse in the space of forty years has been well documented (Chapin, 1969; Evans, 1989; Mkandawire & Yi, 2014). What has not been as well covered is the story of South Korea’s more recent emergence as an environmentally conscious state. As detailed in the country’s National Strategy for Sustainable Development (NSSD) (2006), rapid development has come at a cost that threatens the very

model of prosperity lauded around the globe. As described by Rice,

the NSSD was created with the intent of formulating an integrated approach [to] managing the economic, social, and environmental pressures faced by South Korea. . . . The brisk economic development of the country was not coupled with advanced environmental policies or social programs to curb any adverse effect[s] of the rapid change. . . . High industrial growth rates prompted a massive wetland reclamation project in order to secure more land for development, while increases in untreated sewage, industrial pollutants, and soil sediments from deforested mountainsides polluted South Korea's main water sources. South Korea was also dealing with the increased incidence of acid rain as the result [of] the massive industrialization that was occurring in China. (2008, p. 7)

The drafting of the NSSD was the culmination of a slow but steady rise in the salience of environmental issues, both domestically and in the international community. Domestically, the development of a cohesive set of environmental policies was driven partly by internal dissatisfaction with the central government's ability to represent diverse interests in environmentally sensitive cases, such as the Youngwol Dam project (Lim & Tang, 2002), as well as difficulties in coping with the public health components of industrial pollution (Rice, 2008). Externally, the country's image was not holding up well compared to the countries that South Korea considered its peer group: the Organization for Economic and Community Development (OECD) member states. In 2002, for example, South Korea was ranked at 135 out of 142 countries around the world and dead last among OECD member nations in the Environmental Sustainability Index compiled for the World Economic Forum by Yale University's Center for Environmental Law and Policy and Columbia University's Center for International Earth Science Information Network (Global Leaders for Tomorrow Environment Task Force, 2002, p. 3). To add to the humiliation, North Korea only ranked five spots behind South Korea, at 140 overall. For many policy makers at the national level, this was unacceptable (Chosun Ilbo, 2002).

However, to view the drafting of the NSSD in 2005 as merely a response to "bad press" is to overlook a slow but steady evolution of a public environmental "consciousness" (Rice, 2008) during the period of Korea's rapid industrialization. The roots of environmental policy in Korea began with the public health concerns accompanying the rapid increase in pollution associated with heavy industrialization and economic growth. In 1967, a pollution section was created within the Ministry of Health and Society to address these concerns. However, this entity had no regulatory authority, so it served a primarily symbolic function (So, 2003). This lack of regulatory power was finally addressed by the National Assembly in 1977 with the passage of the

Environmental Preservation Act. While the act instituted standards by which environmental hazards might be measured and then managed, it did little to change the behavior of public officials who had a mandate to pursue economic development at all costs (So, 2003; Lee, 1998). However, environmental concerns grew rather than abated, culminating in the creation of the Environmental Administration in January 1980. The national government recognized the importance of this new area of public responsibility by including “environmental rights” in article 35 of the amended Constitution of the Fifth Republic, ratified in October of that same year (Lim & Tang, 2002; Ministry of Environment, 2015; Rice, 2008; So, 2003). Finally in 1990, the Ministry of Environment (MOE) was created as an autonomous agency, and six regional environmental management offices were subsequently set up around the country. As an administrative entity, the MOE has gone through several different reorganizations, including the consolidation of the six regional offices into four (one for each of the major rivers represented in the Four Major Rivers Restoration Project: Han, Nakdong, Geum, and Yeongsan). But overall, it has retained most of its original authority up to the present day, and it is the primary body for establishing national environmental policy and priorities.

### **THE RELATIVE IMPORTANCE OF ENVIRONMENTAL POLICY OVER TIME**

The evolving importance of environmental policy compared to other policy areas in South Korea is reflected in the pattern of expenditures at the national level over several decades. The use of budgets as evidence of policy priorities has a long and well-documented history (Edelman, 1972; Wildavsky, 1988; Rubin, 1989). Edelman in particular argues that politicians will often talk about issues that are of concern to their constituencies and will enact legislation to address those concerns, creating commissions, oversight boards, committees and the like. But if one wishes to understand what is of real import to politicians, one should follow the money (Edelman, 1967). Examining budget behavior of governments longitudinally can offer a view of a particular policy area’s importance and how it may be related to the rise and fall of particular political groups. It can also illustrate how stable the support for a particular policy area is over time. This can be seen in tables 1 and 2, which illustrate two different ways of looking at national budget figures related to environmental policy over time.

Data for table 1 was collected from all national departmental budgets, and the portion dedicated to environmental expenditures at the department level is shown in the figures on the right-hand side (Kim & Gwak, 2000). The data runs from 1970

**Table 1.** Budget Expenditures, of the Ministry of the Environment, 1970-1997

President	Year	National Government Total Budget (A)		Environmental Agency Budget (B)		(B/A=%)
		Budget	% Increase/Decrease from Previous Year	Budget	% Increase/Decrease from Previous Year	
Park Chung-hee	1970	4,462		0.2		0.00004
	1971	5,553	24.4	<b>0.5</b>	<b>150</b>	<b>0.00009</b>
	1972	7,093	27.7	0.9	80	0.00013
	1973	<b>6,593</b>	<b>-7.0</b>	1.1	22.2	0.00017
	1974	<b>10,382</b>	<b>57.5</b>	<b>10.6</b>	<b>863.6</b>	<b>0.001</b>
	1975	<b>15,869</b>	<b>52.8</b>	13.3	25.47	0.00084
	1976	22,700	43.0	<b>22.1</b>	<b>66.1</b>	<b>0.00097</b>
	1977	28,699	26.4	25.1	13.6	0.00087
	1978	35,170	22.5	25.1	0.0	0.00071
	1979	52,134	48.2	<b>51.7</b>	<b>105.9</b>	<b>0.00099</b>
Jeon Doo-hwan	1980	64,667	24.0	<b>120</b>	<b>135</b>	0.00186
	1981	80,400	24.3	152	27	0.00189
	1982	93,137	15.8	207	36	0.00222
	1983	104,167	11.8	<b>206</b>	<b>-0.5</b>	<b>0.00198</b>
	1984	111,729	7.3	<b>343</b>	<b>67</b>	<b>0.00307</b>
	1985	124,323	12.2	420	22	0.00338
	1986	138,005	10.1	432	3	0.00313
	1987	160,596	16.4	<b>670</b>	<b>55</b>	<b>0.00417</b>
Roh Tae-woo	1988	184,290	14.8	772	15	0.00419
	1989	220,468	19.6	644	<b>-16</b>	<b>0.00292</b>
	1990	274,557	24.5	902	40	0.00329
	1991	313,822	14.3	2,434	<b>169</b>	<b>0.00776</b>
	1992	335,017	6.8	805	<b>-67</b>	<b>0.00240</b>
Kim Young-sam	1993	<b>511,879</b>	<b>52.8</b>	1,887	<b>134.0</b>	<b>0.00369</b>
	1994	644,575	25.9	4,716	<b>149.9</b>	<b>0.00732</b>
	1995	745,344	15.6	6,729	42.7	0.00903
	1996	853,083	14.5	8,967	33.2	0.0105
	1997	985,933	15.6	10,802	20.5	0.0110

Adapted from Kim and Gwak (2000). Bold figures indicate >50% increase in expenditures from the previous year OR a decrease in spending of any amount. Units are in ₩10 million.

**Table 2.** National Budget Expenditures, for Environmental Activities by Presidential Administration, 1998-2011

		National Budget and Environmental Department (Unit=₩10 million)				
President	Year	Government Budget (A)		Environmental Department Budget (B)		(B/A)= Proportion of Total Budget Devoted to Environmental Spending
		Budget	Increase/ Decrease from Previous Year (%)	Budget	Increase/ Decrease from Previous Year (%)	
Kim Dae-jung	1998	1,344,939		11,131		0.83
	1999	1,539,920	14.4	11,536	3.64	0.75
	2000	1,604,080	4.1	13,023	12.89	0.81
	2001	1,617,387	0.8	14,143	8.60	0.87
	2002	1,732,841	7.1	14,336	1.36	0.83
Roh Moo-hyun	<b>2003</b>	1,880,037	8.4	<b>14,036</b>	<b>-2.09</b>	<b>0.75</b>
	2004	1,943,554	3.3	16,575	18.09	0.85
	<b>2005</b>	1,999,128	2.8	<b>28,557</b>	<b>72.29</b>	<b>1.43</b>
	2006	2,059,280	3	29,991	5.02	1.46
	2007	2,098,000	1.8	32,231	7.47	1.54
Lee Myung-bak	2008	2,281,859	8.7	35,914	11.43	1.57
	2009	2,565,246	12.4	40,282	12.16	1.57
	<b>2010</b>	<b>2,553,343</b>	<b>-0.4</b>	44,832	11.30	1.76
	2011	2,640,928	3.4	47,778	6.57	1.81

Figures in (B) are the total environmental expenditures at the department level, regardless of type of agency (Ministry of Strategy and Finance, 2012). In 2006, the budget structure was changed to program budgeting, and the Ministry of Government Administration and Home Affairs, Ministry of Construction and Transportation, Ministry of Agriculture and Forestry, and the National Emergency Management Agency were exempt from reporting expenditures on environmentally related programs (Ministry of Strategy and Finance, 2012).

through 1998, the last year of the Kim administration, and figures are expressed in units of ₩10 million. The table allows us to see how environmental spending either increased or decreased independently of overall spending on the national budget. There are two observations of note: first, the share of the national budget represented by expenditures on environmental protection has increased over time, but as of the end of the Kim administration, it still represented a relatively unimportant area of policy, with little more than 1% of the national budget being devoted to it. Second, it is interesting to observe the correspondence between sudden jumps in expenditures and large

natural disasters. Between 1973 and 1974, for example, there was an 864% increase in the environmental budget. Two tropical storms hit Korea in 1973, and two more storms in 1974 contributed to heavy rainfall and flooding. This pattern is repeated in 1979, 1980, 1991, 1993 and 1994. This seems to indicate that environmental expenditures were largely crisis expenditures and not connected to protection, prevention, or remediation policies during this time.

In table 2, we can see environmental policy budget expenditures from a different perspective. The figures include not simply the expenditures of the environmental departments but all expenditures by national public agencies that play a role in implementing environmental policy goals (pollution control, waste reduction, alternative energy production, and the like). The more recent data seems to reflect a continuation of the trend from previous administrations. There is a very large jump in 2005, in response to a series of oil spills off the coast of Korea, but other than this, there is very little variation from year to year, and clearly the national government has not changed course from a reactive policy position to a more proactive or regulatory position.

## **LOCAL ENVIRONMENTAL POLICY MAKING IN SOUTH KOREA**

City and metropolitan governments secured local autonomy in 1991, when elections for local councils were held for the first time since the founding of the Republic of Korea. A second set of elections was held in 1995 for local mayors and governors at the provincial level, and then a third election was held in 1998. Since then, elections for local mayors and council members and provincial governors have been held every five years. They are elected by districts, which are established according to population parameters. Thus, local elected officials serve local residents and their needs directly (Korea Research Institute for Local Administration [KRILA], 2015).

Funding for local governments, however, is still strongly tied to national government sources. Even though local governments employ over 338,000 employees (KRILA, 2015), and account for 55% of all public spending in South Korea, less than 25% of this funding is generated by local revenue. Local governments rely heavily on the national government for their budgets, and they borrow heavily (especially in recent years) for capital projects (KRILA, 2015). So local government autonomy in South Korea is somewhat circumscribed: local citizens may elect their local representatives, but their local representatives and, perhaps more importantly, their administrative staff are highly dependent on the national government for a large proportion of their budgets.

Given this background, what behavior might we expect from local government

officials with respect to environmental policies? Our first inclination might be to argue that local officials are likely to “follow the leader” and strictly adhere to national priorities because of their fiscal dependence on national allocations. But as our overview of national priorities with respect to environmental policy suggests, there seems to be little indication that this is an area of intense interest for the central government. Therefore, local officials may feel somewhat less constrained to “follow the leader” with respect to environmental policies because the leader in this case is not really paying close attention. In the following examination of the literature, I explore this idea more closely and place the special circumstances surrounding South Korea’s unique intergovernmental structure within the context of theory.

### **LOCAL AUTONOMY IN STRONG CENTRALIZED STATES: A REVIEW OF THE LITERATURE**

Environmental policy studies often fall into two categories: those that consider the policy activities of national governments in an international context (Morse & Fraser, 2005; Agram & Chapman, 1999; Neimeijer, 2002), and those that examine the policy activities of subnational governments in response to some national policy directive (Wood & Waterman, 1992, 1993, 1994). Recently, however, policy studies have begun looking at local governments and their role in addressing environmental problems ranging in complexity from simple water quality assessment concerns to global climate change and its potential impacts (Feiock, Tavares, & Lubell, 2008; Feiock, Kassekert, Berry, & Yi, 2009; Feiock, Francis, & Kassekert, 2010). But the idea of local autonomy, especially within countries such as the United States, is undermined by the nested institutions problem (Ostrom, 1990). Local governments must first follow national and state directives before they begin to craft their own policies. Thus those cities that chose to address environmental issues through their policy-making agenda are either cities that have either large or vocal populations concerned with environmental issues or cities that face environmental problems that are pressing and require more action than state or national policies allow for. This has been particularly notable in cities that are concerned about the impacts of global warming and that see inaction as contributing to the problem (Feiock, Francis, & Kassekert, 2010).

The U.S. literature reflects the country’s federalist political context, making certain assumptions about the relationships between local governments and the national government. First, it assumes some degree of local autonomy, despite the polycentric nature of local decisions. Many of the current models of local government behavior, such as the institutional collective action (ICA) model (Feiock, 2007; Feiock, 2009;



Feiock, Francis, & Kassekert, 2010; Feiock, 2013), examine how local governments make decisions that serve collective interests in a competitive local environment, where the incentives for pursuing common goals may be relatively weak. The competition is over mobile resources, such as capital (location decisions by firms or industry) and citizens (e.g. Tiebout's (1956) median taxpayer [Tiebout & Ostrom, 1961]). Second, this literature assumes that competition occurs because the role of the national government in regulating this mobility is limited. Third, it assumes that the collective problems local governments may need to solve fall outside the interest zone of the national government, so central resources for addressing such issues may be unavailable or sanctions for not pursuing solutions may be weak.

In South Korea, however, such assumptions do not necessarily hold and therefore the application of such models to it may yield results that should be interpreted with caution. First, the centralized role of the national government often overshadows local policy agendas (Kwak, Yoo, & Shin, 2002), and the power of national level bureaucrats to set policy objectives is comparatively high. Second, the limits on local autonomy posed by polycentric systems (Ostrom, 1990; Anderies, Janssen, & Ostrom, 2004; Ostrom, 2012) are strengthened in a unitary government system like that of Korea, thus the range of responses available to local governments to address problems are that much more constrained. But the assumption that the national government has a limited interest in some kinds of local problems does offer a unique opportunity with respect to environmental policy to examine whether local governments do exhibit autonomous behavior in South Korea. If local governments demonstrate that they do exercise some degree of autonomy, then there may be relevant recommendations that this policy literature offers them with respect to environmental problems.

Given that the context of South Korean local government differs from that of United States, it may be helpful to examine other theoretical contexts that are less dependent on political structures and institutions. In the sections that follow, three separate theories are presented as possible models for local government decision making in South Korea: principal-agent theory, representative bureaucracy theory, and finally, democratic responsiveness theory. I consider the strengths and constraints of each within the South Korean local government context and outline the expectations for local government behavior generated by each.

### **Local Government Officials as “Good Agents”**

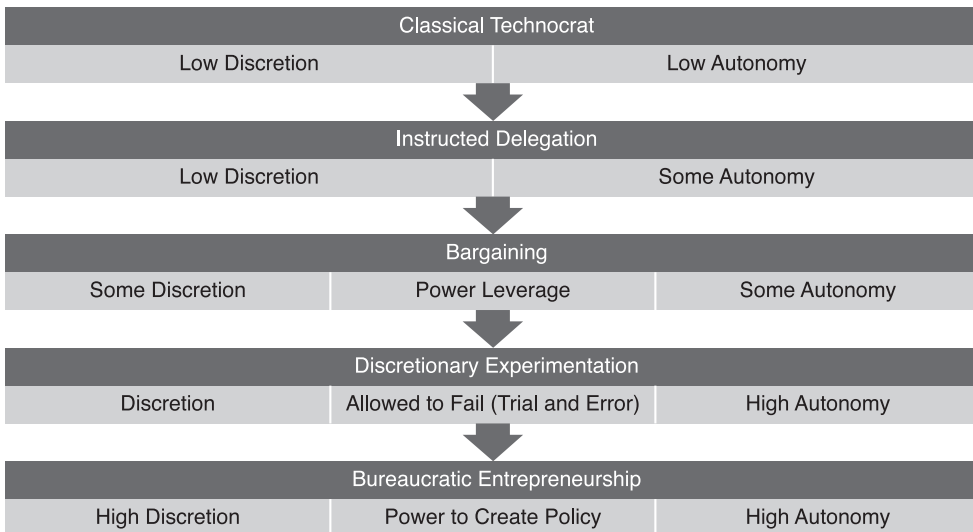
Principal-agent theory has been used many times to explain the behavior of lower-level officials who make environmental policy decisions within a polycentric system of institutions (Wood & Waterman, 1994). The evidence seems to indicate that officials

do act as fairly faithful agents of their political masters (Wood & Waterman, 1992, Wood & Waterman, 1993). However, such studies generally examine the behavior of bureaucrats employed by states or localities charged with carrying out a national mandate. Studies of elected officials are much harder to find, and the evidence available is mixed. Studies of mayors in Colombia (Avellaneda, 2009), for example, indicate that there are educational and socioeconomic factors that influence behavior but that the affect of those factors is perhaps mitigated by the selection processes that take place inside bureaucratic public organizations (Petrovsky, Avellaneda, & Saharia, 2010). However, the principal-agent model in a unitary system may provide robust explanations for the behavior of local officials, so this is an important model to test within the Korean context.

The principal-agent model predicts that local officials will comply with policy decisions made by the central government along a continuum from the classical technocrat, who implements policy with little reinterpretation, to the bureaucratic entrepreneur, who creates and implements policy with little to no guidance from the principal (Nakamura & Smallwood, 1980). The closer the official's personal position to that of the central government policy the more likely the official will behave as an instructed delegate. The less the local official agrees with the central government's position the more likely the official will behave like a bureaucratic entrepreneur (see figure 1).

When a given local official's goal disparity with the national government increases,

**Figure 1.**



Adaptation of Nakamura and Smallwood's implementation linkages (1981, pp. 114-115).

the potential for agency cost increases (Eisenhardt, 1989; Bebchuk & Fried, 2004).

Within the South Korean context, there is also an important role for political parties to play in determining how closely local officials align their own policies with those of the central government (Hwang, 2002). Political parties structure loyalties at the local level, and the need to follow national party direction, especially if the party controls the Blue House, can be very strong. Thus we would expect that classical technocratic behavior is much more likely when party membership is shared at the national and local levels, regardless of policy area or local conditions. In such a context, informational asymmetry is low, since party mechanisms serve to reduce the monitoring costs of the principal (the national government). But if the local party majority differs from the national party in power (the party of the presidency), then the likelihood of informational asymmetry and, therefore, agency cost, is higher (Eisenhardt, 1989).

### **Local Government Officials as Good Environmental Stewards.**

Much of the literature on representative bureaucracy posits that street-level bureaucrats will often make policy decisions based on their preexisting ideas about the value a given policy may hold (Lipsky, 1980; Downs, 1967). In environmental policy areas, street-level bureaucrats with higher levels of education and income are more likely to be faithful implementers of rigorous policies that protect environmental resources (Smith, 2000), an idea that has been proposed within Korea as a viable explanation for official decisions on environmental policies (Jeong, Nam, & Chu, 2003). This hypothesis differs from the principal-agent theory, because stewards will pursue good environmental outcomes regardless of what the central authority is telling them to do. This situation can be highlighted when there is a mismatch between central priorities and local action.

There are two conditions under which such a mismatch may be easier to see: first, when the characteristics of local bureaucrats lead us to suspect goal disparity; and second, when local conditions compel goal disparity. In 2010, Kim and Kim discovered that female bureaucrats are more likely than their male counterparts to support environmental policies, especially those related to public health issues of vulnerable populations such as children and the elderly. The gender of local civil servants is data that is available across local governments, so we may see whether gender helps predict the number of good environmental stewards we can expect to find at the local level. Additionally, we can examine whether local pollutant levels help to explain local policy behavior. This may be reflected in budget allocation decisions made by local bureaucrats and then approved by elected officials.

## **Local Governments as Responsive to Local Interests**

The final framework is democratic responsiveness theory. This is perhaps the most interesting and least examined way of approaching environmental policy, since most studies of democratic responsiveness consider whether politicians keep campaign promises, whether money, such as campaign contributions, influences the kinds of policies that politicians promote (Claibourn, 2008; Claibourn, 2011), or whether the pressure from interest groups is enhanced and pressure from the public is diluted by low participation (Sharp, 2003; Pelissero, 2003). There are case studies of politicians who consolidate power at the local level (Stone, 2008) and use it to both respond to local constituents and build coalitions between competing interests. But these studies often focus on communities that are underserved (poor or minority) where participation in elections or civic life is lower than in more affluent communities. There is very little examination of whether policy makers respond to the environment of the community in which they live or whether they respond to the members of the community itself. Korea has witnessed a rising environmental consciousness at the local level that is often led by grassroots opposition to proposed development or deteriorating environmental conditions. If local politicians respond to citizen voices rather than central command or poor conditions, then this would supply support for the democratic responsiveness thesis.

There is an additional wrinkle in this final framework. As pointed out by Stone (1993), there are multiple publics to be served in any jurisdiction. South Korea has taken the somewhat uncharacteristic step (from a unitary system perspective) of delegating all regulatory activity over environmental outcomes to the local level (Lee, 2004). In districts that have seen rapid industrialization over the past thirty years, local fortunes have been made as deals have been struck between political and economic elites. So the question of which public is capable of engendering a government response is currently unanswered. As the country tries to move toward a postindustrial economy, the chance for new coalitions to be built is growing. This is evidenced by the increasing number of jobs created in the environmental sector (KOSIS, 2016). Therefore, this particular model may generate mixed results as coalitions are reconfigured, and new, more environmentally favorable voices are added to the public square.

## **RESEARCH FOCUS AND DESIGN**

In order to properly evaluate the degree to which local officials respond to local rather than national directives, two questions must be answered: first, at what point

severe local pollution is likely to generate public reaction; and, second, how much local budget allocations to deal with this problem vary from national allocations. I focus on air quality measures, since air quality and air pollution have increasingly been areas of concern for Korean citizens (Chung, 2014).

Having chosen air quality as a variable of significant public concern, I used three criteria to determine sample selection. The first is geographical diversity. I included locations spread across the peninsula, both from north to south and from east to west. The second is size diversity. I considered size both in terms of land area and in terms of population, but I excluded extremes (so Seoul is not included). The third is climatological diversity; cities that historically receive high levels of yellow dust from China and Mongolia may be less likely to view air quality as a concern they can control. I identified 9 cities in the different regions of South Korea, excluding Seoul, that met these criteria: Incheon, Busan, Daejeon, Daegu, Ulsan, Sinan, Sokcho, Andong, and Jeju (see table 3).

There are two pollutants that have particularly harsh impacts on human health and are monitored and regulated by the National Ministry of the Environment: sulfur dioxide (SO<sub>2</sub>), and nitrogen dioxide (NO<sub>2</sub>). Each of these is related to a different kind of activity: SO<sub>2</sub> is primarily a by-product of the burning of coal, either by power plants or by homeowners for heating or cooking purposes. When present in large quantities, it contributes to acid rain. NO<sub>2</sub> is produced by high-temperature fuel combustion, largely found near power plants or in high-density areas where people drive a lot of vehicles (United States Environmental Protection Agency, 2015; Chung, 2014). And as already mentioned, there is an additional pollutant whose source lies outside of South Korea:

**Table 3.** Population in Cities over Time and Location

City	Population 2010	Population 2005	Population 2000	Location
Sinan	33222	38463	46315	SW
Sokcho	80791	84908	87880	NE
Andong	123209	123191	126290	CE
Jeju	322005	311281	279529	SSW
Ulsan	1082567	1049177	1014428	SCE
Daejeon	1501859	1442856	1368207	CW
Daegu	2446418	2464547	2480578	CE
Incheon	2662509	2513280	2475139	NW
Busan	3414950	3523582	3662884	SE

Source: Korean Statistical Information Service: Five-Year Census figures.

yellow dust. If local governments see yellow sand as an external problem, they are more likely to request that the national government help them address it, and the amount of help that they that request is likely to be proportionate to the levels of yellow dust that their communities experience. All three of these pollutants contribute heavily to visible reductions in air quality (smog, reduced visibility) and unpleasant odors. Thus, higher levels may generate a greater number of requests for government action among local citizens.

Based on the three models discussed, there are three sets of propositions that we can test to see whether a given model provides better explanatory power for how local officials make environmental choices. According to the principal-agent model, if local governments are agents of national policy, then local decisions will closely follow national decisions; local conditions in this case would only slightly mitigate this tendency to follow national directives. I expect national budget behavior to be the most significant driver of local budget behavior in this model, with the size of the local administrative staff being the second most important driver. Under the representative bureaucracy model, if local officials are good environmental stewards, then budget decisions will be driven by the characteristics of local bureaucrats and by local environmental conditions. I expect that cities with greater environmental hazards will spend more on their environmental budgets and that those cities with a higher percentage of female employees will see an additional positive impact on expenditures. With respect to the democratic responsiveness model, the choice of which public is represented here is important. For this analysis, the public is defined in general terms, and so what is good for the most people may change depending on what the most people value. In this model, therefore, I expect economic conditions to trump environmental conditions, since the tradeoff between economic well-being and environmental hazards is not a prevalent concern for the time period examined here.

Since the propositions outline an expectation of change over time and since there may be a range of factors that are not specified in the models that may affect local budget behavior, a fixed-effects ordinary least squares (OLS) panel regression is the best approach for establishing which of these variables demonstrates the most significant change within each city, on average, over time (Gould, 2001). For this reason, in each city, I collected a baseline of pollutant information beginning in 2007, and then observed annual changes through 2012.

As mentioned above, there is a long and well-documented use of budget data as a measure of policy priorities. As Jones et al. suggest, “Budgets quantify collective political decisions made in response to incoming information, the preferences of decision makers, and the institutions that structure how decision are made” (2009, p. 855). Thus the expenditures (not the budgeted outlay) illustrate the outcome of competing

priorities at a given point in time. However, local government expenditures tend to be far more stable over time than national budgets and thus are more prone to incrementalism. For this reason, a previous year's expenditures might be the best predictor of the next year's expenditure levels (Budge & Hofferbert, 1990, Budge, Robertson, & Hearl, 1987). The dependent variable for this analysis is therefore the proportion of local budgets dedicated to environmental air quality.

### **LOCAL BUDGET DATA COLLECTION AND DESCRIPTIVE FINDINGS**

Based on this information, we can see how local officials respond to changes in air quality by lagging budget expenditures on air quality programs. Such programs may be underwritten by stronger enforcement measures on the part of local officials, support from private "tattle-tale" citizens, or requests for more assistance from the central government. Drawing on publicly released documents, I gathered budget information for all environmental allocations at the local level from 2008 to 2012, and sought to resolve discrepancies by telephoning local government budget officers.

A quick preliminary examination of the proportion of local budgets expended on environmental programs reveals initial support for the use of budget expenditures as a dependent variable. The proportion of funding dedicated to environmental concerns at the local level varies widely across governments. This is the first indication that local governments do exercise some discretion over the distribution of funds in the policy areas established by the national government. It might be expected that a larger proportion of the budgets of larger cities such as Busan and Incheon, where manufacturing facilities are far more numerous, would be dedicated to environmental activities, but this does not appear to be the case, as in 2008, Busan spent only 0.22% of its local budget on environmental activities, while Incheon spent just 3.06%. On the other hand, the proportion of budget expenditures on environmental programs in Ulsan, where the Hyundai Corporation is headquartered and where several of its largest manufacturing facilities are located, was 12.58% of its total expenditures. All of these percentages vary substantially from the national proportion of spending (see tables 1 and 2).

There are a number of possible explanations for this variance, but the two most likely are geographical and economic. All three cities are on the coast, so air quality problems may be somewhat mitigated by coastal winds sweeping pollution elsewhere. Busan and Incheon have very large international ports that have a high volume of traffic coming from overseas, and ship exhaust is one of the highest contributors to poor air quality in the region. However, Incheon faces China across the Yellow Sea and therefore

may face higher levels of air pollution than Busan. From a political perspective, since all three cities have economies that rely heavily on manufacturing, the public to which the local council may find itself most beholden is that which provides economic benefits (and jobs) to the local community. So there may be common interests between politicians and local industry. Thus budget expenditures seem an appropriate measure for capturing the sum of pressures on local officials.

## **ENVIRONMENTAL DATA COLLECTION**

The environmental data was collected from the Korea Meteorological Association (KMA) and from the MOE and was compiled across six years from 2007 to 2012, with 2007 providing a baseline. The data from the MOE generally notes the highest and lowest levels of pollutants by year and then takes averages over the entire year, removing the outliers. However, this method may skew the averages reported if there are multiple instances of either high or low level scores. In short, it is not a very precise measure of pollution levels. Additionally, it is not a good indicator of change over time, since it aggregates and averages daily measures over a year, so even severe spikes in the level of a pollutant are not reflected well in the annual average. For this reason, I used the output measures from locally monitored pollution sources as a proxy for a given city's pollution levels. This is the level of pollutant emitted in metric tons each year.

## **MODEL PARAMETERS, HYPOTHESES, AND VARIABLE DEFINITION**

Given the factors outlined in the literature review, each model tests a different set of premises as to what best explains the change in policy priority for the environment at the local level. For this reason, it is useful to generate a set of hypotheses for each model to help summarize the expectations of each approach.

The first model, where local governments are understood to be good agents, has assumptions that revolve around the nature of the relationship between the central and local governments. In accordance with principal-agent theory, this relationship can best be structured by examining the nature of information asymmetry between the two levels of government. As outlined in the literature review and the subsequent propositions, the most significant variables for testing this relationship are the characteristics of the local political environment and the degree to which it changes over time with respect to changes at the national level. In this model, the party affiliation of the local



council, which exercises control over local budget decisions, should mediate between the national government’s expenditures on environmental issues and local levels of expenditures. So, I expect that over time, if local governments are “good agents” of the national government, cities that have the same party majority in the city council as in the national administration will adhere more closely to the “party line” and the proportion of the budget they spend to address environmental problems will be similar. For this reason, I use a dummy variable for the political party majority of the local council (1 if the party is the same as the party of the president, 0 if otherwise) to

**Table 4.** Major Variables, 2008-2012

Variables	Units	Measure
<b>Dependent Variable for All Three Models</b>		
local responsiveness	Korean won	proportion of total local budget expenditures dedicated to air quality per year
<b>Independent Variables Model 1—Principal Agent</b>		
central government influence	environmental expenditures/ Total budget expenditures	proportion of national budget expenditures devoted to environmental programs each year
party solidarity	Dummy (0,1)	1=local council majority same party as president; 0=otherwise
bureaucratic power	public employees/ population	number of local government civil servants per capita
economic strength	Korean won	per capita regional GDP
<b>Additional Independent Variables Model 2—Representative Bureaucracy</b>		
SO <sub>2</sub>	tons	pollution levels—annual emissions for city
NO <sub>2</sub>	Tons	annual emissions for city
yellow dust	µg/m <sup>3</sup>	annual daily average for city
advocacy—gender	dummy (0=male, 1=female)	proportion of female public employees
<b>Additional Independent Variables Model 3—Democratic Responsiveness</b>		
local industry influence	number of employees	number of people employed in manufacturing industries in city
local environmental influence	number of employees	number of people employed in environmental activities

measure party solidarity (see table 4 for variable units and measures). The influence of party solidarity will be greater if local administrative staff represent the interests of the national government, so I also include bureaucratic power in this model.

In addition, for this model, the regional economy may play a role in how much of a given local budget can be spent on resolving environmental problems. For example, in a declining regional economy, expenditures in other areas of the budget, such as welfare, may take priority over environmental issues. This may also mitigate the influence of the national government on local expenditures, so economic strength is also included in this model. Finally, in this model, as in all the models tested here, expenditures at the national level will be expected to play a major role in predicting local expenditures over time, so central government influence, measured as the proportion of the national budget expended on environmental programs, is likewise included. Given these expectations, model 1 can be expressed as a set of hypotheses. The first hypothesis is that as central government influence increases or decreases over time, local responsiveness will likewise either increase or decrease (+ relationship). The second hypothesis is that party solidarity and bureaucratic power will strengthen the relationship between central and local governments, so these variables are also expected to move in the same direction as local responsiveness (+ relationship). The third hypothesis is that economic strength will also be positively related to local responsiveness, so that if the regional GDP is increasing, local expenditures will increase as well for environmental programs.

Model 2 examines the premise of whether local governments are good environmental stewards. The crux of this model is the strength of the local administration and leadership. If local environmental conditions warrant increased expenditures, and the local leaders and administrators are receptive to addressing environmental issues, this model should generate significantly higher expenditures in cities where there are more severe air quality problems and more receptive officials. But in places where there are unreceptive officials, levels of pollution may not be significant predictors of increased local responsiveness. These expectations can be expressed as fourth and fifth hypotheses. The fourth hypothesis posits that as pollutant levels for SO<sub>2</sub>, NO<sub>2</sub>, and yellow dust increase over time, local responsiveness will also increase proportionally (+ relationship); the fifth hypothesis posits that as the proportion of female public employees (and thus the level of advocacy) increases, local responsiveness will also increase (+ relationship).

Model 3 tests whether local governments are responsive to local interests, and therefore focuses on the political influence wielded by local interests. These interests include manufacturing industries, or local industry influence, and the political influence of environmental companies (such as recycling ventures or research and development

companies), or local environmental interests. This model is straightforward: the stronger the presence of industry, the lower the local responsiveness, and the stronger the presence of environmental interests, the higher the local responsiveness. This model thus generates two additional hypotheses to be tested: for the sixth hypothesis, as the level of local industry influence increases over time, the level of local responsiveness will decrease (- relationship). For the seventh hypothesis, as the level of local environmental interests increases over time, the level of local responsiveness is expected to increase (+ relationship).

The measures for each of these variables can be found in table 4. For all three models, the dependent variable is the proportion of the local government budget dedicated to air quality control. In each case, the environmental data are drawn from emissions records between January and December of that year; the employment figures for the manufacturing sector and environmental firms in each city likewise cover the period from January to December. The results of the analysis are reported in table 5 and discussed in the next section.

**Table 5.** Results of Panel Data Times Series OLS Fixed-Effects Regression Models

Variables	Model 1 Coefficients	Model 2 Coefficients	Model 3 Coefficients
central government influence	-.8815 (.5360)	.5077 (.5320)	-.9672 (.5945)
party solidarity	.003 (.0016)*	.0035 (.0016)**	.0029 (.0016)*
bureaucratic power	4.24 (2.34)*	4.7719 (2.593)*	4.820 (2.6630)*
economic strength	4.62e-07 (1.80e-07)**	-	3.84e-07 (2.11e-07)*
NO <sub>2</sub>	-	3.29e-07 (1.27e-07)**	-
SO <sub>2</sub>	-	3.66e-07 (1.27e-07)!	-
yellow dust	-	-.00002 (.00002)	-
advocacy		2.43e-06 (3.08e-06)	
local industry influence	-	-	.0880 (.1211)
local environmental influence	-	-	-.9741 (3.404)
Constant	-.0226 (.0162)	-.0467 (.0187)**	-.0260 (.0174)
R-squared overall	.150	.0038	.1506
R-squared within/between	.3786/.3242	.4687/.0000	.3933/3258
N	44	41	44
F (prob)	4.72 (.004)	3.15 (.0001)	3.13 (.0172)

Sig. levels: \*<0.10; \*\*<0.05; !<.01

Note: Standard errors for coefficients in parentheses.

## RESULTS AND DISCUSSION

Between the three models, there was virtually no difference in terms of which one might provide a better explanation of local budget expenditures: all had equally limited overall explanatory power. Given that the dependent variable was a relatively small proportion of all local budget activity, this result is not wholly unexpected. However, there are some notable findings of interest, especially with respect to the long-standing observation that a unitary government results in a relative lack of autonomy for local governments in Korea.

The first item of note is the lack of any significant performance by the national budget variable (central government influence). None of the three models generated a significant coefficient for the national budget. This indicates that regardless of size or location, the priority of environmental expenditures within national budget allocations does not influence local environmental spending on air quality in any significant way. This result has two possible explanations. The first is that the proportion of local budgets dedicated to environmental expenditures was, for the most part, relatively small, and since there were only five years of budget data, the relationship may be somewhat muted by the limited time frame. The second is that this demonstrates the national government's lack of interest, or broad zone of indifference with respect to environmental issues, and therefore offers an opportunity for more discretion by local governments. The finding that the role of the national budget is not significant when it comes to local expenditures on air quality problems would be consistent with this interpretation.

The second interesting result pertains to the importance of regionalism in South Korean partisan politics. This idea in itself is not new, but to find such consistent evidence for the important role it plays in local budget decisions is significant. In all three models, when the local majority party of the city council was the same as the party of the Korean presidency, there was a significant positive effect on local budget expenditures. Given the lack of consistency between the performance of the national budget variable and the performance of the party variable, we can conclude that shared party dominance between the national and local levels does not translate into similar lack of concern for environmental problems at the local level. On the contrary, it seems to indicate that when there are air quality problems at the local level, party solidarity allows local governments to exercise discretion as the need arises. This is borne out by the positive and significant performance of the party variable and the emissions variables for SO<sub>2</sub> and NO<sub>2</sub> in the second model.

Another significant finding is that in all three models, the number of public employees in each city was significant and positively related to air quality expenditures

and the impact was relatively similar, so that if the proportion of public employees increased by 1%, for example, we could expect to see a 4-5% increase, on average, in local government air quality expenditures the next year. This was by far the greatest impact exhibited by a significantly performing variable across all models, and it lends some support for the principal-agent thesis and the second hypothesis, but it may also demonstrate some support for the fourth hypothesis, although the proportion of female public employees did not generate significant results.<sup>1</sup> Although the proportion of female public employees did not produce significant results, the underlying idea that local administrators may serve as advocates when the need arises, as demonstrated in the second model, could be argued as consistent with these results.

The final item of note is that the third model, the democratic responsiveness model, showed no significant effect from the presence of local interest groups, and thus this analysis does not yield support for either the sixth or the seventh hypothesis. The other variables for the model performed consistently with the first and second models, indicating a relative lack of correlation between the interest group variables and local budget behavior. Additionally, the two additional variables in the third model added no explanatory value at all to the first model in terms of the R-squared values.

A summary of the results for each of the hypotheses is as follows. The first hypothesis is unsupported, and thus the null is accepted. The second hypothesis is supported at the 0.10 level, and thus the null is rejected. The third hypothesis is supported at the 0.05 level, and thus the null is rejected. The fourth hypothesis is supported at the 0.05 level for NO<sub>2</sub> and at the 0.01 level for SO<sub>2</sub>, and so the null is rejected; for yellow dust, the hypothesis is unsupported, and so the null is accepted. The fifth hypothesis is unsupported, and so the null is accepted. The sixth hypothesis is unsupported, and thus the null is accepted. The seventh hypothesis is unsupported, and so the null is accepted.

Of the three models, democratic responsiveness shows the least promise. This is somewhat disappointing but perhaps is to be expected given the relatively recent rise of influential local interest groups in Korea. The combined performance of the first and second models indicates a strong level of support for principal-agent behavior in South Korea and suggests that regionalism and party politics plays a significant role in local budget decisions. However, the principal for environmental policy in this scenario is not the principal that one would expect in a unitary state. The principal seems to be a hybrid between national political parties and a core of professional

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1. The advocacy variable changed little from year to year; however, the proportion of female employees at the local government level across all jurisdictions was relatively consistent (approximately one-third), which could lead to the lack of significant findings.

administrators in the form of local civil servants. The first provides income, and the second provides problem solving at the local level.

## **CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH**

The results of this analysis are compelling but should be interpreted with caution. Since the sample of cities was chosen specifically to ensure a range of different environmental conditions, the results cannot necessarily be generalized to all localities in Korea. Additionally, there are likely two sources of the high “within” R-squared values and low overall R-squared values. First, the models were run using fixed-effects OLS, which means each city was being compared to itself over time with respect to the variables included in each model, so variables that were more consistent over time performed better. Second, if there were variables with high degrees of variance across cases (and there is every indication that there was), this would reduce the overall explanatory value of the models. Indeed, one of the shortcomings of this analysis is that variance was sought in the sample design, and yet in a fixed-effects model, such variance can lead to less-than-stellar explanatory measures. But fixed-effects models allow us to compare performance across time, and this is perhaps the most important finding: local governments do respond to local environmental conditions, even when the national government does not give priority to environmental policy. So even in a unitary government like South Korea’s, local governments can have a say in how funds will be disbursed.

Future research may examine other policy areas that seem to be of limited interest to the national government to see whether the “zone of indifference” offers local governments more room to maneuver. If so, the idea that local governments in South Korea have limited policy discretion may need to be reexamined.

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