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Fragmented local governance and water resource management outcomes

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ABSTRACT

Fragmented jurisdictions and decision making structures can result in destructive competition and/or a lack of systematic cooperation that can hamper effective resource management and environmental planning, although the value of local autonomy and stakeholder participations should not be underestimated. This study empirically examines if political fragmentation in local governance is a significant barrier to successful resource management. To test this hypothesis, the authors quantify the degree of political fragmentation at two different geographical scales – 1) site-level: 12-digit watersheds and 2) regional: metropolitan statistical areas or equivalent regions – and analyze how water resource management outcomes vary with the level of political fragmentation using nationwide land cover and stream gauge information in the U.S. Regression analysis shows water quality declines (or slower quality improvements), measured in terms of total suspended solids, are associated with both site-level and regional political fragmentation indicators, suggesting that political fragmentation can make resource management more challenging.

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1. Introduction

Water resource management is an extraordinarily challenging realm in which consideration should be given to the complex behaviors of both the natural environment and human settlements. While the challenges are often grand, managing water resource systems is critical and high on the priority lists of various organizations (ranging from grass-roots groups to international agencies), although management contexts vary significantly by region or country (see e.g., Komatsu et al., 2010; Marsh, 2012; Martins et al., 2013). In the U.S., the FY2013 National Water Program Guidance (U.S. Environmental Protection Agency, 2012a) highlights the critical value of successful water resource management, sets priorities based upon “sustainable communities” and “healthy watersheds”, and clearly articulates various implementation strategies, but

admittedly, how to effectively achieve these priorities is an ongoing question.

Given that water resource management has to deal with complex “coupled natural and human systems”, successful management largely depends not only on our understanding of the mechanisms of ecological systems but also on our institutional environments that can shape the way we perceive and respond to dynamic changes in the ecological systems (Berkes and Folke, 1998; Anderies et al., 2004; Ndubisi, 2008). The importance of institutional arrangements has been widely acknowledged in resource management and environmental planning (see e.g., Carlsson and Berkes, 2005; Lane and Robinson, 2009; Sternlieb et al., 2013). In particular, fragmented authorities and decision making structures (i.e., political fragmentation) have often been viewed as a significant challenge to effective resource management and environmental planning, although the “hometown advantages” and other benefits of disaggregated-local-government-initiated planning have also been recognized. For instance, according to Yaffee (1997), fragmentation of responsibilities and authorities is one of the main causes of recurrent failures in environmental planning and resource management. Moreover, it has been contended that political fragmentation can induce destructive competition as opposed to cooperation, and this can hamper successful

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management of valuable natural resources (Kim and Jurey, 2013). In other words, individual agents may not be able to see incentives enough to take a holistic strategy for resource management without an institutional arrangement that promotes systematic cooperation, and therefore may tend to have parochial, myopic views which in turn result in undesirable outcomes for everyone, as suggested by “the tragedy of the commons” (Hardin, 1968).

However, despite longstanding recognition of the importance of institutional structures in resource management, little is known about how political fragmentation really affects resource management efforts in the field, and thus the outcomes (i.e., quantity and quality of resources). Previous empirical research has typically looked at individual cases in a qualitative, descriptive manner, rather than testing the relationship between political fragmentation and the effectiveness of resource management using a large number of observations under various governance arrangements, although few exceptions exist (see e.g., Sigman, 2007; Kim and Hewings, 2013). To fill this gap, this study examines the potential effects of political fragmentation in local governance on water resource management by conducting a regression analysis with the use of information from more than five hundred stream gauges. More specifically, the present study quantifies the degree of political fragmentation at two different geographical scales – 1) site-level: 12-digit watersheds and 2) regional scale: metropolitan statistical areas (MSA) or equivalent regions – and analyzes how the water resource management outcomes, measured in terms of total suspended solids (TSS), vary with the level of political fragmentation. By doing so, it attempts to better understand the implications of fragmented local governance for water resource management, and eventually contribute to a more effective management of water resources.

In the remainder of this article, attention is first directed to how water resource management outcomes can be influenced by local governance structures, particularly political fragmentation. Then, Section 3 provides an empirical analysis (designed to examine if political fragmentation in local governance is a significant barrier to effective water resource management) and explains the model, metrics of political fragmentation, and the data utilized in this study. The empirical analysis outcomes are presented in Section 4. Finally, Section 5 discusses the main findings of the study and their policy implications with emphasis on some potential strategies for dealing with the challenges arising due to political fragmentation.

2. Political fragmentation & water resource management

There are multiple sources of complexities that make water resource management extremely challenging. Similar to all other types of planning or resource management practice, managing water resources has to deal with not only “environmental uncertainty – uncertainty for planning” but also “process uncertainty – uncertainty from planning” that creates difficulties in identifying what will happen in the foreseeable future and how to cope with emerging problems (Abbott, 2005). In addition, both ecological and human systems involved in any management tasks of water resource are non-reducible, spontaneous, and sometimes chaotic in nature, thus they present largely unpredictable interactions (Dryzek, 1987; Huiterna et al., 2009). Recently, this inherent unpredictability of system behaviors has been further compounded by the force of globalization which increases competition in various dimensions and densities of interactions across scales (see e.g., Cash et al., 2006; Young, 2006; Young et al., 2006). These complexities force us to confront unprecedented challenges to effective water resource management; for instance, in the U.S., a recent national summary of state reports to the U.S. Environmental Protection Agency provides a warning by showing that a significant

proportion of rivers, streams, lakes, reservoirs, and wetlands can be viewed as either impaired or threatened (U.S. Environmental Protection Agency, 2012b).

In accomplishing successful water resource management, the overarching and/or associated institutional arrangement is critical, as noted by Lepawsky (1950), Gerlak (2006), Nimmo (2006), Thiel and Egerton (2011), Larson et al. (2013a), and many others.³ Particularly, water quantity and/or quality changes can be significantly affected by the way local governance structures are organized (e.g., highly fragmented with a large number of municipalities vs. relatively more consolidated), since local governance systems largely shape how individual agencies interact with each other and further influence the behaviors of private agents including developers, businesses, and many other stakeholders. For instance, the local governments within highly fragmented settings may be under higher levels of interjurisdictional competition, so they may tend to be more favorable to new business and development projects (see e.g., Break, 1967; Cumberland, 1979; Kunc and Shogren, 2005). This pro-growth attitude (or “races to the bottom” according to Verchick (2003)) can have a substantial impact on water resource management outcomes, as illustrated in Fig. 1.

More specifically, first, political fragmentation in local governance can modify land use patterns, and thus affect water quantity and quality changes.⁴ This possibility is supported by a growing number of empirical studies which find political fragmentation can cause rapid land use conversion and sprawl. For instance, in their study of the counties in 14 states, Carruthers and Ulfarsson (2002) reported that development densities tended to be lower in more politically fragmented areas with a relatively greater number of local government units per residents.⁵ More recently, Kim and Hewings (2013) conducted a micro-level analysis of small (1 mile × 1 mile) land areas within 82 Midwest metropolitan regions, and found that land use conversion rates were likely to be accelerated when the area was shared (or surrounded) by multiple jurisdictions.

Secondly, given interjurisdictional competition and pro-growth attitudes, land use in a more fragmented context may be less likely to be managed well. For instance, in such a context in which a large number of cities or towns seek new development to expand their tax bases, critical water bodies and/or land surfaces may not be systematically protected through appropriate zoning ordinances or other instruments, such as water quality protection setbacks and impact fees. If this is the case, the marginal negative impact of land use change on water quantity and quality will be greater in the areas with more fragmented governance structures than in cases with lower levels of fragmentation or with the presence of institutionalized entities (e.g., special districts for water resource

³ See also Ndujisi (2002), Randolph (2004), Lane (2006), and Reed (2007) for the importance of institutional factors in the management of other types of resources and/or general environmental planning.

⁴ The 2008 National Research Council publication, Urban Stormwater Management in the United States, indicates “There is a direct relationship between land cover and the biological condition of downstream receiving waters. The possibility for the highest levels of aquatic biological condition exists only with very light urban transformation of the landscape. Conversely, the lowest levels of biological condition are inevitable with extensive urban transformation of the landscape, commonly seen after conversion of about one-third to one-half of a contributing watershed into impervious area” (p.5, National Research Council, 2008).

⁵ The association between political fragmentation and sprawl (i.e., characterized as low density development) is also detected in the authors’ other subsequent studies, such as Carruthers (2003) and Ulfarsson and Carruthers (2006). Also, see Lewis (1996) and Razin and Rosentraub (2000) for detailed explanations of why a fragmented local governance structure can induce a more sprawling pattern of land development.

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