

Chicago Fed Letter

Midwest infrastructure: Assessing the contribution of basic infrastructure to economic growth

by Richard Mattoon, senior economist

A recent Chicago Fed conference on the basic infrastructure of the Midwest highlighted the need for policymakers to better understand which infrastructure investments provide the greatest economic return. In addition, they need to understand how to price and manage these infrastructure assets to ensure that investments are efficient and productive.

Readers can access an expanded version of this article, to be published only on the Internet, by following the Research Publications link to Chicago Fed Letter, 2002, December (Midwest Infrastructure Issue) from the Bank's homepage, <www.chicagofed.org>.

On September 25, 2002, participants from government, academia, and business gathered at the Federal Reserve Bank of Chicago to discuss the role of infrastructure in the growth of the economy. The conference, cosponsored by the National Association of State Budget Officers (NASBO), was designed to assess the condition of the region's infrastructure and to discuss approaches to valuing, maintaining, and investing in these assets. This was the fourth conference in the Chicago Fed's Midwest Infrastructure Program.

In his welcoming remarks, Michael H. Moskow, president and chief executive officer of the Chicago Fed, noted that infrastructure systems, such as roads, water systems, energy, and telecommunications, are key to the economic health of any region. However, many analysts believe we are under-investing in these critical assets. Moskow challenged the conference participants to explore methods for pricing and managing our infrastructure assets to ensure that infrastructure investments are efficient and productive.

Scott Pattison, executive director of the conference cosponsor, NASBO, noted in his opening address that the conference was particularly timely given the extraordinarily difficult budget

challenges currently facing the states. With operating budgets being strained, there is a concern that investments in infrastructure may suffer. Pattison said that in this context, it is particularly important that policymakers understand the contribution of infrastructure to their state's economy.

What is the condition of the basic infrastructure of the region?

Rick Mattoon, a senior economist at the Chicago Fed, provided an overview of the condition of the basic infrastructure assets of the five states (Illinois, Indiana, Iowa, Michigan, and Wisconsin) that comprise the Seventh Federal Reserve District. While the condition of roads, water systems, and buildings in the region is not substantially different from that of the rest of the nation, various measures do suggest that the condition of the Midwest's infrastructure assets could be improved upon. For example, Illinois, Iowa, and Wisconsin all reported slightly over 35% of their road pavement as being in either poor or mediocre condition. The national average is 27%. Indiana and Michigan fared only slightly better, reporting scores of 24% and 34%, respectively.

One source of relatively good news comes in the form of District capital management practices. A 2001 study

by *Governing* magazine found that District states are making progress on establishing the systems that will help track the condition of their infrastructure and are taking steps to catch up on their maintenance. District scores ranged from a high of A- in Michigan to a low of B- in Indiana.

Infrastructure and development

The conference participants next considered the relationship between infrastructure and economic development. Geoffrey Hewings, director of the Regional Economics Applications Laboratory at the University of Illinois, presented evidence of the changing role (and growing importance) of transportation infrastructure in the Midwest economy. Hewings emphasized that with the fragmentation of production, the various parts of the region have become increasingly interrelated. This changing relationship between producers and suppliers has made transportation infrastructure a critical component in competitiveness. For example, in the Chicago area, the average firm is more dependent on external suppliers and external markets than in the 1970s and 1980s. This has left firms more dependent on inter-regional trade. The efficiency with which this inter-regional trade is conducted is largely dependent on an efficient transportation network. In this context, Hewings stressed that transportation infrastructure should be seen as an input to efficient production on par with other inputs like raw materials, labor, and capital.

Hewings also warned about the effect that bottlenecks in transportation could have on economic development. Using the example of constraining the Chicago railroad transportation system at its 2005 capacity, Hewings estimates such a bottleneck would cost the Chicago region almost \$2 billion in lost output and nearly 18,000 jobs by 2020.

Chicago's railroad freight infrastructure was the topic of the presentation by Karyn Romano, transportation director with the Metropolitan Planning Council. The council was the lead agency in a coalition of groups that produced a 2001 study called "Critical cargo," which suggested a regional strategy

for enhancing the freight transit system. Romano began by emphasizing Chicago's dominant role as a freight hub. The freight system contributes \$8 billion to the region's economy and is responsible for 117,000 jobs. Chicago is the third largest intermodal shipping hub in the world with over half of U.S. container traffic passing through the region. Romano reported that freight volumes are expected to rise significantly through 2020; however, the system needs significant improvements to ensure Chicago's premier position. The current system is burdened by congestion and engineering problems such as an excessive number of railroad grade crossings. The system is also inefficient in terms of transferring rail freight. Freight transfer often requires the use of trucks; a more efficient system would transfer goods from one train to another.

Romano noted that the study makes three recommendations for improving the region's rail infrastructure. First, there is a need to organize public and private support for a package of capital improvements, including establishing a freight corridor, building grade separations, and upgrading intermodal connector routes. Second, the report recommends aggressively pursuing federal funding. Finally, it recommends creating a regional public/private freight entity to help manage the region's freight system.

How productive are investments?

The last panel of the morning discussed the productivity of infrastructure investments. Senior economist John Fernald of the Chicago Fed presented his research on the returns to investments in highways. The correlation between the value of road stock and changes in labor productivity since World War II has interested macroeconomists as a research question. The challenge has been to establish the causality of this relationship. Does public capital increase productivity or does increased productivity encourage investment in public capital? It is also possible that this is a spurious correlation or reflects a set of common factors affecting both measures.

In conducting his research, Fernald attempted to measure the relationship

between roads and productivity by allowing road-building activities to respond to overall economic conditions. He also tried to relate the dependence of individual industries on roads to increases in productivity in their industry. Presumably, industries with lots of vehicles use roads more intensively and should receive a significant benefit from road investment. Finally, Fernald's model allows for roads to be subject to congestion. His study found that the rate of return for roads was significantly higher before 1973 (when the interstate highway system was being built) than in the period that followed. Fernald suggested that while building a first interstate highway system would be highly productive, building a second system would obviously be more duplicative and less productive. Fernald also found that vehicle-intensive industries benefited disproportionately from the interstate highway system but that the data did not support the view that roads offer an abnormal return on the margin. Fernald concluded by suggesting that the macroeconomic literature has not made the work of policymakers much easier. They still must answer the question of where infrastructure projects make the most sense and which projects reflect the best investment.

Randy Eberts, executive director of the Upjohn Institute, offered his views on the value of the transportation system to the region's economy. He suggested that the key question in assessing the value of infrastructure is not whether transportation systems are important to the economy but rather whether additional investments in transportation systems contribute to economic growth. Part of the challenge of answering this question is that economic development is a complex process, affecting income and product generated within a region. Increases in these factors can in turn lead to gains in jobs, income, quality of life, environmental preservation, and even sustainable development. Transportation infrastructure can support these outcomes by improving access to employment or production and improving connectivity between cities.

Eberts suggested two tools for assessing the contribution of transportation

infrastructure to these economic development goals—benefit–cost analysis and macro-production function estimates. Making these assessments requires understanding the complex relationship between infrastructure system facility characteristics (such as lane miles, grade and pavement conditions), facility outputs (access, traffic flow, speed, and reliability) and outcomes (productivity, income/output generation, job creation, and business location).

Congestion is limiting the productivity of many of Chicago's infrastructure assets.

Eberts reviewed the literature estimating the returns to investments in highways. Generally speaking, studies suggest that the U.S. is currently not under-investing in transportation infrastructure. The one-time super returns to highway projects have been replaced by normal returns that are typically less than returns to private capital. However, Eberts cautioned that individual regions might be over- or under-investing in transportation, depending on the needs of their economy. While highways are clearly necessary to stimulate growth, they cannot do so without other factors being present.

Infrastructure and Chicago

Keynote speaker Dave Schulz, director of Northwestern University's Infrastructure Technology Institute, described the role infrastructure has played in the history of the Chicago area and its continuing importance to the city's economy. Schulz suggested that Chicago and much of the Midwest economy has been built on big infrastructure. However, the city and the region seem to be losing that advantage and the area is facing significant infrastructure challenges. Schulz noted that infrastructure is what made Chicago a dominant location in the country. This infrastructure included work on ports and rivers, pollution control, potable water, rail construction, public transportation, airports, and highways.

Today, the region faces significant infrastructure problems. Congestion is limiting the productivity of many of these

assets. For example, regional airport capacity needs to be expanded. Interstates and tollways need greater capacity and rebuilding. New infrastructure is needed to deal with suburban and exurban (development that is neither fully suburban nor rural) congestion. In addition, existing mass transit needs rehabilitation and expansion. Other infrastructure needs are improvements to freight systems, renewing older urban infrastructure, ensuring a reliable energy supply, and

sorting out telecommunications. Schulz suggested that a particular opportunity for the region would be a high-speed rail network linking midwestern cities. He suggested that this could help integrate the region's economy, while maintaining Chicago's dominance as the hub of the Midwest.

To accomplish these projects and overcome a seeming lack of will to build infrastructure, Schulz suggested several strategies. Among these were: educating people about the importance of infrastructure; restoring public confidence in the infrastructure industry; taking measures to mitigate negative impacts from projects; and building interdisciplinary project teams to design and build infrastructure. Most of all, Schulz emphasized the need to make "visionary" plans that integrate all phases of the infrastructure life cycle from planning and design, to construction, to operations and maintenance, to monitoring and evaluation. Schulz concluded his push for reinvigorating Chicago's infrastructure by quoting Teddy Roosevelt, who said "make the dirt fly!"

Infrastructure asset management

The next conference topic touched on best practices for infrastructure asset management. Roemer Alfelor from the Office of Asset Management of the Federal Highway Administration described work underway to provide guidance to states on how to best manage their transportation assets. Alfelor provided

a definition of asset management as a "strategic approach to optimal allocation of resources for the management, operation, and preservation of transportation infrastructure." A good asset management system creates a feedback loop that links six key elements, ranging from data collection and inventory through performance monitoring, and developing alternatives to program development, implementation, and monitoring. Asset management is becoming easier as new tools and analytic techniques are becoming available that improve the quality of information necessary for decision support.

Alfelor reported that state departments of transportation are beginning to adopt asset management programs, particularly since the public is demanding greater accountability for maintaining the roads. Michigan is among the lead states in adopting asset management. Alfelor also stated that the importance of asset management has risen as our highway infrastructure has aged and states have taken on a larger role in highway maintenance. He concluded by noting that it is the role of the Office of Asset Management to provide technical assistance and leadership in encouraging states to use asset management principles.

James Fountain, assistant research director for the Government Accounting Standards Board (GASB), then discussed the impact of GASB Standard 34 on

Michael H. Moskow, *President*; William C. Hunter, *Senior Vice President and Director of Research*; Douglas Evanoff, *Vice President, financial studies*; Charles Evans, *Vice President, macroeconomic policy research*; Daniel Sullivan, *Vice President, microeconomic policy research*; William Testa, *Vice President, regional programs and Economics Editor*; Helen O'D. Koshy, *Editor*; Kathryn Moran, *Associate Editor*.

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ISSN 0895-0164

the reporting of capital assets by state and local governments. GASB 34 focuses on government performance by requiring state and local governments to report the value of capital assets. This makes it easier to assess whether capital assets are being properly maintained. Fountain noted that there are several reasons to report capital assets. First, it helps users determine whether the current-year revenues cover the cost of current-year services. Second, it allows an assessment of the service efforts and costs of programs. Third, it allows a better assessment of the deterioration or improvement in a government's financial position. Finally, it allows an assessment of the service potential of long-lived physical assets.

GASB allows some flexibility in how governments account for their capital assets. A government can base its infrastructure reporting on the historical cost of the infrastructure (or if records are inadequate, the estimated historical cost) or it can use the modified approach that relies on condition assessments of infrastructure at least every three years. Currently, many governments are opting for the modified approach, but Fountain noted that this approach is no less rigorous. He concluded by defining a performance-based asset management system as "a holistic and systematic approach to asset development and preservation that promotes maximum service performance at minimum life-cycle costs."

Regional governance for infrastructure

Cameron Gordon, executive director of the Advisory Council of Intergovernmental Relations, next turned to the topic of optimal regional governance for making infrastructure investments. Gordon noted that understanding the value of infrastructure is a tricky process. Often the benefits go beyond the obvious physical value of the structure to indirect benefits, such as changes in organization and management. For example, when the railroads were built, organizational and management changes introduced time zones and standardized schedules, which were benefits above and beyond the rails themselves.

Gordon said that four organizational factors should be kept in mind when managing regional infrastructure. These are scale (size of operations), scope (range of activities), structure (internal patterns of authority and communication), and strategy (long-range objectives). The goal is to combine these four factors to produce infrastructure synergies that decrease unit costs for scale, scope, and structure.

Gordon next discussed the complexity of defining appropriate infrastructure regions in the context of the American federalist system. Without formal guidelines, regional infrastructure arrangements have ranged from coalitions, to compacts, to multistate commissions, to regional authorities. Examples include

the Appalachian Regional Commission and the Midwest Regional Rail Initiative. The success of regional infrastructure governing structures is hard to assess, but systems can be designed to create measures for new regional infrastructure management systems. Gordon provided a template with a checklist for planning regional infrastructure systems. Using the template requires analyzing a project's dimensions by characteristics like service area, infrastructure service provided, physical assets, jurisdictions involved, and management and fiscal capacity. Each of these characteristics needs to be assessed against the criteria of scale, scope, structure, and strategic objectives to properly assess its contribution to the region. With a rising need for regional infrastructure, establishing effective governance structures will be critical to planning, building, and managing regional projects.

Conclusion

The presentations at the conference clearly demonstrated that it is critical for policymakers to understand the economic value of infrastructure. This goes beyond accounting for the condition of infrastructure to an understanding of the specific value of individual infrastructure projects to economic growth. For policymakers to make informed choices about scarce resources, more work needs to be done to assess the marginal value of specific infrastructure projects.