The Timing of Adoptions of Land-Use Plans and Regulations in Pennsylvania Localities*

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Objective. This article explores the relationship between the timing of land-use tool adoptions and local growth. Methods. Land cover data, census data, and information about land-use tools were merged for all Pennsylvania minor civil divisions (MCDs) for the period 1975/1980 to 1990/1992. First, the extent to which growth was absorbed in MCDs without land-use tools was assessed. Second, the importance of structural changes for distinguishing new adopters and nonadopters was analyzed using a subset of MCDs. Results. Both the aggregate- and MCD-level analyses suggested that nonadoptions under growth pressure were not widespread. Growth was not a necessary condition, however, for adoption. Conclusions. The findings support an emphasis on outreach aimed at improving the effective use of existing tools, but suggest that the importance of improving the capacity of MCDs without tools is increasing with population decentralization.

When compared with the previous decade, migration from metropolitan (metro) to adjacent and amenity-rich nonmetropolitan (nonmetro) counties increased during the 1990s (Frey and Johnson, 1998; Fuguitt et al., 1998). This trend is projected to continue. Although it presents opportunities for rural development, low-density settlement patterns can undermine such prospects and pose challenges for natural resource management. These include the fragmentation of ecological, aesthetic, and working landscapes, as well as increased water and air pollution (Beatley, 2000; Daniels, 1999; U.S. Environmental Protection Agency, 2001).

Growth management policies, popularized in recent years as smart growth, have long been advocated as a means to capture the benefits of growth while minimizing its negative impacts (Daniels, 1999; Porter, 1997). These policies refer to a combination of public spending programs, regulations, and incentives intended to guide the timing, location, and nature of

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development. Although nonregulatory tools have received increased attention, approaches that combine their strengths with those of regulations offer the greatest potential (Daniels, 1999; Porter, 1997).

Despite the important role of land-use regulations, challenges to their effective utilization have been well documented. Some challenges relate to local technical capacity (Russell, 1996) while others refer to a lack of political will to enforce ordinances (Logan, Whaley, and Crowder, 1997; Warner and Molotch, 1995). Further complicating the situation is the reality that land-use regulations can reduce housing options unless steps are taken to ensure an adequate mix remains (Downs, 1992; Smart Growth Network, 2001).

These challenges underscore the importance of comprehensive approaches to growth management outreach. This includes both a better understanding of the conditions that prompt action and the processes through which localities develop land-use tools. Most quantitative analyses addressing the effects of structural changes have been conducted in suburban contexts and have focused on those tools specifically intended to limit growth (i.e., Logan and Zhou, 1990; Protash and Baldassare, 1983). Significant partial effects both of population growth and of socioeconomic composition (affluence) have been reported.

Case studies of local politics have been largely grounded in the growth machine perspective (Molotch, 1976), which has shown utility for understanding the general alignment of actors in the land development process (see Logan, Whaley, and Crowder, 1997). It positions land-based elites seeking to block the development of regulations that would limit their profits against those fighting to protect their residential use values. Both groups attempt to influence local government officials who are constrained by their need to grow the tax base while responding to the concerns of residents. These studies, however, have not fully explained the development of land-use tools (see also Bridger, 1992; Rudel, 1989; Vogel and Swanson, 1989).

The ability to analyze relationships between structural changes and local actions to manage growth has been improved by advances in geographic information systems (Bradshaw and Muller, 1998; Marceau et al., 2001; Schweik and Thomas, 2002). By merging land cover data, census data, and information describing the presence/absence of land-use tools, it is possible to assess the adequacy of the timing of adoptions for reducing growth’s negative impacts. Analyses of the effects of land-use tools are possible with sufficient information about their content. Further, this kind of data set enables the development of empirical classifications of localities from which to select study sites for the purpose of informing theory.

This study explores the timing of the adoption of basic land-use tools among Pennsylvania minor civil divisions (MCDs). The following research questions are addressed: (1) To what extent has growth been absorbed in localities without land-use tools? (2) How well do structural changes distinguish new adopters and nonadopters of land-use regulations,
controlling for geographic location and local government type and size? Implications for research and outreach are discussed.

**Methods**

**Data and Measurement**

A statewide, MCD-level data set was constructed using National Land Cover Data (NLCD) for 1975 and 1992 as a baseline. These data were organized as total acres in specific cover types for each MCD. Residential and commercial/industrial/transportation types were aggregated into a *developed* land category. Other indicators of structural change were selected from the Census of Population and Housing for the period 1980–1990. Quantitative measures included change in total population and total housing units. Qualitative indicators included change in the proportion of families with annual incomes of at least $50,000, of total housing units that were single-family, and of total housing units that were owner-occupied.

Information on local land-use planning and regulation was acquired from the Pennsylvania Department of Community and Economic Development. It described the presence or absence of the following tools at discrete points in time: comprehensive plans, zoning ordinances, and subdivision ordinances (exact years of adoption were unavailable). Survey years 1975 and 1992 were selected to correspond to the NLCD. These data were aggregated to the following categories at each point in time: no tools, comprehensive plan only, plan plus one regulatory tool, regulatory tool(s) only, and all three tools.

Two geographic variables were constructed. The first represented the location of the MCD within one of Pennsylvania’s eight tourism promotion regions (Figure 1). These regions delineate areas with similar natural resource endowments, economic conditions, and cultural heritage. The second variable reflected the position of the MCD relative to population centers, and was created following the framework of the county rural-urban codes developed by the USDA Economic Research Service (see Ghelfi and Parker, 1997). Categories included metro/urban, metro/rural, nonmetro/urban, and nonmetro/rural (Figure 1).

1 The empirical distribution of changes in *total area* between these points in time was used in conjunction with a list of municipal changes to identify MCDs to be excluded from analyses. Those that expanded or contracted by at least 30 acres, as well as those along Pennsylvania’s border for which acreage had been added to 1992 NLCD in order to facilitate regional mapping, were excluded. The final data set represented 97 percent of Pennsylvania’s MCDs and 94 percent of its total land area.

2 The 1975 data had been previously aggregated using this procedure. Because data representing acreage in the original cover types were no longer available for that year, it was impossible to assess the share of land development attributable to residential and non-residential uses.

3 This procedure is available upon request.
Local government type reflected whether the MCD was a city, borough, or township. Population size class was treated as an intervally-scaled variable: 1 = 500 or fewer; 2 = 501–1,000; 3 = 1,001–1,750; 4 = 1,751–2,500; 5 = 2,501–5,000; 6 = 5,001–10,000; 7 = 10,001–25,000; and 8 = greater than 25,000. These categories were selected based on the empirical distribution. A final indicator of local government context was location in a county with a subdivision ordinance in 1975.

Data Analysis

First, growth experiences were described in relation to region, urban influence, and MCD type. Second, the distribution of growth across planning and regulatory status categories in 1975 and in 1992 was described. Third, an urban influence group was selected based on its growth experience for analysis of adoption behaviors. Among MCDs in this group without any tools or with only a comprehensive plan in 1975, the empirical distribution of adoptions and nonadoptions of regulations was examined. The characteristics of these MCDs were then compared and a discriminant analysis conducted.

Results

Despite the minor statewide population increase (0.2 percent from 1980 to 1990 to nearly 12 million residents), substantial variation across regions existed. The four western regions all experienced net losses (ranging
from –3.6 to –7.1 percent), and the four eastern regions net gains (ranging from 1.4 to 9.2 percent). Housing unit growth occurred faster than population growth in all eight regions, at a statewide rate of 7.4 percent. From 1975 to 1992, the rate of land development (3.6 percent statewide) exceeded population and housing unit growth in all except the most highly developed regions: Philadelphia, Pittsburgh, and Hershey/Gettysburg.

From 1980 to 1990, the total population residing in cities decreased by 7.2 percent and in boroughs by 4.1 percent. In contrast, the population residing in lower-density townships increased by 6.8 percent.\(^4\) Metro/rural townships experienced the fastest growth at 13.3 percent, followed by metro/urban (5.0 percent) and nonmetro/rural (2.4 percent) townships. Housing growth followed the same pattern, with the exception that boroughs experienced net growth. Nonmetro/rural townships experienced the highest rate of land development (10.0 percent), suggesting the presence of significant nonresidential uses. Metro/rural townships followed at 6.8 percent.

Table 1 depicts the distribution of population and housing growth across planning and regulatory status categories in 1975 and 1992. Findings show that MCDs without any land-use tools accounted for a large share of those that experienced growth but for a comparatively small share of the total. For example, MCDs without any tools in 1975 accounted for nearly 36 percent of those that experienced population growth from 1980 to 1990, but absorbed only about 9 percent of the total growth. In contrast, 60 percent of the population growth during that decade occurred in MCDs that already had all three tools by 1975, and 80 percent occurred in those that developed all three by 1992.

Compared to their share of population growth, MCDs without land-use tools absorbed a slightly greater share of housing growth (which includes seasonal units; Table 1). The distribution of land development is not tabled because 76 percent of all townships and nearly all boroughs and cities experienced growth of less than 5 percent.\(^5\) Nevertheless, the total share absorbed by MCDs without land-use tools suggests the potential for problems. Of all land development between 1975 and 1992, 24 percent occurred in MCDs without any tools in 1975, and 17 percent in those still without them by 1992.

Given their high growth rates on all three indicators, metro/rural townships were selected for analysis of adoption behavior. Of the 209 such MCDs without any land-use tools or with only a comprehensive plan in 1975, 85 (41 percent) developed at least one regulation by 1992. The characteristics of adopters and nonadopters are depicted in Table 2. Both regions and structural variables distinguished these groups. Adopters

\(^4\) This trend continued through the 1990s. From 1980 to 2000, the total population residing in cities declined by 11.4 percent and in boroughs by 5.2 percent, while that in townships increased by 17.3 percent.

\(^5\) Because of this finding, land development was treated as a dummy variable (coded as 1 = 5.0 percent or greater and 0 = less than 5.0 percent) for the purpose of subsequent MCD-level analyses.
experienced higher population and housing unit growth, a greater increase in the proportion of families with incomes of at least $50,000, and a greater decrease in the proportion of housing units that were single-family, compared to nonadopters.

When these variables were included in a discriminant model, the resultant function correctly classified 68 percent of adopters and 85 percent of nonadopters (not tabled). The canonical correlation, which summarizes the relationship between the groups and the function on a zero to one scale (Klecka, 1980), was relatively high (0.624). The classification results indicate that while nonadoptions under growth pressure were uncommon among metro/rural townships, growth was not a necessary condition for the adoption of land-use regulations.

Discussion

While low-density areas experienced population and housing growth, the share absorbed by MCDs without land-use tools does not suggest cause for
TABLE 2

Characteristics of Adopters and Nonadopters of Regulations Between 1975–1992, Based on Metro/Rural Townships Without Any Tools or with Only a Comprehensive Plan in 1975 (N = 209)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Adopters (N = 85)</th>
<th>Nonadopters (N = 124)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Local gov’t context</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980 pop. category</td>
<td>3.3</td>
<td>(1.5)</td>
</tr>
<tr>
<td>Cty. subdiv. ord.</td>
<td>0.79</td>
<td>(0.41)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Erie</td>
<td>0.02</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Valleys Susque.</td>
<td>0.28</td>
<td>(0.45)</td>
</tr>
<tr>
<td>Pocono Mountains</td>
<td>0.18</td>
<td>(0.38)</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>0.14</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Laurel Highlands</td>
<td>0.15</td>
<td>(0.36)</td>
</tr>
<tr>
<td>Hershey/Gettysburg</td>
<td>0.20</td>
<td>(0.40)</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>0.02</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Structural changes, 1980–1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population growth</td>
<td>13.3</td>
<td>(23.2)</td>
</tr>
<tr>
<td>Hsg. unit growth</td>
<td>18.8</td>
<td>(19.7)</td>
</tr>
<tr>
<td>Land development¹</td>
<td>0.31</td>
<td>(0.46)</td>
</tr>
<tr>
<td>Chg. prop families &gt;$50,000</td>
<td>16.5</td>
<td>(6.2)</td>
</tr>
<tr>
<td>Chg. prop. hsg. units single-fam.</td>
<td>−3.1</td>
<td>(4.9)</td>
</tr>
<tr>
<td>Chg. prop. hsg. units owner-occup.</td>
<td>1.0</td>
<td>(3.4)</td>
</tr>
</tbody>
</table>

¹Dummy variable coded 1 = 5.0 percent or greater and 0 = less than 5.0 percent.

*p<0.05; **p<0.01; ***p<0.001.

widespread concern. This does not assume that the presence of such tools ensures their effective use, but rather focuses on the obvious implications of their absence. It supports an outreach emphasis on improving the utilization of existing tools. At the same time, the fact that MCDs without tools accounted for a large share of those that experienced any growth, and that they will likely continue to grow, warrants attention to strategies aimed at improving their ability to develop more effective approaches from the start.

That a comparatively large share of land development occurred in MCDs without land-use tools is not surprising given their high proportions of undeveloped land. It does, however, raise important questions about the timing of adoptions where development is unassociated with population growth. To the extent that it reflects large-scale projects such as highway construction, the review processes of higher levels of government could help reduce the most serious negative impacts. Although only local action could moderate the effects of subsequent development, the conditions (if any) under which this occurs prior to population and housing growth are unclear.
The MCD-level analyses also suggested a lack of widespread problems associated with nonadoptions under growth pressure, although the land development variable did not contribute to the discriminant function. The fact that there were reasons for adopting regulations unrelated to growth management underscores the complexity of meanings ascribed to these tools and the challenges for outreach. It is unclear whether localities that adopt regulations for protection from undesired land uses, for example, would be more capable of responding to any later growth than would those that did not previously adopt such tools.

The ability to assess the timing of local actions to manage growth would be substantially improved by spatial analyses that account for diffusion effects, using more sensitive causal intervals. There is also an important need to improve understanding of the extent to which the community-related, as opposed to technical, challenges to effective growth management reflect disagreements over goals or over the use of particular tools. Focusing on ends rather than means expands the range of possibilities for improving the linkages between community development and planning practice.

REFERENCES


This is based on the use of a stepwise procedure to eliminate noncontributing variables (see Klecka, 1980).


