



GRIDLOCK AND GROWTH: THE EFFECT OF TRAFFIC CONGESTION ON REGIONAL ECONOMIC PERFORMANCE

by David Hartgen and Gregory Fields

INTRODUCTION

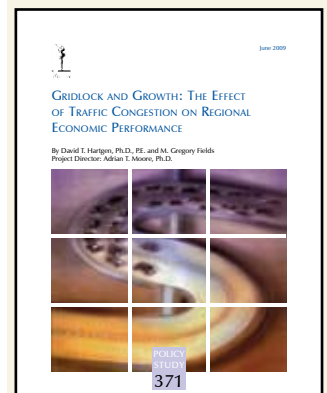
Even though it ranks among the American public's greatest nuisances, transportation planners and elected officials have done little to tame traffic congestion. Indeed, to the extent congestion has moderated in a few urban areas, credit goes to the steep economic downturn, not to public policy. Cities, including Los Angeles, Chicago and New York, see few signs of decreasing traffic despite high unemployment and lower incomes.

Moreover, while the economic recession has temporarily taken traffic congestion off the front burner for elected officials, this is likely to change as the economy heats up at the end of 2009 and into 2010. The dip in vehicle miles traveled (VMT)—a common measure of travel—will likely increase again as pent-

up demand for travel and more fuel-efficient cars hit the roads. More vehicles on the same roads implies ever-climbing costs to American businesses, workers and families as it takes more time and fuel to get where we want to go.

Rising traffic congestion will significantly undermine the competitiveness of U.S. cities and regions unless policymakers earnestly try to reduce it. Part of the resistance to taking the bold actions necessary to reduce congestion is a lack of understanding how congestion negatively affects our cities and their competitiveness, and the benefits of achieving free-flow travel on a regional scale. This study fills that void in the policy discussion by examining the economics of congestion relief. This study finds that reducing congestion adds billions of dollars in additional output for cities, and tax revenues generated from the growth

This is a policy summary of a Reason Foundation policy study no. 371, titled, *Gridlock and Growth: The Effect of Traffic Congestion on Regional Economic Performance*, available on reason.org.





induced by freer-flow travel are likely to be three to five times greater than the costs. Increasing travel speeds enough to improve access by 10 percent to key employment, retail, education and population centers within a region increases regional production of goods and services by 1 percent. While seemingly small in percentage terms, this leads to tens of billions of dollars for a region's employers and workers due to productivity and efficiency benefits.

THE ECONOMICS OF TRAFFIC CONGESTION

For everyday travelers, the frustration of traffic is obvious. Understanding the impact on cities and the economy, however, is not as straightforward as many would like. Sitting on the road stuck in traffic is exasperating. But, from an economic perspective, the impact is the lost productivity from more time traveling to work rather than working, delaying (or missing) meetings, foregoing interactions among individuals or personal activities due to long travel time, and spending more time to accomplish tasks than would otherwise be necessary if we could reliably plan for accomplishing the same things at free-flow speeds.

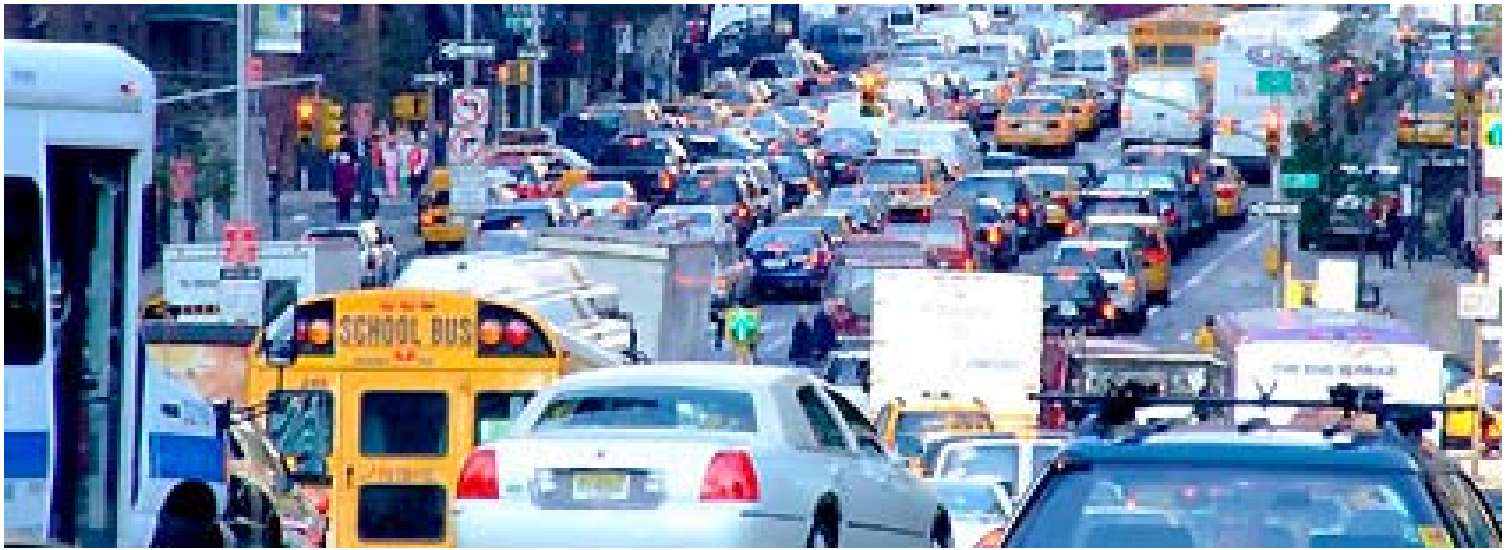
In short, a region's economy does better when people spend more time working and doing things

they find valuable and less time traveling to do them. We depend on our transportation system to provide access—access to people and places we want to go.

Accessibility can be defined several different ways. In this study, we define *absolute accessibility* as the number of residents or jobs reachable within 25 minutes' driving time from a given point, roughly equivalent to the average commute of the typical American worker. *Relative accessibility* is defined as the percentage of regional residents or jobs within 25 minutes of a given point. Defined as such, absolute accessibility can (and will, due to increased population) increase, even as relative accessibility falls when the population outside the urban center increases faster than inner-city population. For this study we compare these categories of accessibility with the economic output of a given region.

We use a form of "gross national product," or GNP, a commonly used measure of economic output (equal to the sum of the value of all goods and services produced annually in the national economy) to measure economic output at the city level. Analogously, one can also think of a gross state product (GSP) or gross regional product (GRP) as the sum of the value of all goods and services produced annually by a state or urban region.

To determine the effect of congestion on GRP, we picked eight cities as representative examples, per-



forming detailed modeling and analysis on each. The results give a very good idea of the economic costs of congestion in the larger urban areas in the United States, and show the economic benefits they can expect from making the transportation investments needed to solve congestion. The cities we analyzed to get these results were Charlotte, Detroit, Salt Lake City, Seattle, Denver, San Francisco, Dallas and Atlanta.

To determine how changes in regional economic performance related to accessibility, we first estimated the gross regional product (GRP) of each region, proportional to state GSP and county income data for the base year. Dividing by the number of workers (jobs) in each region gives the regional productivity, or gross regional product per worker (job). These range from \$81,700 for Salt Lake City to \$125,400 for San Francisco.

The impact of severe congestion on regional economies is significant. Moving to free-flow traffic throughout the region could boost productivity for workers by as much as 30 percent in highly congested regions. Moreover, congestion influences different parts of the urban area in different ways. Reducing congestion in major suburbs in Charlotte, for example, could net productivity increases of 30 percent. Reducing congestion around a major university could boost productivity by nearly 20 percent. Excellent connectivity around the downtown and major malls, on the other hand, results in an increase in productivity of just around 5 percent, or, in the Charlotte region's case, about \$5,000 per worker.

We found that urban areas with less congestion,

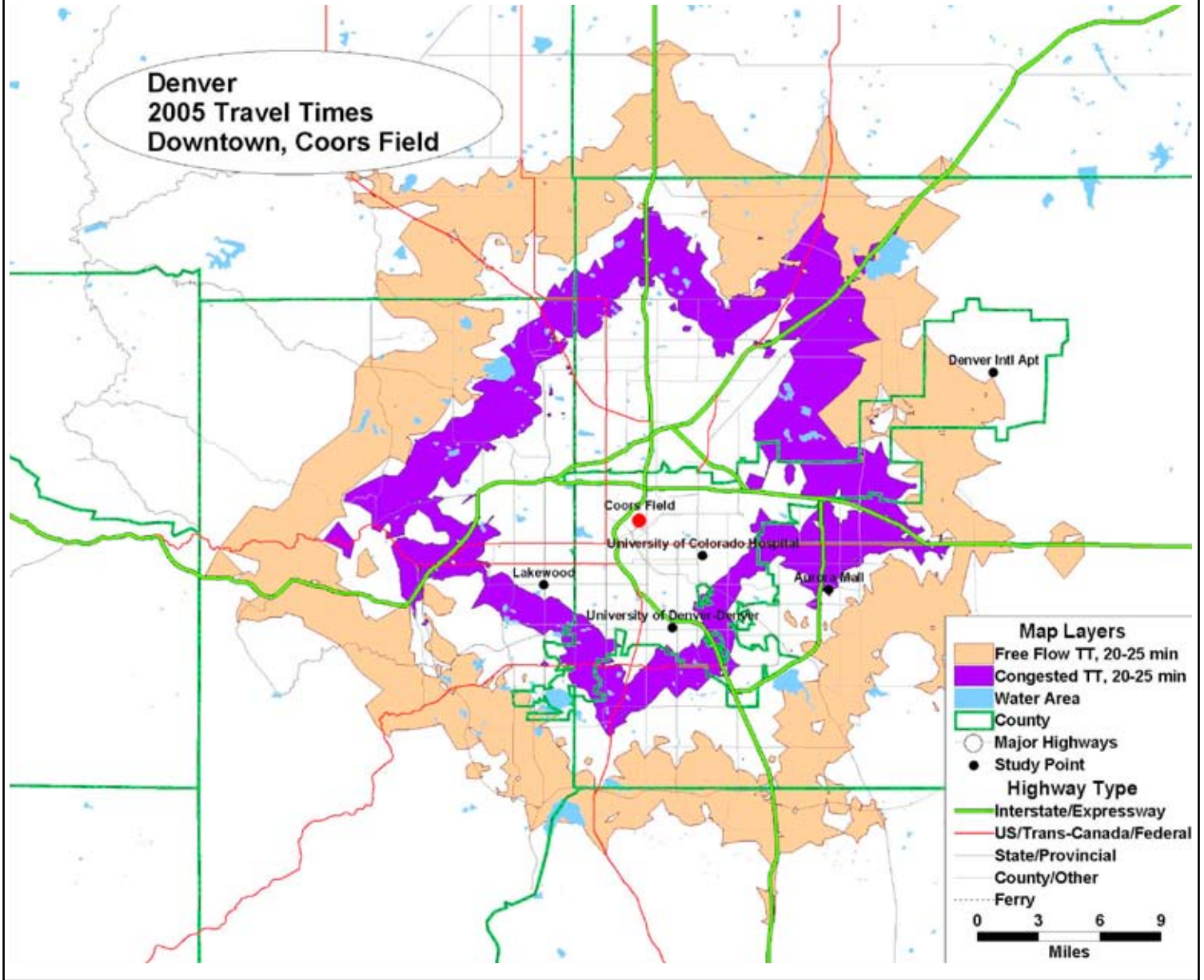
such as Salt Lake City, would not experience dramatic improvements in productivity. Nevertheless, the region still benefits as the accumulation of improvements in travel flow boost regional productivity. In the case of Salt Lake City, access to the downtown, airport and university would not significantly improve although greater access to major suburbs and retail centers could add hundreds of millions of dollars to the economy.

In our analysis, major urban areas such as Seattle, Denver, San Francisco, Dallas and Atlanta would see dramatic improvements in regional economic performance if they achieved free-flow travel on a regional level.

A NEW MEASURE OF HOW CONGESTION COSTS URBAN ECONOMIES

This report breaks new ground in several ways. Unlike many other reports of this type that use distance, we use drive time to measure accessibility, for the most practical and accurate approach. First, we examine the impact of congestion on accessibility to key employment centers and destinations within an urban region, using a 25-minute drive time standard. The 25-minute drive time closely approximates the median peak-hour travel time for auto-mode commuters in major cities in the United States. This straightforward measure relates directly to road speed and traffic congestion during peak hours. It is also has the

Figure 1: 25-Minute Travel Time in Downtown Denver from Under Congested (Purple) and Uncongested (Beige) Conditions



benefit of being computationally straightforward and comparable across regions and from year to year, and is well understood by planners and interested citizens.

For instance, Figure 1 shows the area enclosed by 25-minute drive time from the Denver downtown, using Coors Field as the starting point for a trip. The beige area represents the additional parts of the region that could be accessed if severe congestion were eliminated by 2030. The purple area represents the parts of the region that will no longer have 25-minute access if congestion continues to increase at the planned pace.

An uncongested network of roads permits higher free-flow speeds and hence a larger contour, particularly along major routes. This results in a significant increase in the number of jobs or residents within 25 minutes of downtown—or other parts of the metro area. These increases could (in theory) improve regional performance by reducing travel time and increasing the jobs available to residents, workers and customers available to employers. Drive time contours express changes in access as transportation systems improve. They determine and illustrate how cities are growing over time,

how access is improving or worsening, and how future improvements might change access.

Unfortunately, the 25-minute drive time standard does not capture the much larger area that the majority of all travel in an urban region encompasses. Using a larger catchment area, and/or a longer commute time would probably strengthen our modeling results.

Thus, the study examines the effect of congestion—higher travel times and lower travel speeds—on the number or percentage of jobs or residents within a given drive time from a point. We measured drive time via the available highway networks of the regions, not local roads, and asked four key questions:

- How accessible are various points in urban regions?
- How will the accessibility of these points change in the future?
- What effect will removing congestion have on accessibility?
- How would improving accessibility affect the economic performance of the region?

Unfortunately, trying to examine the impact of improving mobility to the millions of points that make up an urban region was computationally impractical. So, we narrowed the field of candidate locations down to a handful that we believe (and research suggests) are critical to a region’s economic growth. In our case, we examined congestion’s impact on accessibility to five major points: the downtown (central business district), a major suburb, a major retail center (mall), a major university and a major airport. While these points are

certainly not the only major points in regions, they are indicative of the range of locations that allow the region to function economically. They would also undoubtedly be chosen as starting points in local travel time studies.

The next step was to quantify how much current and future traffic congestion would increase through 2030, a typical end date for current long-range plans of urban areas. We could then estimate how improved mobility, or moving the region to free-flow travel, might affect the economic productivity of each region.

Our analysis was applied to eight specific cities—Charlotte, Salt Lake City, Seattle, Denver, San Francisco, Detroit, Dallas and Atlanta—that were chosen because they are representative of the challenges facing all U.S. urbanized areas of various sizes. The congestion problems facing Dallas, Atlanta and San Francisco are well known and perhaps unsurprising given their large size. Detroit also ranks as one of the nation’s largest urbanized areas and its traffic congestion problems are as severe, albeit less well known. Denver and Seattle are growing rapidly, and traffic congestion is rising rapidly as well. Charlotte and Salt Lake City are mid-size cities that are growing rapidly, although they face less severe traffic congestion than their larger counterparts.

All the urbanized areas except Detroit are expected to see congestion rise to the level already seen in today’s San Francisco by 2030 unless major corrections to transportation policy begin now. Dallas, Denver, Atlanta, Seattle and San Francisco will see levels of congestion equivalent to today’s Los Angeles if policymakers maintain the current course.

Table 1: Summary of Regional Traffic and Congestion Statistics

| Region | 2003 Urban Area | | 2030 Urban Area | | Long-Range Plan Costs (\$B) | | | Cost to Remove LOS F Congestion, (\$B) |
|----------------|-----------------|------|-----------------|------|-----------------------------|---------------|-------------|--|
| | Pop, K | TTI | Pop, K | TTI | Highway Costs | Transit Costs | Total Costs | |
| Charlotte | 725 | 1.31 | 1,185 | 1.62 | 4.7 | 6.3 | 11.0 | 2.9 |
| Salt Lake City | 877 | 1.28 | 1,251 | 1.59 | 3.2 | 17.3 | 23.0 | 1.2 |
| Denver | 2,050 | 1.40 | 3,210 | 1.80 | 53.9 | 23.4 | 87.8 | 10.0 |
| Atlanta | 2,924 | 1.46 | 5,009 | 1.85 | 29.6 | 21.5 | 53.0 | 13.1 |
| Seattle | 2,946 | 1.38 | 3,963 | 1.79 | 49.4 | 46.3 | 101.6 | 4.8 |
| Detroit | 3,939 | 1.38 | 4,277 | 1.50 | 31.5 | 9.3 | 41.0 | 24.1 |
| San Francisco | 4,120 | 1.54 | 4,968 | 1.86 | 47.0 | 76.0 | 118.0 | 29.2 |
| Dallas | 4,312 | 1.35 | 7,014 | 1.73 | 30.6 | 13.5 | 45.1 | 26.4 |

CONGESTION SIGNIFICANTLY REDUCES A CITY'S ECONOMIC GROWTH

Regional road networks were provided by each region's respective planning agency. Using points corresponding to central business districts, universities, airports, major malls and major suburban locations, we then translated this data into a consistent format for ease of analysis. (The full report details each location's economic and demographic characteristics.) We determined drive time contours for a base year and 2030 under both congested and free-flow conditions for each point. We then estimated regional productivity, enabling us to examine the relationships between traffic congestion relief and regional productivity and their relative effects on major destinations in each metropolitan area.

Not surprisingly, the central business district, or CBD, was generally the most accessible place in each region, with typically 30 to 60 percent of jobs and 25 to 50 percent of residents within 25 minutes of downtown under current congested conditions. Other key points have typically one-third to one-half the percentage of CBD jobs or residents within 25 minutes. Our research determined that in the future, rising traffic congestion and rapid suburban growth together mean that key points in most regions will become relatively less accessible than they are now. The reduction in access is typically 1 to 10 percent. But removal of congestion would increase the access to key points by 2 to 30

percent, allowing most regions to reverse the expected decline in access and making these key points relatively more accessible as the region grows.

The study also found that a 10 percent worsening in CBD accessibility would decrease regional productivity by about 1 percent, about the same as observed in Europe and Korea in previous studies. Surprisingly, and contrary to conventional planning wisdom, the research suggests that regional economies might be more dependent on access to major suburbs, malls and universities than on access to downtowns or airports. Not only are models of productivity somewhat stronger for these sites than for CBD accessibility, but access to them has a stronger effect on regional productivity. Solving congestion would boost gross regional performance by 6 to 30 percent if targeted at suburbs, malls and universities, but 4 to 10 percent if targeted at CBDs, and just 2 to 8 percent if targeted at airports.

Over 20 years the additional tax revenue generated by the productivity gain caused by accessibility improvements is likely to be several times larger than the estimated cost of congestion removal. Higher productivity generates higher tax revenues and increases property values from land (and buildings), which then generate even more tax revenues. Notably, in five of the eight cities we studied, additional tax revenues from just one location generated more than enough revenues to pay for the costs of removing congestion for the entire region (see Table 2). Since lower congestion improves access throughout the region, in most cases the productivity improvements would likely generate tax revenues

Table 2: Additional Tax Revenue Generated by the Productivity Gain Caused by Accessibility Improvements

| Urbanized Area | Location with Largest Benefit from Congestion Reduction | Addition to Gross City Product with Free Flow by 2030 (\$M) | Additional Tax Revenues Generated by 2030 (\$M) | Estimated Cost to Remove Severe Regional Traffic Congestion by 2030 (\$M) |
|----------------|---|---|---|---|
| Atlanta | Major Suburb | \$15.4 | \$21.5 | \$13-15 |
| Charlotte | Major Suburb | \$22.5 | \$31.5 | \$3-5 |
| Dallas | Major University | \$46.0 | \$64.4 | \$26-30 |
| Denver | Major Mall | \$38.5 | \$53.8 | \$10-15 |
| Detroit | Major Suburb | \$7.3 | \$10.3 | \$25-30 |
| Salt Lake City | Major Suburb | \$0.7 | \$1.0 | \$1-2 |
| San Francisco | Major Mall | \$10.7 | \$15.0 | \$29-40 |
| Seattle | Major Suburb | \$13.4 | \$18.8 | \$5-10 |

more than sufficient to pay for the transportation improvements necessary to remove congestion. Not surprisingly, this analysis suggests that the focus of transportation plans on CBD (and to a lesser extent airport) access may be misplaced, as regions grow and other locations become relatively more congested. It suggests a re-thinking of plans to improve access through congestion reduction particularly in non-CBD locations, reflecting more complex and dynamic suburb-to-suburb employment and travel patterns.

The results from our analysis, averaging all regions studied, suggest that reducing congestion and increasing travel speeds so that accessibility increases 10 percent would increase regional economic productivity by about 1 percent. The impact on productivity was stronger for employment than residential population. In other words, the benefits of congestion reduction will be driven primarily by providing better access to jobs and workers than by improved access to residential locations. For example, a 10 percent improvement in access to the downtown central business district would produce about a 1.1 percent increase in productivity because workers (and businesses) would be able to access a larger number of jobs (and workers).

In addition, our estimates suggest that access to major malls (as job sites) is at least as and probably even more influential in determining regional productivity than access to the CBD. Reducing congestion to improve access to a mall by 10 percent would generate a productivity improvement of about 1.7 percent. Improved access to major suburbs tended to have productivity improvements in the range of 1.3 percent to 1.6 percent, lower than for universities but higher than for CBDs. Improved access to universities had among the strongest impact on regional productivity, ranging from 1.3 percent to 1.8 percent.

Importantly, throughout our analysis access to jobs seems to be more important in regional economic performance than is access to population. Not only is the impact on regional productivity greater, but the impact from congestion removal is greater when viewed through a job prism than a resident prism. Regions depend on fluid movement between jobs and other

locations like malls and universities, as well as residence connections to these sites. Many people come to malls and universities from work sites, not from home.

RECOMMENDATIONS

Our analysis suggests that congestion reduction should be a central element of a regional economic development strategy in U.S. cities. More specifically, policymakers at the federal, state and local levels should:

1. **Recognize that increasing congestion shrinks the range of job opportunities for local residents and limits local access to workers by businesses.** City leaders and planners have long been aware that congestion wastes fuel and people's time, but our findings show that it is a drag on the productivity and growth of the regional economy as well.

2. **Pay more attention to the accessibility of other locations, not just downtowns or CBDs.** Our findings suggest that improving accessibility to other key points in the region may provide overlooked opportunities to improve regional performance at a fraction of the cost of improving CBD access.

3. **Improve accessibility in other locations, particularly job centers in major suburbs, retail centers and universities.** These locations showed the most potential for access improvement and significant positive impact on regional productivity.

4. **Remove bottlenecks throughout regions.** Relatively modest expenditures to remove bottlenecks in a road system can have a substantial impact on accessibility, particularly if congestion is concentrated geographically. These locations should be explored first for improvement.

5. **Add capacity in the rims of cities, where major suburban job and retail centers are located.** Our findings suggest that investment in suburban accessibility is likely to be productivity-gaining. Not only is access likely to improve more per dollar invested than in the CBD, but future growth is likely to be higher.

6. **Conduct an accessibility assessment for each city.** From a planning perspective accessibility studies

are a convenient way of understanding the impact of congestion removal and of comparing alternate treatments. They are under-used in transportation planning, however, because until recently they were difficult to undertake. New software has made the task easier.

7. **Reconsider arguments against sprawl.** This study suggests that an overlooked benefit of congestion reduction is the ability to improve accessibility. This finding dents the planning wisdom that higher density will yield greater productivity and is therefore preferable. Adding the benefits of greater access may be sufficient to tip arguments in favor of greater, not less, highway access.

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RELATED REASON STUDIES

Robert W. Poole, Jr., *Miami Toll Truckway: Preliminary Feasibility Study*, Reason Foundation Policy Study No. 365, November 2007, http://www.reason.org/ps365_miami_truckways.pdf

Ted Balaker, *Why Mobility Matters to Personal Life*, Reason Foundation Policy Brief No. 62, July 2007, <http://www.reason.org/pb62.pdf>

David T. Hartgen and Ravi K. Karanam, *16th Annual Report on the Performance of State Highway Systems (1984–2005)*, Reason Foundation Policy

Study No. 360, June 2007, <http://www.reason.org/ps360.pdf>

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