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Congestion Impacts on Business and Strategies to Mitigate Them

This NCHRP digest summarizes the findings from the final report of NCHRP Project 2-17(5), "Impact of Urban Congestion on Business," conducted by Cambridge Systematics, Inc. Mr. Lance R. Grenzeback and Dr. Marc G. Warner were the principal authors.

INTRODUCTION

Congestion is a daily phenomenon in all large metropolitan areas and a source of frustration and anxiety for millions of commuters and business travelers. Congestion in metropolitan areas affects business transportation costs and productivity and, hence, the "bottom-line" cost of doing business. Transportation costs have gained ever greater importance as the pressures and opportunities of the global marketplace force U.S. companies to change how they do business. Congestion is perceived to be reaching critical proportions and imposing costs on business that are detrimental to economic development and competitiveness.

Despite increasing concerns about congestion, it has become clear that not enough is known about congestion and its impacts. Even less is known about the consequences of congestion on business. Some direct costs of congestion—the hours lost to truck drivers and automobile drivers on business trips—must be passed on as business costs, but little is known about the magnitude of these costs and their significance to the bottom line of individual businesses and industries.

This digest summarizes the project findings, provides a typology of congestion impacts, discusses how congestion affects different types of businesses, and identifies ways some businesses have mitigated the impact of traffic congestion. The extensive use of interviews with business people helped create a clear view of their perspective. The digest will be of interest to those involved in assessing and mitigating the impacts of traffic congestion on business. The final report for this project will not be published; however, a copy has been sent to each state department of transportation.

RESEARCH OBJECTIVES AND APPROACH

The objectives of this research were to assess and quantify the impact of urban congestion on the cost of doing business. Tracing the costs of urban congestion to different types of businesses will enable transportation planners to better understand the impact of congestion on economic productivity and will help transportation decision makers to analyze the costs and benefits of specific transportation investments. Additionally, business managers will be able to improve the efficiency of their operations by clearly identifying congestion costs.

For this project, congestion was defined as impedance to the flow of traffic—delays that occur because more motorists are trying to use the road network than it can handle at a reasonable level of service. The study focused on businesses in the service and manufacturing sectors, with most (80 percent) being service-sector businesses. Although service-sector businesses generally do not depend as heavily on transportation as manufacturing or

covered on foot. In suburban areas, parts and equipment are stocked at widely dispersed locations so that service personnel do not need to travel to a central office or warehouse. Because of the density of clients in downtown areas, the productivity and profitability of service and repair personnel are higher in congested downtown areas than in less congested suburban and rural areas.

Office, Administrative, Research and Development, Back-Office, and Headquarters Operations

Businesses in this category include finance, insurance, advertising, architecture/engineering, real estate, and most high-tech businesses. Their employees are exposed to congestion while commuting, but the businesses generally have few people or goods moving during the day. Senior staff in these businesses travel frequently but have some flexibility in scheduling.

Manufacturing

Manufacturing businesses are moderately exposed to congestion. Staggered shifts are common among large manufacturing businesses, permitting employees to commute on the shoulders of the peak periods. Large manufacturing businesses often operate 12 to 24 hours a day and, therefore, can take advantage of night shipping and receiving. The trend toward just-in-time operations has increased the exposure of manufacturing businesses to congestion; however, manufacturing businesses have offset this trend by relocating to suburban and exurban areas.

Warehousing, Distribution, and Trucking Operations

Courier and less-than-truckload businesses are among the businesses most exposed to traffic congestion. These businesses make most of their deliveries in the morning after businesses open and most of their pickups in the afternoon just before businesses close. Although they must operate in congested traffic, these operations are tightly planned to minimize travel time and delay. In highly congested areas, the density of customers creates economies of scale that make it profitable to operate even in congested conditions.

MITIGATING CONGESTION IMPACTS

Businesses can reduce their exposure to congestion and, thereby, reduce the direct cost of congestion. This is particularly true in the delivery of goods and services.

Additional Vehicles and Staff

In addition to paying overtime, many businesses—especially those with rigid schedule constraints or with the most to lose from delays—will hire additional staff and purchase more vehicles. Regardless of the pay incentives for drivers to make deliveries on time, such businesses usually employ extra drivers and vehicles to ensure timely service. Examples include the following:

- A department store shipping manager plans for the occasional late delivery by hiring an extra driver and vehicle to act as a "floater" for 20 hours a week. This contingency costs the business $20,000 yearly.
- A parcel delivery service reports a need for added drivers and vehicles to meet its guaranteed 10:30 a.m. delivery time for packages shipped by air. Its Los Angeles district offices use 94 drivers and trucks in daily operation; this number includes approximately seven drivers and trucks that would not be needed in the absence of congestion.
- A restaurant chain with franchises throughout California and the West hires additional staff because congestion reduces the size of the territory the field manager can cover in a week. Each additional field manager costs the business about $72,000 yearly; however, the full cost is not attributed to congestion because the added staff offer better service for the franchise operators and allow the business to cut back on overtime, offsetting some of the added cost.

Businesses with fewer critical deadlines and with less travel through congested areas are less likely to add extra staff or vehicles. For an insurance business with more flexibility to schedule meetings at off-peak times of the day, the response to congestion is to avoid travel during peak hours rather than add staff.

Off-Peak or Night Travel

Only one of the managers interviewed paid a premium wage rate for on-the-job travelers working at night. In this case, a baked goods producer and distributor in Philadelphia, the night-shift premium for the delivery staff was "rather small" and "not significant compared to other costs." The baker attributed much of the decision to shift to night delivery to congested parking spaces rather than congested roadways. In densely developed commercial areas (such as those where bread, dairy, and restaurant provisioners make many of their deliveries), the opportunity to park close to the destination or to double park without risk of being ticketed is much greater at 3:00 a.m. than it is during daylight hours. The cost savings can be significant: Warner and Wilson, in their study of the costs of urban congestion, found that, for United Parcel Service, the cost of the parking tickets its trucks received in downtown Boston was five times greater than the cost the business incurred on those routes as a result of traffic congestion (*1*).

The major constraint on off-peak and nighttime deliveries is usually the availability of the receiver. Many small businesses do not have adequate staff or security to open receiving docks at night. This is particularly true of offices, mall retailers, and small manufacturers. Others are constrained by labor agreements that specify the hours that employees may work; this has been a major problem in operating ports around the clock. Other businesses that depend heavily on trucking may be limited in their night operations because of lack of adequate lighting at job sites, limited security for truck drivers and receiving personnel, or local noise regulations that prohibit late night operations. By contrast, warehouse operations, refineries, and manufacturers that normally operate 16 to 24 hours per day regularly schedule off-peak and nighttime shipping and receiving because they have the staff and facilities in place, and night truck movements represent only a marginal additional cost.

Alternative Modes

The freight industry is experiencing a significant shift in long-haul freight movements from truck to rail and, in the case of high-value products, from truck to air. This trend is expected to continue with the introduction of domestic containers to complement standard maritime-rail containers and the expansion of air freight service. Such services provide businesses with alternatives for long-haul shipments but have relatively little impact on metropolitan and regional freight, which are carried primarily by truck.

At the metropolitan scale, there has been a modest shift within the trucking industry away from using large tractor-semitrailer combinations toward using smaller combination trucks (e.g., snub-nosed city tractors and short 28-ft "pup" semitrailers) and vans. These vehicles are more maneuverable on crowded city streets and are better able to take advantage of congested commercial parking zones and narrow loading docks. This shift was mentioned as a congestion avoidance strategy in interviews in New York City, where truck access is restricted by height limitations at some of the tunnels (*2*).

Telecommunications

A business that substitutes telecommunications or postal service for on-the-road travel may incur some congestion avoidance costs related to loss of personal contact. In general, the telephone, fax, and computer modem will not be used where the personal visit is critical. It is only when travel is not essential but still more desirable than using the telephone or the postal service that it could conceivably bear a cost. One example of this comes from the insurance industry. "Insurance is a personal business, and you lose a little bit of personal contact by doing business by phone or mail," says a manager of an insurance business. He also notes that the use of the mail may also raise some legal issues that would not arise with a face-to-face visit. For example, insurance documents processed through the mail lack the verification of witnesses and signatures. "It's not a critical thing," says the manager, "but you wonder sometimes."

Satellite Branches and Consolidation Terminals

Satellite bases and branches may be established in response to congestion. A business may create a satellite base to avoid sending its staff and vehicles

between the service area and a more distant central facility during the day. Use of a satellite facility reduces vehicle mileage and exposure to congestion. An office machine repair business that has small bases throughout the service area is an example of this. The bases serve as an inventory location for parts that can be restocked periodically. They also provide a locker room and office space where technicians can leave personal items, do paperwork, or eat. Technicians travel locally to the offices where service is needed. In large central business districts (CBDs), where there is the heaviest concentration of office machines, the bases are numerous enough so that technicians can walk to the customers in their territory. There are no vehicles and no congestion problems for these technicians. Outside the CBD, however, where distances between office buildings are greater, the added bases for the office machine repair business exist as a congestion avoidance strategy.

Some businesses will create new bases to serve as local consolidation points. A food distribution business with a central warehouse in the Los Angeles terminal district near downtown has satellite bases in Santa Monica, San Bernardino, and other cities in the metropolitan area. Large trucks transport bulk goods from the central warehouse to the bases each night, where the food is divided into smaller orders, loaded onto smaller trucks, and then delivered to local restaurants. However, according to the managers from this business, the major reason for the arrangement has more to do with saving time for drivers and vehicles because of distance than it has to do with saving time because of congestion.

Relocation

Several of the businesses that the researchers interviewed had relocated offices within the last 5 years. The managers of these businesses reported that congestion was a contributing—but not a major—factor in these decisions. Discussions with industrial and corporate location specialists and state and local economic development officials reinforced the interview findings that transportation and the consequences of congestion are not a top business concern, although relocation may significantly reduce a business's exposure to congestion.

In Atlanta, a real estate services manager, who finds sites for businesses, says that he has "never heard of an office-oriented company choosing not to locate somewhere because there was a lot of traffic." In Los Angeles, economic development officials reported that congestion was "a hassle, but not much of a problem." Los Angeles' Economic Development Corporation surveyed area businesses as part of its "LA Means Business" campaign, and, according to officials, found that transportation was a "minor, minor factor in business decisions." The survey results indicated that the important factors in business location decisions were workers' compensation, regulations affecting land use and plant expansion, and environmental regulations affecting stationary-source air pollution emissions. Other business groups, public agencies, and businesses interviewed in the Los Angeles area agreed that these factors, as well as poor schools, high crime, and the high cost of housing, were the critical factors that detracted from the local business climate. Traffic congestion—even its negative effect on the quality of life—was uniformly ranked low on the list of concerns.

Studies of business relocation decisions that included an explicit look at congestion as a business location factor arrived at similar conclusions. A Detroit study found that personal transportation and distance from materials were very small parts of a business's satisfaction with the area; crime, taxes, productivity, and labor skills were found to be more important determinants of business location. In Boston, plans for construction of a new Central Artery and third harbor tunnel through the core of the CBD triggered intense concern about congestion. Opponents of the project argued that it would drive business out of Boston; however, a survey of businesses in Boston's congested Fort Point Channel industrial section, adjacent to the Artery and tunnel, found that traffic congestion was a relatively unimportant factor in business relocation decisions. The dominant factor was the changing character of the area, which was shifting from manufacturing to office use before the Artery project started, and the accompanying speculation in rent rates.

Although congestion was not perceived as an important factor in business relocation decisions, it is worth noting that among the interviewees, all relocations had been away from dense, highly congested locations towards less dense, less congested locations.

FINDINGS

With motorists spending millions of hours because of congestion-related delays, the premise of this research was that some, if not much, of the cost of congestion was being passed through to business and that the cost would be of considerable concern to business managers. The major finding of the research is that the cost of urban congestion is not perceived as significant by business managers in the predominately service-sector businesses interviewed. In general, congestion was a low-level concern of business managers. Although business managers believe that congestion imposes some cost on operations, most of the interviewees do not believe that the cost is significant to their businesses.

The researchers found that businesses rarely measure the costs of congestion. The businesses interviewed do not track congestion costs in their accounting systems nor, with the exception of a few urban trucking businesses, do they undertake special studies to estimate the cost of congestion when making business decisions. An immediate consequence of this lack of data was that it was not possible to quantify the impacts of urban congestion on business beyond anecdotal estimates.

Business managers do not attribute significant costs to congestion because of the following:

- The type of business travel most exposed to congestion is employee commuting. Employees bear most of the direct cost of urban congestion; however, business does not consider this a direct cost because society views employee commuting costs as the responsibility of the employee.
- Transportation costs are a relatively small proportion of the total cost of providing most goods and services. Severe traffic congestion raises the direct costs of transportation and generates indirect costs, but the order of magnitude of total transportation costs relative to other production factors is still relatively small.
- Exposure to congestion varies by type of business. Not all business travel is exposed to significant congestion. In fact, much business-related travel occurs at off-peak hours, on routes that are not highly congested, and in directions that are counter to peak-hour flows. Transportation businesses, such as courier and parcel services, less-than-truckload motor carriers, and local private fleets are most exposed to urban congestion. Other urban businesses—especially office-based service businesses and retail businesses—typically have less exposure to congestion.
- For some businesses, compensating economies of scale and operational expertise gained by working in densely developed and, therefore, congested areas allow the businesses to operate efficiently and profitably.
- Costs of commuting are shifted to the public sector. In cities with rail transit (i.e., commuter rail, subway, or light rail service) business managers viewed transit as the "escape valve" for worsening traffic congestion.
- Congestion is not perceived as a competitive factor. Some businesses simply do not consider the cost of congestion because it is a pervasive phenomenon, a constant presence that affects all businesses operating and competing in the metropolitan area. Managers believe that their businesses are so intertwined with other local businesses and customers that their businesses will continue to serve the local area regardless of the level of area-wide congestion.
- Businesses adjust their operations to minimize the cost of congestion. Businesses can minimize their exposure to the adverse effects of congestion in several low-cost ways. Flexible scheduling, substitution of telecommunications for travel, use of contract transportation services, and, occasionally, relocation were the most frequently mentioned congestion avoidance strategies.

CONCLUSIONS

The study findings provide contradictory evidence on the need for greater transportation investment. Although the study indicates that businesses absorb some of the cost of congestion and are aware of these impacts, the study also finds that businesses do not internalize these costs and, therefore, do not measure and account for the costs of congestion in ways that directly influence business decisions and the bottom line of the business. These findings point toward a conclusion that the performance of the highway system, at least as measured by the effects of congestion upon service-sector business, is adequate and does not warrant increased investment on this impact alone.

The contradictory evidence is that employees continually adjust to the impacts of congestion. These adjustments include changes in commuting patterns and business hours because a 9-to-5 work schedule cannot be maintained in the face of peak-hour congestion that spreads over two and three hours; and changes in residence and business location that are made to keep a balance between transportation and other activities. While these adjustments are not solely ascribed to congestion, the findings suggest that congestion is extracting a considerable cost if measured by the cost of these congestion avoidance strategies. This interpretation of the findings points toward a conclusion that the performance of the highway system is not adequate and does warrant increased investment.

Overall, the researchers believe that the interview findings support the second interpretation—that the direct costs of congestion and the indirect costs of congestion avoidance impose a substantial cost on business. However, the findings also suggest that further strategies, beyond providing additional capacity at critical bottlenecks, should be considered to reduce the cost of urban congestion to business.

First, the findings suggest that urban traffic and congestion management programs should be given higher priority by state and metropolitan transportation agencies. Businesses are very effective at adjusting their operations to minimize the costs of congestion. Businesses are particularly effective at countering the effects of congestion when the congestion patterns are understood and relatively predictable. These findings point to the need for better traffic monitoring and better dissemination of information on traffic patterns and congestion. Intelligent transportation system programs, especially those designed to provide drivers with timely, accurate, and reliable information on current traffic conditions, could improve the productivity of employees and businesses.

Second, the study findings indicate that congestion management and intermodal freight programs can target transportation investments to help specific industries in metropolitan areas. An important finding of the study is that business exposure to congestion varies widely from business to business. The major constraint on the development of effective urban goods movement strategies is the current lack of knowledge about the tripmaking patterns of particular industries and businesses.

Last, the study findings indicate that state and local transportation agencies need to build stronger ties to their business communities and a better understanding of their business needs and outlooks. The interview results suggest that there is a considerable gap between the popular opinion that congestion is choking American cities and the perception of congestion by businesses. It will be difficult to develop a constituency among business managers for investment in transportation to address congestion as long as the costs of congestion are not being charged to transportation, not perceived as being significant to these businesses, and not seen as affecting the bottom line of individual businesses.

FUTURE RESEARCH

Research is needed to describe and document industry logistics patterns. This information is not available today in a form that is readily accessible to state and local transportation decision makers and planners. This information is critical if the researchers are to determine the exposure of businesses and industries to congestion and design transportation programs that address the needs of business.

AVAILABILITY OF REPORTS

The final report for this project will not be published but is available for purchase on microfiche from the Transportation Research Board (202/334-3214).

REFERENCES

1. Warner, Marc and Nigel Wilson, *The Potential for Traffic Restraint Techniques in Major U.S. Cities*, Progress Report Number 2, Center for Transportation Studies, Massachusetts Institute of Technology, November 1989.

2. Cambridge Systematics, Inc., "Interstate Goods Movement: Trends and Issues." Final Report prepared for the Port Authority of New York and New Jersey, New York, May 1992.