Geographic approaches to resolving environmental problems in search of the path to sustainability: The case of polluting plant relocation in China

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ABSTRACT

This paper applies a spatial perspective to environmental problems in search for the paths to sustainability, using polluting plant relocation in China as a case study. It examines how environmental improvement in one place may lead to environmental degradation in another place, how geographic concepts such as location, distance, spread and backwash effects, and land use models can help understand such phenomenon, and what the implications are for the environmental Kuznets curve (EKC) and development policies. Field research was conducted from 2006 to 2012 in Chinese cities of Beijing, Dalian, Shanghai, Guangzhou, Wuxi, Hangzhou, and Ningbo. It involved intensive site observations and in-depth interviews with government officials of environmental protection, economic development, and business recruitment, and grassroots environmentalists. The results indicate that environmental improvement in all these cities has led to environmental degradation in their suburbs and rural areas due to relocation of polluting plants. Environmental spread and backwash effects may help explain the severe intra-regional environmental and economic disparities and environmental injustice. The powerful and wealthy may achieve rapid economic growth and environmental recovery at the expenses of the powerless and poor, leading to environmental poverty and sustainability disparities.

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Introduction

Developing countries are struggling with problems of environmental degradation. This study describes attempts to use geographic approaches to better understanding and resolving these problems, with a particular focus on the issue of polluting plant relocation. These geographic approaches include von Thünen's (1966) agricultural land use model, Burgess's (1925) urban land use model, Myrdal's (1957) *concept of spread–backwash effects*, and Hirschman's (1958) core–periphery theory. These traditional approaches continue to offer insights that are helpful in addressing today's resource management and allocation problems. For example, Ahlfeldt (2011) finds the monocentric model useful under certain conditions, while Irwin (2010) calls for the development of spatially dynamic and heterogeneous models. Arauzo-Carod, Josep-Maria, Liviano-Solis, and Manjón-Antolín (2010) note that the link between econometric methods and associated location theories is
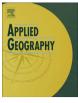
weak particularly with respect to relocation. They foresee increasing research interest in plant relocation studies as a result of new data collection strategies that address the lack of appropriate data. Ying (2000) shows evidence of spread–polarization effects in China. Xing (2007) finds both spread and backwash effects in the Changsha–Zhujiang–Xiangtan region in China. Ke (2010) finds that the central cities in China have backwash effects on nearby rural counties but spread effects on other cities. However, these geographic approaches have not been commonly applied to the debate over the path to sustainability.

The paper attempts to fill that gap, based on field research conducted in China from 2006 to 2012. The focus of the field work was on how polluting plants had been relocated from urban centers to suburban and rural areas in large cities in various parts of China and their environmental and economic impacts on the receiving areas. Polluting plants refer to any industrial facilities that cause significant pollution of the environment. In the study areas, they typically include electroplating, metallurgical processing, chemical, and pharmaceutical plants. This research relied mainly on grounded theory and qualitative (intensive) methods, because they provide the strong explanatory power (Bradshaw & Stratford, 2010) needed to achieve the research objectives. The specific techniques

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used included intensive personal in-depth interviews and on-site observations. The interview questions were designed to be open-ended and probing to obtain intensive and explanatory responses. Because environmental issues, pollution transfer, corruption, and cancer villages are sensitive topics in China, reliable quantitative data are difficult to collect. Other techniques used included searching local documents and records and online data collection. The use of these different forms of data collection in combination provided not only additional information but also additional dimensions (Saldaña, 2011). The field work, conducted in Beijing, Dalian, Shanghai, Guangzhou, Wuxi, Hangzhou, and Ningbo, included site inspections and discussions with government officials concerning environmental protection, economic development, and business recruitment, as well as discussions with grassroots environmentalists. The major findings are reported in this study.

The debate over the environmental Kuznets curve—in search of the path to sustainability

The question of how to achieve environmental recovery has long been contested. Beckerman (1992) suggests that the best and most likely the only way to achieve a decent environment in most countries is in a manner consistent with the environmental Kuznets curve (EKC), which suggests that environmental quality first decreases and then improves with economic growth. Weber and Allen (2010) assert that economic growth can lead to achievement of both economic and environmental goals, while environmental protection may impede economic growth. Panayotou (1993) suggests that.

"Economic growth appears to be a powerful way for improving environmental quality in developing countries.... The environment needs no particular attention, either in terms of domestic environmental policy or international pressure or assistance; resources can best be focused on achieving rapid economic growth to move quickly through the environmentally unfavorable stage of development to the environmentally favorable range of the EKC."

Ekins (2000) notes that these conclusions.

"…created the impression that economic growth and the environment are not only not in conflict [but indeed that] the former is necessary to improve the latter. They invite an emphasis on achieving economic growth rather than on environmental policy because the former is perceived to be able to achieve both economic and environmental objectives, while the latter may impede the former. … these conclusions suggest that growth is a requirement for environmental improvement."

Findings obtained in the field work conduced for this study suggest that in policy making and practice, the "grow (pollute) first, clean up later" approach continues to dominate in the minds of leaders in China. Rock (2002) and Rock and Angel (2007) find that the experiences of the newly industrialized economies (NIEs) in East Asia, including China, are largely consistent with the broad pattern described by the EKC and that these governments have followed the "grow first, clean up later" environmental strategies pioneered in the OECD (Organization for Economic Co-operation and Development) countries. Azadi, Verheijke, and Witlox (2011) believes that the "pollute first, clean up later" path is unavoidable in some developing countries, including China, whose "cleanup" can be postponed by tremendous economic growth.

The Chinese officials interviewed tended to believe that rapid economic growth must be achieved at any costs, even if the cost of future cleanup is higher than current economic gains, because impoverished areas have no other path to economic wealth. These findings agree with those of other authors (e.g., Su, 2007). Furthermore, China has been regarded as a model for developing countries

that have adopted the "grow first, clean up later" approach to development (Azadi, Verheijke, and Witlox, 2011). Horn (2008) suggests that China's economic achievement has been an inspiration to many around the world and that leaders of developing countries are turning to China in search of solutions to their own developmental quagmires. Glaeser (2011) suggests that other developing countries should learn from the Chinese model for environment and development.

On the other hand, the grassroots environmentalists interviewed tended to be against the "grow first, clean up later" approach. They say the practice allows polluting industries to pollute in the name of economic growth and leave the pollution problems for the whole society to address. An EKC does not mean anything to those who are dying from cancer and other environmental diseases. In the literature, the applicability of the EKC has been long disputed (e.g., Levinson, 2002; Liu, 2008, 2012; Stern, 2004; Tevie, Grimsrud, & Berrens, 2011). EKC studies do not support the existence of a simple, predictable relationship between pollution and per capita income because multiple factors are involved, and the effects of these factors must be determined (Dasgupta, Hamilton, Pandey, & Wheeler, 2006; Stern, 2004). Harbaugh, Levinson, and Wilson (2002) conclude that there is little empirical support for an inverted-U-shaped relationship between several important air pollutants and national income. Chowdhury and Moran (2012) argue that a reworking of EKC-related approaches is critical to comparative scientific analyses of dynamic and coupled human–environment systems and for policy prescriptions targeted at geographical issues and a transition toward sustainability on various scales. According to Dietz, Rosa, and York (2012), there is an inverse Kuznets curve between per capita gross domestic product and the ratio of a nation's per capita ecological footprint to its average life expectancy at birth. Franklin and Ruth (2012) highlight the potential impact of population and economic structure in explaining the relationship between income and pollution levels. He and Wang (2012) find that economic structure, development strategy and environmental regulation all have important implications for the relationship between environmental quality and economic development, but they note that the impact can vary at different development stages.

A spatial perspective has been applied to sustainability studies by researchers, including Wilbanks (1994), Eden (2000), Whitehead (2006), Biles (2007), Kajikawa (2008), Sultana (2009), Pickerill and Maxey (2009), and Liu (1999, 2008, 2011). This study describes a further application of geographic knowledge to the pursuit of better understanding of the problems with the EKC and the "grow first, clean up later" approach to development and the search for appropriate solutions for these problems.

Environmental improvement in one place at the cost of another place

The Chinese government has developed various programs to address problems with environmental degradation and rapid urbanization. One such program, established by the Ministry of Environmental Protection (MEP) in 1996, accredited 84 environmental Model Cities—cities that have met specific economic, social, and ecological requirements, particularly pollution control standards set by the MEP (2013). The central and local governments use the Model Cities to showcase their environmental achievements and promote environmental protection. Referring to these achievements, some officials and scholars believe that environmental conditions in some parts of China have improved along with economic growth. Using the Model Cities as exemplars, hundreds of other cities are making efforts to win the accreditation.