

Relationship Between Interstates and Economic Development

The relationship between highway investment and economic development has been the subject of two recent studies funded by the Federal Highway Administration (FHWA) and the US Department of Agriculture (USDA). These are “Contribution of Highway Capital to Output and Productivity in the US Economy and Industries,” by M. Ishaq Nadiri and Theofanis Mamuneas, August 1998; and “Rural Economic Development - What Makes Rural Communities Grow?” by Lorna Aldrich *et al.*, *USDA Agricultural Information Bulletin* No. 737, September 1997. In addition, a landmark study was published in 2002 entitled *Manufacturing Works - the Vital Link Between Production and Prosperity*, by Fred Zimmerman and Dave Beal. This 2002 study considers the link between the performance of the manufacturing sector and the overall health of the economy, and considers the role of the transportation sector in supporting manufacturing.

Following is a summary of the key findings of each work. These findings are summarized at the end of this Appendix.

Nadiri and Mamuneas, 1998

The authors were members of the Department of Economics of New York University and the University of Cyprus, respectively. Their 1998 study, funded by the FHWA, is an update of their 1996 study entitled *Contributions of Highway Capital to Industry and National Productivity Growth*. The 1996 study measured the total effect of investment in highway capital on 35 industries during the post-World War II period. The 1998 study used newer modeling techniques and an enhanced data set to address the following issues:

- Consideration of whether omitting other variables, in particular that of other infrastructure capital stock, has biased the magnitude of highway’s capital contribution to output and productivity growth.
- Consideration of how investment in highway capital affects total levels of output in industries. The 1996 study had considered levels of output fixed, and considered only the effects of highway capital on industry productivity. This study considered how investment in highway capital leads to increased production, which in turn increases the demand for factors of production, such as labor, materials, and capital.
- Revising the economic models to improve their functional format, as well as to explicitly account for public capital other than highway capital. The previous study had used a Cobb-Douglas specification, which implies that there is a unitary elasticity of substitution among inputs, including infrastructure capital. The present study uses a translog cost function, which allows the substitution relationship among inputs to vary.

Following are some of the findings in this report.

Chapter 2 - Literature Review

- The authors found “a preponderance of evidence that suggests that infrastructure capital contributes significantly to growth in output, reductions in cost and increases in profitability. The magnitudes of these contributions, however, vary considerably from one study to another because of differences in econometric methodology and level of data aggregation.” (pp. 6-7)
- The literature review summary found that the overall elasticity of industrial output to infrastructure capital at the national level ranges from 0.16 to 0.25. This means that a dollar in overall capital infrastructure investment leads to a \$0.16 to \$0.25 increase in industrial output. (p. 7)

Chapter 3 - Summary of 1996 Report

- The 1996 calculated a “social rate of return” (an estimate of overall societal benefits) for two types of highway capital investment in the 1980s. These two types of highway capital are total highway investment, and the non-local highway system (NLS), which roughly corresponds to the National Highway System. The social rate of return for all highway investments is about 10%, but is 16% for NLS investment. (p. 3)

Chapter 7 - Contribution of Highway Capital at the Industrial Level

- Over a wide variety of industries, highway capital leads to a reduction in production costs in industries. The elasticities are fairly large for manufacturing industries, ranging between -0.14 and -0.22. This means that, within manufacturing industries, \$10 invested in highway capital leads to a reduction in manufacturing costs of between \$0.14 and \$0.22, depending upon the industry. (p. 1)

Chapter 10 - Summary

- Total highway capital has a significant effect on employment, private capital formation, and demand for materials inputs in all industries. (p. 2)
- Given a level of output, an increase in highway capital leads to a reduction in demand for labor and materials and an increase in demand for private capital in all industries. (p. 2)
- In decades prior to the 1980s, the rates of return on total highway capital were greater than those for private capital. By the 1980s, those rates of return converged, so that the rates of return on total highway capital and on private sector capital are similar. (p.2)
- At the aggregate level, the contribution of highway capital to Total Factor Productivity (TFP - a measure of industrial productivity) is 0.25. This means that for every 10% increase in highway capital stock, the observed increase in industrial productivity is 2.5%. This productivity tends to be highest in manufacturing industries. (p. 2)

Aldrich & Kusmin, 1997

This report was published by the USDA, as a summary of an Economic Research Service analysis on factors which were associated with the growth of rural counties in the 1980s. Using a variety of statistical methods, the following factors were identified as being associated either with higher or lagging rates of growth. Associated with higher rates of growth in rural areas of America were (p. 1):

- Low labor costs
- Counties with higher proportions of retirees
- Higher per pupil educational spending
- Nearby (within 50 miles) passenger service airport
- State right-to-work laws
- Higher percentages of high school graduates
- Access to Interstate highway system

Later in the report (p. 3) it made the specific finding that each Interstate interchange located within a rural county was associated with an additional 0.42% increase in total county level earnings between 1979 and 1989 (p. 3).

In sum, this report noted that seven factors are positively associated with higher rates of economic growth in rural areas during the 1980s. One of these seven factors was access to the Interstate highway system.

Zimmerman and Beal, 2002

This book is written by Professor Fred Zimmerman, a manufacturing systems engineering and international management professor at the University of St. Thomas. His co-author is *St. Paul Pioneer Press* business columnist Dave Beal. It is written to expound the premise that America's manufacturing base drives its prosperity. It contains both in-depth analysis, based upon an exhaustive database of manufacturing trends in each of the nation's 3,000 plus counties, as well as observations and interviews from travel to manufacturing locations in many parts of the United States. It offers insight into the relationship between Interstate highways and economic development in three key areas. Chapter 3 is a case study of manufacturing in Northeast Indiana, in which the relationship between its manufacturing base and the existing I-69 is discussed. Chapter 4 discusses industry location trends, and addressed the role of Interstate highway access. Chapter 5 discusses counties which are gaining momentum in manufacturing employment, including one category for which Interstate highway access is essential.

Chapter 3 - Indiana: Jitters in the Comeback Land

Northeast Indiana is entitled the "comeback land." The authors describe the somewhat dire straits in which manufacturing in northeast Indiana found itself in 1982, its comeback from this manufacturing low point, and prospects for the future. Key points include:

- Automotive-related industries have been key to the manufacturing comeback in northeast Indiana. During the 1980s and 1990s, many Michigan-based automotive suppliers moved production to industrial

sites which were located near either I-69, or the Indiana Toll Road, in northeast Indiana. These locations often were better situated for shipping goods to customers than the suppliers' existing plants in Michigan. (p. 35)

- The largest single manufacturing relocation to Allen County (Ft. Wayne) was made when General Motors chose to locate a new truck manufacturing plant near an I-69 interchange. By 1999, this plant was Allen County's largest taxpayer, and General Motor's investment in the plant was approaching \$1 billion. (p. 35)
- Manufacturing employment grew rapidly in the four counties north of Ft. Wayne. Their location along the I-69 corridor was a key factor in this manufacturing growth. The town of Hamilton, in Steuben County boosted its tax base from \$2.4 million in 1981 to \$20.3 million in 1999 in association with this manufacturing growth. (p. 37)

Chapter 4 - Changing Geography and What it Means

- Once-excellent locations which had efficient access to supplier and customers via well-established rail networks increasingly find themselves in highly-congested areas, surrounded by heavy traffic. As the authors state, "In some instances, railroads may have lost their advantages due to the trend to just-in-time shipment of lighter-weight modern products to geographically dispersed locations." (p. 58)
- For many industries, Interstate highway access is increasingly important. They state, "Ready access to the interstate highway system, reasonably priced and effective air transportation, and good rail connections are all attributes appealing to many manufacturers. Some may also be attracted by the close proximity to suppliers and customers." (p. 61)

Chapter 5 - Counties Gaining Momentum

- A category of counties called "Freeway Fliers" have been successful in utilizing their location along Interstate highways to attract manufacturing employment. For these counties the authors note, "Quick access and speedy transport have attracted many manufacturers." (p. 68)
- Dubois County in the Study Area is highlighted as one of these Freeway Fliers. A variety of manufacturing locations which provide wood-based products are the mainstay of manufacturing in DuBois County. Manufacturing employment in DuBois County rose 30 percent between 1988 and 1995. Woodworking has been a mainstay of manufacturing there for decades, and the opening of I-64 has contributed to the increase in manufacturing employment. The Chairman of Styline Industries, office furniture manufacturers, is quoted saying, "I-64 really opened up southern Indiana." (p. 69)
- In the 20 Freeway Flier counties profiled in this section, manufacturing employment increased between 1977 and 1997 by 76%, during a time when the nation as a whole lost 2 million manufacturing jobs. (p. 70)

Summary

This Appendix summarizes key findings the research cited. Overall, the following key points are brought out.

- Transportation infrastructure supports economic performance across the broad scope of industries in the United States.
- Highway investment leads to economic growth by lowering production costs in nearly all industries.
- For certain types of industries, access to higher levels of facilities (including Interstate highways and other types of four-lane divided facilities with at least partial access control) are considered essential.
- The relationship between Interstate highway access and manufacturing is particularly strong. This is important, given the large role that manufacturing has in Indiana's economy.
- Growing trends in just-in-time delivery and use of large regional warehousing centers is a significant part of this trend.
- While high quality highways are an important or even necessary component to support a wide variety of industries, highways alone will not guarantee economic success to a region. Other factors (e.g., an educated work force, labor costs, state and local government policies) also are important in attracting and retaining businesses.
- Investment in higher-level facilities (Interstate highways and other National Highway System routes) appears to have a closer relationship with economic growth than other types of highway investment.
- Within Indiana, I-64 and I-69 in northeast Indiana are held out as specific examples of Interstate highways, which were key factors in economic development in areas which they serve.