

Assessing the growth-inducing impact of the Appalachian Development Highway System in southern Ohio: Did policy promote change?

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Abstract

The concept of “inducing growth” is typically considered an adverse consequence of a project on the land use system. In certain instances, however, the desire to induce growth and foster land use change is a focus of land use policy. Such is the example of the Appalachian Highway Development System (AHDS) program initiated by the Appalachian Regional Commission (ARC) during the late 1960s. With the goal of providing highway infrastructure to improve access to a geographically isolated and historically impoverished region, the AHDS has added nearly 3000 miles of highway to the Appalachian landscape. The degree to which highway investment has contributed to regional growth remains a controversial point and tractable methods to quickly assess landscape change given a project of this magnitude are elusive. In this paper a portion of the AHDS trending through southern Ohio is examined using data acquired from the Landsat series of satellites. Beginning with a pre-highway condition in 1976, a 26 year time horizon, concluding in 2002, was analyzed based on a post-classification change detection methodology. Results of this investigation revealed slight, yet significant, levels of urban expansion within a 10 km corridor along the path of AHDS Corridor D/State Route 32. Beyond this buffer zone the land use system evidenced more stability, suggesting that as distance increased from Corridor D/State Route 32, reduced accessibility also reduced the attractiveness of land for urban uses. Relating these results back to the infrastructure investment policies of the ARC demonstrates that growth did result from the construction of Corridor D and supports previous findings that land development based on highway construction is extremely time-sensitive.

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Introduction

Within the context of environmental impact assessment a growth-inducing impact describes the potential for a project to foster economic or population growth as evidenced by direct or indirect changes in land use (Canter et al., 1984). Growth inducement may develop should a project remove existing impediments to urban expansion by providing essential public services or new access to an area, promoting the urbanization of land in a remote location, facilitating economic expansion by increasing employment or changing the local revenue base, or establishing a precedent-setting action (Erickson, 1995; Green et al., 1994; Lo and Yang, 2002; Webster et al.,

1990). In each instance growth inducement may constitute an adverse impact if growth is not consistent with, or accommodated by, the plans or policies of the affected area (Gessaman and Sisler, 1976). However where the desire exists to promote growth, deriving the beneficial effects it may offer places emphasis on the timing, magnitude, and location of development within the region of interest. Complicating factors that may derail efforts to “grow” a region include the influence of regional economic trends, changes in market demand for residential and non-residential uses, rising land cost, declines in availability, and the availability and quality of transportation facilities. Any or all of these considerations can effectively retard the growth process and force a change in policy goals and objectives.

Of the myriad ways used to initiate growth, highway investment has served as the basis for many regional

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development policies, particularly in areas where significant economic barriers exist that frustrate alternative strategies (Brown, 1999; Hale and Walters, 1974; Munro, 1969; Nijkamp, 1986; Rephann and Isserman, 1994; Straszheim, 1972). Perhaps one of the more comprehensive programs utilizing highway investment for the purposes of regional economic growth is the Appalachian Regional Commission's (ARC) Appalachian Development Highway System (ADHS). Initiated during the late 1960s, the ADHS represents an attempt to dissolve the pattern of endemic isolation characterizing the Appalachian region by connecting "areas where there is a significant potential for future growth" (US Congress 1965).

The degree to which the ADHS has contributed to growth remains unclear and comparatively little is known concerning the degree to which landscape change may be attributed to this controversial program. Using the association between economic development and land cover change, this paper seeks to enhance knowledge regarding the success of the ARC's infrastructure investment policies through an examination of land use/land cover change, focusing on the Ohio portion of the ADHS (Corridor D/State Route 32 in southern Ohio). Using data acquired from the Landsat system of earth observational satellites, this study focuses on the pre-highway and post-highway conditions for the period spanning 1976–2002. Following a conventional change detection methodology coupled with geographic information system (GIS) data modeling, the intent of this analysis is to:

- document the spatial pattern of land use/land cover change within the southern Ohio portion of Corridor D/State Route 32,
- ascertain the form and location of land use/land cover change in relation to ARC goals, and
- determine the degree to which land use/land cover change may be attributed to the Corridor D/State Route 32.

Through a detailed assessment of land use change in the region, the potential for future change along the Corridor D pathway can be better defined, and avenues for further investigation on the growth impacts induced by State Route 32 can be explored. Additionally, this baseline investigation provides a methodology to guide more detailed assessments of the policy instruments used to promote highway investment as a means of encouraging regional economic development.

Highway development and induced growth

Decentralization, characterized by a spontaneous, almost accidental pattern of land use is an active process of the land use system in the United States (Chen et al., 2002; Crews-Meyer, 2002). Although this spatial pattern of development may mimic close-knit neighborhoods and possess metropolitan characteristics, it typically occurs at

much lower densities (i.e., fewer households per land unit). Highway development contributes to the decentralization process in two critical ways (Kraft et al., 1971). First, transit systems leading away from the urban core create a demand for highways which in turn attract industry. Upswings in the regional economy draw industry to inexpensive outlets and create pressures on the current highway network. This demand necessitates increased highway capacity in order to reach resource markets, resulting in a net shift of people toward the highway, but not necessarily within the developed area. In this context, transportation acts to encourage a "spill over" or "growth fallout," from the developing centers to the adjacent underdeveloped area. The introduction of a new or much improved highway that lowers commuting time and short-haul costs may attract new workers and/or industry which generally convert land from a less-intensive use to a more intensive use. Hence, a cycle of induced growth begins and continues until associated costs overwhelm the benefits of the system (Todd, 1980).

In this context, highway improvement describes a form of regional economic development where land improvement and/or construction involving infrastructure represents a means of recruiting business operations to a region, and ultimately developing populated settlements. Over time, populations in these settlements rely on increases in job opportunities and income that accompany the introduction of additional employment sources. Time in this model plays a pivotal role in determining the economic success related to highway investment as a growth strategy. (Helling, 1997; Rephann and Isserman, 1994). Although construction generates immediate impacts temporally, it may not be a true indicator of the expected pattern and magnitude of future development. Regions must also possess a competitive edge over other regions in order for the highway to be effective. In this regard policies ultimately determine land use, and in turn, result in land cover change (Erickson, 1995), resulting in a cyclic pattern of development. The implications and scope of regional development may therefore vary in accordance with the definition of a region, and how the region and its boundaries are perceived.

Highway interchanges accommodate a substantial level of decentralized growth along corridors. The location at which major transit arteries momentarily convene often-times becomes an opportunity for rural areas to capitalize on the needs of highway users. Also, in order for development to occur, existing adjacent urban cores are needed. For example, a study using aerial photography to examine development patterns on interchanges along the Ohio Turnpike over an 18-year period found a discontinuous pattern of growth, where a number of interchanges experienced marginal development, while a select few areas exploded with residential, industrial, and commercial land uses (Corsi, 1973). The 18-year time horizon also demonstrated that neither time nor proximity to urban centers influenced the rate of development. Rather, it was

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