URBAN ACCESS INDICATORS

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INTRODUCTION

A strong association between mobility and affluence is generally acknowledged.[1] Despite this, various popular urban planning policies would retard mobility, seemingly on the assumption that there would be little or no economic price.

For example, some urban areas have failed to make roadway investments that would be needed to maintain or improve present levels of traffic circulation. As traffic congestion increases and speeds decline, it can be expected that an urban area will become less efficient and will experience less economic growth. Generally, higher levels of poverty are associated with less economic growth. Thus retarding mobility can be expected to lead to increased poverty.

Other initiatives seek to encourage people to substitute mass transit use for car use. However, mass transit travel times, with few exceptions, are substantially longer than would be required for the same trips by car. At least given current mass transit technologies and systems, mass transit substitution is a mobility limiting strategy, which if widely adopted could be expected to reduce economic growth and increase poverty.

A related strategy is to reduce roadway travel speeds on major arterials in cities. Again, material achievement of such an objective would reduce mobility and could be expected to reduce economic growth and expand poverty in the long run.

These, in effect, anti-automobile policies are often justified on environmental grounds, albeit superficially.[2] However, it is clear from recent history (especially the record of the former Soviet Union and its satellite nations) that effective environmental protection requires affluence. Less affluent societies are simply unwilling or unable to provide sufficient resources for environmental protection.

In recognition of the relationship between mobility, economic growth and poverty alleviation, the Texas Governor's Business Council reports have proposed objectives that would improve traffic congestion in Texas urban areas. The general approach has been embraced by the Governor and metropolitan planning organizations are in the process of integrating such objectives into their planning processes through Texas Metropolitan Mobility Plans.

This paper outlines measures that could be adopted to more effectively assess mobility throughout metropolitan and urban areas.

THE CASE FOR MOBILITY

In the context of urban planning initiatives that would reduce mobility, it is appropriate to review the relationship between mobility, economic growth and poverty alleviation. Both history and current research demonstrate a strong association. This is an important issue because traffic congestion is intensifying in urban areas around the world, including in the United States and

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[1] See, for example, Xavier Goddard, Kyoto and the double trap for public transport, (Paris: INRETS, 2005).
[2] For a critique of smart growth justifications, see Wendell Cox, *War on the Dream: How Anti-Sprawl Policy Threatens the Quality of Life* (New York: IUniverse), 1987, pages 71-118.

urban areas in Texas. Rising traffic congestion reduces mobility and is likely to lead to less economic growth and greater levels of poverty.

As mobility has improved over the past 200 years, there has been an unprecedented improvement in the standard of living. This can be illustrated by reviewing international economic performance estimates prepared by the Organization for Economic Cooperation and Development.[3]

Generally, urban development can be broken into four principal eras, based upon transportation technology. These are "walking," "mass transit" "automobile" and "telecommunications" eras. Each of the eras is based upon a new transportation or transportation substituting technology, though does not completely replace the technologies of previous eras. During the "mass transit" era, walking remained as a mode of transport. During the "automobile" era, walking and mass transit remained as modes of travel. Virtually all automobile trips start, for example, with walking. During the now emerging "telecommunications" era, walking, mass transit and automobiles all remain as modes of transport. As transportation technology has improved, urban population densities have declined substantially (Figure 1)

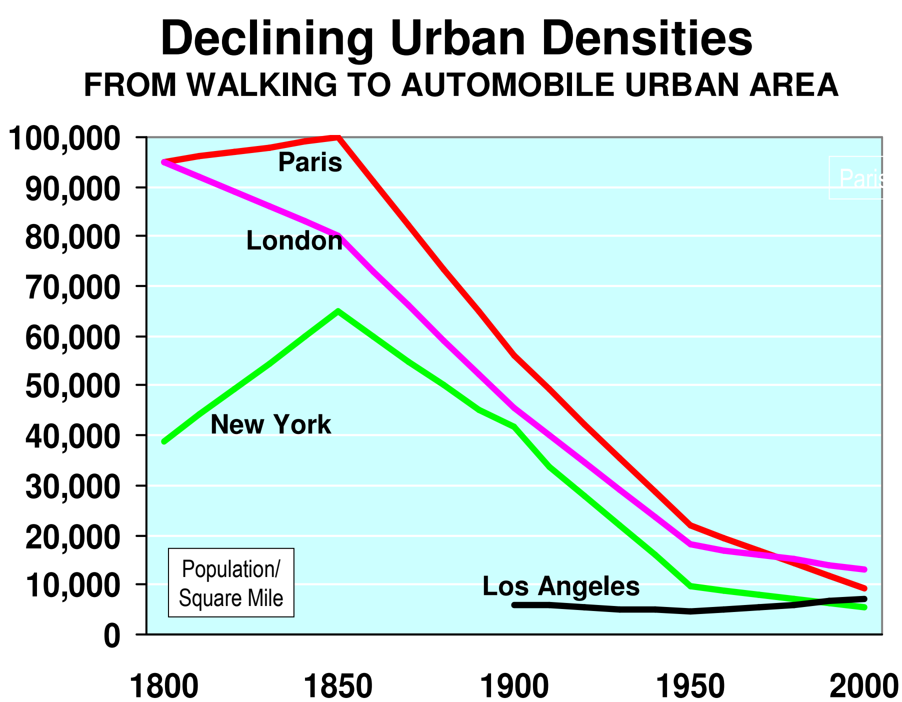

Figure 1

[3] Angus Maddison, *The World Economy: Historical Statistics*, Paris: Organization for Economic Cooperation and Development, 2003.

The Walking Urban Area

The first era was the "walking urban area," which lasted from the beginning of human activity until the early 19th century. Nearly all travel was by foot. More rapid travel was available using animal power, especially horses. However, horses were not affordable for most of the population. Walking was a personal, or individual mode of travel, by virtue of the fact that people could travel whenever and wherever they liked within a particular radius (subject only to their physical limitations).

As a result, urban labor markets were comparatively small, limited by the distance that could be traveled on foot. At this point, today's concept of continuous urbanization --- the urban area (urbanized area or urban agglomeration) and the metropolitan area (which includes rural and exurban areas from which people travel to the urban area for business) were virtually co-existent. Because of the serious limitations on how far a person could travel by foot, there were few, if any, exurbs --- settlements in the labor market separated from the continuous urban fabric. It has been estimated by Ausubel and Marchetti that the maximum size for an urban area in the walking era was approximately eight square miles.[4] As the "walking urban area" era was ending, the largest urban areas in the world had populations of approximately 1,000,000 The Beijing urban area had a slightly higher population, and London had approximately 950,000 residents.[5] Paris had a population of approximately 600,000.

The "walking urban area" exhibited extremely high population densities. This was required so that the residents could access the products and services that they required. The area of London's continuous urbanization has been estimated at approximately 10 square miles, slightly more than Ausubel and Marchetti considered the maximum. London's population density was approximately 100,000 per square mile.[6]

At the first French census (1807), the Paris urban area had a population of approximately 600,000. Paris was approximately the same density as London, with 100,000 persons per square mile and a land area of approximately six square miles, well within the Ausubal and Marchetti maximum urban area size.[7] The New York urban area was still small in 1800, with a population of only 60,000. Yet, New York was comparatively dense, with nearly 40,000 residents per square mile and a land area of approximately 1.5 square miles.[8] This lower density illustrates that fact that smaller urban areas could survive with somewhat lower densities, because the urban footprint was small enough that people could walk virtually everywhere.

The Mass Transit Urban Area

Horse drawn omnibus routes began to appear in the 1820s. This considerably increased the area that could be accessed by urban residents. Mass transit improvements continued throughout the

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[4] Jesse H. Ausubel and Cesare Marchetti, *The Evolution of Transport,* http://www.aip.org/tip/INPHFA/vol-7/iss-2/p20.pdf.
[5] Tertius Chandler, *Four Thousand Years of Urban Growth: An Historical Census*, Edwin Mellen, 1987.
[6] http://www.demographia.com/db-lonuza1680.htm.
[7] http://www.demographia.com/db-parisua.htm.
[8] http://www.demographia.com/db-nyuza1800.htm.

19th century. Steam railroads provided service to peripheral areas, both suburbs and the exurbs beyond. It was at this point that the urban area and the metropolitan area (labor market) emerged as different constructs, as rail mass transit made it possible for some people to live outside the area of continuous development, yet take part in the urban lifestyle. Late in the century, electrified urban rail emerged in the form of streetcars. Streetcar systems propelled the development of large "streetcar" suburbs. Electrified interurban lines followed and for a few decades provided much higher levels of mobility to suburban and exurban areas. These mass transit developments improved productivity compared to the Walking Urban Area and led to greater affluence.

The mobility provided by mass transit, however was different than the mobility of the walking urban area. Mass transit represented a collective mode of transport. People's mobility was limited to when and where the mass transit service was provided. As a matter of economic necessity, mass transit service tended to focus on the core of urban areas and, as a result, a strong radial pattern of mobility was to emerge. As regards travel between non-core areas of the urban area, people still had to rely on walking, since little such mass transit service was available.

Nonetheless, mass transit significantly expanded mobility and, in consequence the urban area. By 1900, when automobiles were beginning to appear, the largest urban areas in the world were three times the largest populations of 1800. By 1900, London had become the world's largest urban area, with approximately 5,000,000 residents. But mass transit had enabled the population to spread over a much wider area. The population density was approximately 45,000, down by more than 50 percent from 1800. London's urban land area grew to 110 square miles, 11 times the 1800 figure.

By 1900, the New York urban area had reached a population of 3,800,000, with a land area of approximately 90 square miles. Its population density was similar to that of London, at approximately 40,000 per square mile. Paris was the world's third largest urban area, with a population of 3,500,000 and a land area of 60 square miles. Paris was somewhat more dense than London, at more than 55,000 per square mile, but experienced a similar steep drop in population density

The Automobile Urban Area

The automobile urban area emerged during the 20th century.[9] By 1930, three-quarters of US households owned automobiles. The mass transition to automobiles was to come later in other nations, with Canada reaching the 1930 US level in the middle 1950s, Australia in the middle 1960s, Western Europe in the 1970s and Japan in the 1980s (Figure 2). The earlier widespread use of automobiles in the United States (made possible by earlier, more widely spread affluence) is a principal reason for the greater automobile orientation of US urban areas. Similarly, Canada and Australia, with their earlier wide use of automobile have urban development similar to that

[9] Bicycles are also a form of personal mobility that improved access compared to walking. Bicycles, however, have never been a significant factor in urban travel in the United States. Bicycles were more important in countries like the Netherlands and China, but bicycle market shares have dropped as motorization has spread. Chinese urban areas, which relied to a great degree on the bicycle during before the affluence brought about by market reforms, are now prohibiting bicycles on many major streets.

of the United States. Still, there are broad expanses of automobile oriented suburban development in Western Europe and Japan, as the automobile has come to dominate urban transportation in all but a very few urban areas.

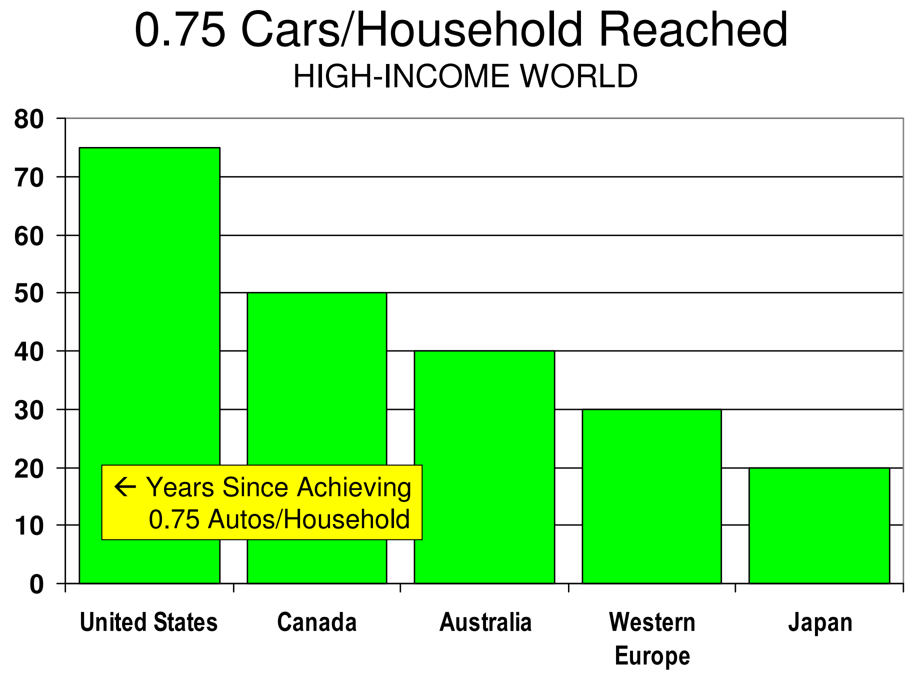

Figure 2

Like mass transit in the 19th century, the automobile enabled urban areas to accommodate larger populations over a much larger land area. The automobile permitted development of inexpensive land on the urban fringe for housing development. This led to substantially higher levels of home ownership in the United States, Canada, Australia and a number of Western European nations. Higher home ownership, made possible by automobile driven suburbanization, has been an important factor in the expansion of affluence, especially since World War II. The automobile represents a substantial mobility (and productivity) improvement compared to mass transit and walking. Its greater speed allows people to access far larger areas than was possible before. This has allowed urban areas to grow to sizes well beyond what was possible when walking or mass transit were dominant.

Tokyo-Yokohama: By the early 2000s, Tokyo-Yokohama had become the largest urban area in the world, with a population of nearly 35 million, spread across approximately 3,000 square miles and with a population density of 11,300.[10] Tokyo-Yokohama is among the more dense high-income world urban areas; however it is barely one-quarter as dense as London or New York in 1900.

[10] http://www.demographia.com/db-worldua.pdf,

Thus, Tokyo-Yokohama has a population seven times the size of the largest urban area of 1900 (London). The physical expanse of Tokyo-Yokohama may be surprising, because it is one of the few high income world urban areas in which mass transit retains a higher market share than automobiles. This has occurred for two reasons.

> The first reason is that Japan achieved affluence later than in the United States and Western Europe, reaching 1930 US household automobile ownership rates only in the late 1980s (above). As a result, it was necessary for mass transit to expand.
>
> The second reason is that suburban railways were substantially expanded at the same time as Tokyo-Yokohama experienced the unprecedented population growth.[11]

As a result, annual mass transit ridership in Tokyo-Yokohama alone is approximately 50 percent more than the annual ridership in the United States.[12] Nonetheless, Tokyo-Yokohama has vast expanses of detached housing suburbs, which are automobile oriented, which accounts for its large urban footprint, second in the world to New York.

New York: New York is the second largest urban area population in the world, having reached 19,700,000 residents by 2000 and covers more than 4,300 square miles.[13] The population density is approximately 4,500 per square mile, down more than 85 percent from the 40,000 of 1900. No urban area in the world covers more land than New York, which now has an urban footprint approximately 40 times that of the most expansive urban area in 1900 (London). New York's land area is nearly 1.5 times that of Tokyo-Yokohama and nearly double that of Chicago, Los Angeles and Boston.

London: London's urban area growth has been stunted by restrictive urban planning policies (compact city or smart growth policies). The principal urban area is confined by a greenbelt. The urban area's population peaked at approximately 9,500,000 just before World War II and has since fallen back to approximately 8,300,000. As a result of the compact city policies, the population density is comparatively high, at 13,200 per square mile. However, this represents a two-thirds decline from 1900. Nonetheless, while the London urban area has stagnated, the London metropolitan area has grown, with all population growth having been forced outside the greenbelt. In 1900, the London metropolitan area[14] had 7.2 million residents, which nearly doubled to 13.9 million by 2001.

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[11] Between 1950 and 1990, the Tokyo-Yokohama metropolitan area (Tokyo, Kanagawa, Chiba and Saitama prefectures) added more than 18.5 million residents, nearly as many as lived in the world's second largest metropolitan area in 1990, New York (19.5 million).
[12] Mass transit's market share is declining moderately in Tokyo-Yokohama (http://www.publicpurpose.com/ut-tokmkt.htm) and is either stable or declining in most major high-income world urban areas for which there is data (http://www.publicpurpose.com/ut-intlmkt95.htm).
[13] Combined US Bureau of the Census urbanized areas of New York, Bridgeport, New Haven, Trenton, Danbury and Hightstown.
[14] Present Greater London plus the first ring of historic counties around Greater London (including unitary authorities formerly in the historic counties).

Paris: Similarly, the Paris urban area has grown, with an estimated population of 10.4 million. The Paris urban area covers 1,175 square miles and has a population density of 8,900 per square mile. This represents more than an 80 percent decrease from 1900.

Los Angeles: Los Angeles is a much newer large urban area and by 2000 had a population of 13.8 million.[15] Los Angeles has routinely been cited as the ultimate example of urban sprawl, yet virtually the opposite is true. Los Angeles is the most dense large urban area in the United States, with 6,200 persons per square mile. Los Angeles is nearly as dense as Toronto,[16] which is the highest density urban area in Canada. Los Angeles covers more than 2,200 square miles, less than that of Chicago (population 8.6 million) [17] and slightly more than that of Boston (population 4.7 million).[18] The suburbs of Los Angeles that have developed in the automobile era are more dense that the suburbs of Paris that have developed since the automobile became widely available there.[19]

Large Texas Urban Areas: The large Texas urban areas exhibit approximately average population US densities. San Antonio is the most dense, at 3,300 per square mile, approximately the same as that of Portland, Oregon, which has strong densification (smart growth) policies. Dallas-Fort Worth and Houston have population densities slightly below 3,000 per square mile, while Austin has a population density of 2,800 per square mile. The Texas urban densities are far higher than some other large and fast growing urban areas in the South (Figure 3), such as Atlanta (1,800), Charlotte (1,700) and Nashville (1,700). The largest Texas urban areas are also more dense than some urban areas in the Midwest and East, such as Minneapolis-St. Paul, St. Louis, Cincinnati and Kansas City, Boston and Pittsburgh.

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[15] Combined US Bureau of the Census urbanized areas of Los Angeles, Riverside-San Bernardino and Mission Viejo, which are contiguous.
[16] Combined Statistics Canada urban areas of Toronto, Hamilton and Oshawa, which are contiguous.
[17] Combined US Bureau of the Census urbanized areas of Chicago, Kenosha and Round Lake.
[18] Combined US Bureau of the Census urbanized areas of Boston, Worcester and Nashua.
[19] See http://www.demographia.com/db-lauza2000.htm and http://www.demographia.com/db-paris2005.htm.

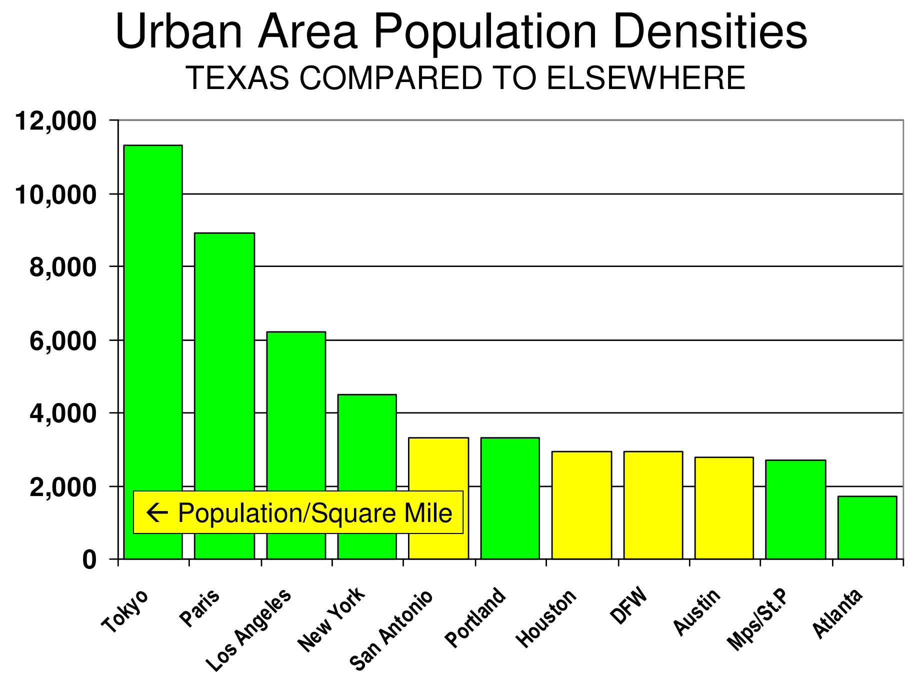

Figure 3

The Telecommunications Society

A new era is emerging, based upon information technology or telecommunications. While telecommunications is not a transportation technology, it substitutes for travel in various applications. For example, purchasing a book over the Internet replaces the need to travel to the bookstore to make the purchase. Another example is the substantial increase in working from home, or telecommuting, with some employees and consultants able to perform their duties from home or even foreign countries. Indeed, research indicates that in most US metropolitan areas the number of people working from home now exceeds the volume of mass transit commuting.[20] At the same time, telecommunications expands access for the user to well beyond the urban area. It is possible for people to purchase goods over the Internet from around the world.

Telecommunications does not appear to have replaced a material share of automobile travel, though it might have reduced the rate of increase. Automobiles remain the dominant form of urban transport in US urban areas and in nearly all high-income world urban areas.[21] Nonetheless, where telecommunications substitutes for travel, it generally represents a productivity improvement over travel by automobile or other modes, principally because it saves time.

[20] http://www.reason.org/ps338.pdf,
[21] The only exceptions are Hong Kong, Tokyo-Yokohama and Osaka-Kobe-Kyoto.

Individual and Collective Mobility

In *Don't Call it Sprawl,* Dr. William T. Bogart of York University (Pennsylvania) classifies walking and the automobile as individual forms of mobility,[22] while mass transit is a form of collective mobility. Individual mobility can be defined as the ability to go where one wants and when one wants, subject only to the technological capability of the mode of travel. Thus, walking is a form of individual mobility, because a person can walk to any point at any time within the radius of their physical capability. The automobile provides individual mobility, because it permits travel to any point at any time within the range permitted by its speed and traffic. Mass transit is not a form of individual mobility, because it permits the user to only travel to those places it goes at those times it goes. As a result, many trips cannot be made on mass transit in an urban area, despite the fact that mass transit's speed would be sufficient. As a collective form of mobility, mass transit operates only where and when there is enough demand to make service sufficiently efficient (Table 1).

Table 1
Modes & Type of Mobility

Mode	Individual Mobility	Collective Mobility
Walking	X	
Mass transit		X
Automobile	X	

Travel Trends and Affluence

As transportation technologies have improved, people have traveled much longer distances in urban areas. The extent to which mobility has increased can be illustrated by the number of daily motorized per capita in the United States. Obviously, in the walking era, the daily motorized trips per capita were zero. It is estimated that at the end of the mass transit era (1900), the number of daily motorized trips per capita was approximately 0.6. By 2000, the number of daily motorized trips per capita had reached 3.7 (Figure 4).[23]

During "Walking Urban Area" period, the highest Gross Domestic Product (GDP) per capita achieved was in the Netherlands at $3,200, according to the Organization for Economic Cooperation and Development (2005 inflation adjusted value).[24] During the "Mass transit Urban Area" period, the highest GDP per capita recorded was approximately $7,100 in 1889 in Australia. In the "Automobile Urban Area" period now exceeds $40,000 (Figures 5 and 6). The

[22] William T. Bogart, Don't Call It Sprawl: Metropolitan Structure in the 21st Century (Cambridge University Press, 2006).

[23] Estimated from 1900 transit ridership and urban population. 2000 estimate from Nationwide Housing and Transportation Survey (2001).

[24] Calculated from Organization for Economic Cooperation and Development (OECD) data.

extent to which improved mobility has driven the greater affluence is not simple to estimate, but it is clear that there is a strong association.

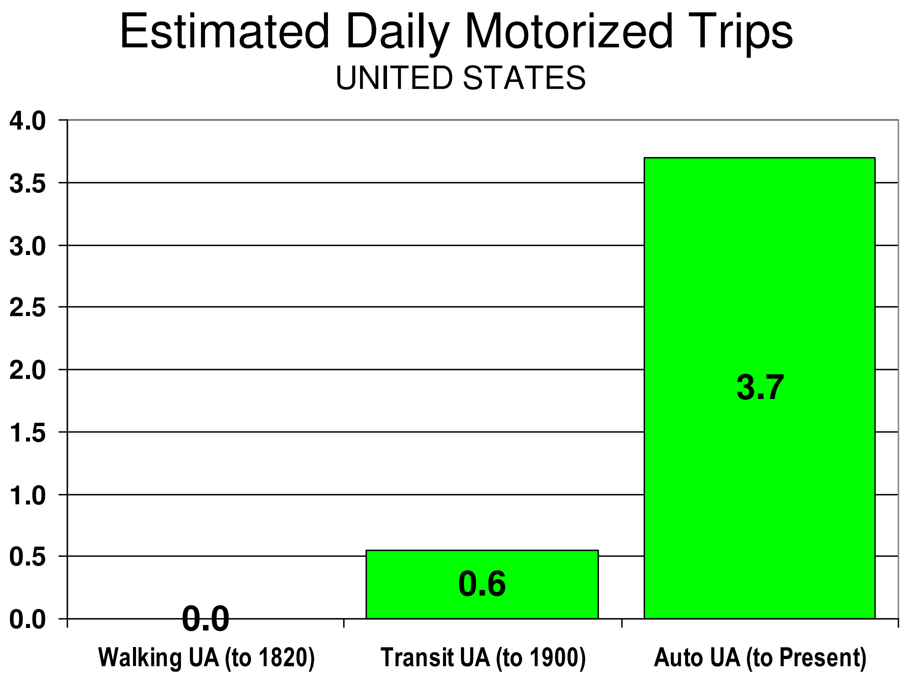

Figure 4

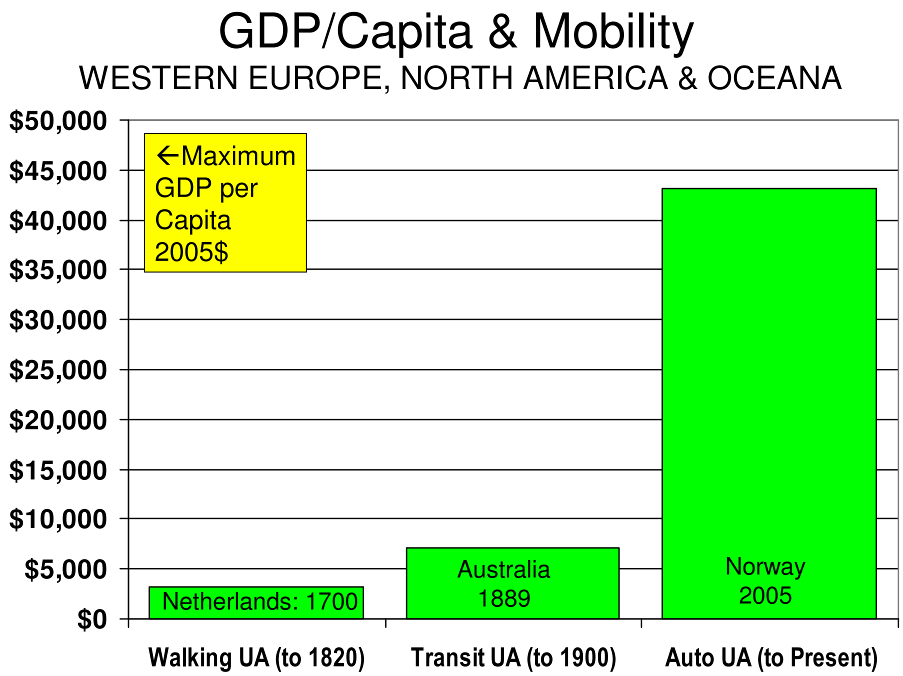

Figure 5

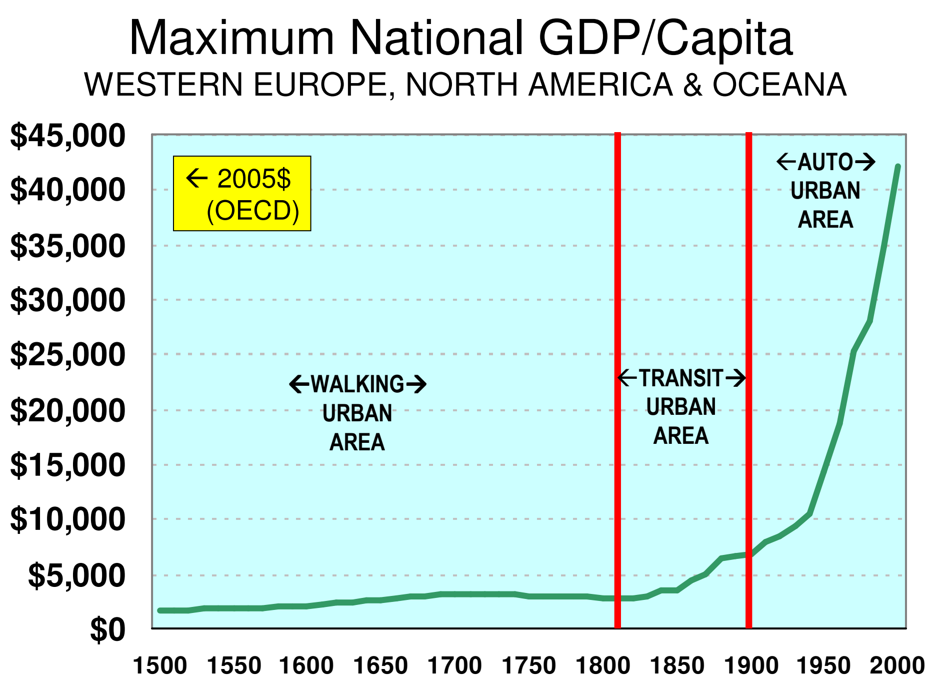

Figure 6

Mobility and Economic Performance

Research also indicates a strong relationship between mobility, economic growth and poverty reduction.

Prud'homme and Lee find that as the percentage of jobs that can be reached increases in a particular period, urban economic production (gross regional product) improves by a factor of 0.18.[25] Thus, a 10 percent improvement in employment access would theoretically lead to an improvement in economic output of 1.8 percent.

Our urban area research found that urban travel is strongly associated with higher urban income levels.[26] This econometric analysis of data from the 99 urban areas indicates that average gross product per capita is strongly related to at least two factors --- (1) the extent of economic freedom, as measured by the Heritage Foundation *Index of Economic Freedom*, and (2) the per capita volume of travel.[27] This research finds much weaker relationships between higher incomes as other factors, such as public transport market share, public transport service intensity, and total population.

Moreover, as with historic data, there is a strong association between the relative affluence of world nations and the volume of daily motorized travel. Generally, higher Gross Domestic Product is associated with higher daily trip rates (Figure 7).[28] Each additional trip per capita was associated with a nearly $8,900 increase in GDP per capita in 1995.

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[25] Remy Prud'homme and Chang-Woon Lee (1998), "Size, Sprawl, Speed, and the Efficiency of Cities," Paris, France: Obervatoire de l'Économic et des Institutions Locals.

[26] Wendell Cox, *Public Transport Competitiveness: Implications for Emerging Urban Areas,* Paper prepared for the CODATU XI Congress, Bucharest, 2004 (http://www.publicpurpose.com/c11-icators.pdf).

[27] Both of these independent variables were significant at the 99 percent level of confidence, and had high elasticities the overall "R squared was 0.74 (89 cases from the UITP *Millennium Cities Database* and 10 additional urban areas from the United States,

[28] R^2=0.71, significant at the 99 percent confidence level. Data outside the United States from Kenworthy, Laube and Newman (Kenworthy, Felix B. Laube, and Peter Newman, *An International Sourcebook of Automobile Dependence in Cities, 1960–1990.* Boulder CO: University of Colorado Press, 1999). An analysis by Gerondeau (Christian Gerondeau, *Transport in the Developed World: 100 Points*, available from the author of this paper) suggests that European urban motorized trip rates are more than 3.0.

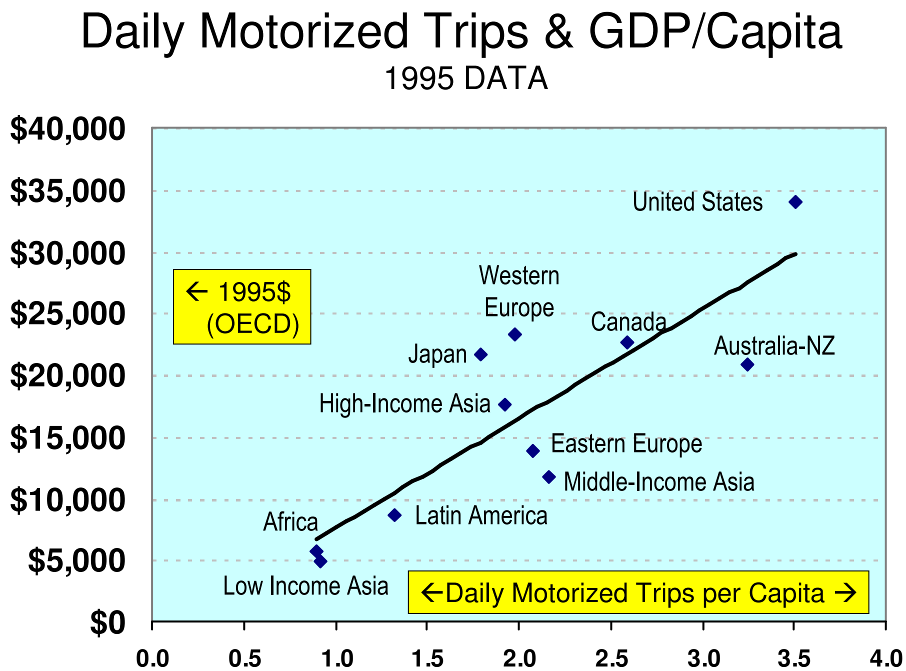

Figure 7

Mobility, Commerce and Prices

Better roadway traffic flow (mobility) lowers product prices by facilitating the movement of freight. This improves affluence by allowing people to purchase more with their incomes. The importance of internal freight movement is illustrated by recent research in Portland, Oregon and Vancouver, BC, on the necessity for improving traffic flows to improve urban area competitiveness. Each of these urban areas has adopted urban densification policies that discourage roadway expansion. As a result, traffic congestion has worsened considerably in both urban areas and is generally worse that in other North American urban areas of similar size.[29]

A report co-sponsored by Metro, the land-use planning agency in Portland, calls for significant highway expansion, which it justifies by Portland's loss of competitiveness and the fact that businesses are being driven away by the traffic congestion.[30] In Vancouver, an important business alliance has called for significant highway expansion to alleviate the extensive traffic congestion and to improve international competitiveness.[31]

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[29] http://www.publicpurpose.com/hwy-tti20011986.pdf,
[30] Delcan and Economic Development Research Group, *Economic Impact Analysis of Investment in a Major Commercial Transportation System for the Greater Vancouver Region,* July 2003: http://www.gvgc.org/pdfs/SW1040_FinalReport_Revised2.pdf.
[31] Economic Development Research Group, *The Cost of Congestion to the Economy of the Portland Region,* December 5, 2005: http://www.metro-region.org/library_docs/trans/coc_exec_summary_final_4pg.pdf.

Mobility and Poverty Alleviation

It is becoming increasingly clear that providing the mobility throughout the urban area to expand low-income employment opportunities requires cars. Raphael and Stoll, at the University of California, estimate that if automobiles were available to all African American households, the gap between non-Hispanic-white and African-American unemployment would be reduced by nearly one-half.[32] A Brookings Institution report concluded:

> *Given the strong connection between cars and employment outcomes, auto ownership programs may be one of the more promising options and one worthy of expansion.*[33]

At the same time, there is only limited potential for mass transit service to provide access to low-income households throughout the urban area. Some mass transit agencies have established routes into the jobs-rich suburbs from core areas where low-income households are concentrated. However, most suburban jobs are not within walking distance of the mass transit routes. A reverse-commute bus or rail service can provide access to only a small portion of suburban jobs: the jobs that are within walking distance (one-quarter mile) of the mass transit route. It is financially infeasible to provide the dense mesh of mass transit routes that would be necessary to provide access to a large share of suburban jobs from core areas (or elsewhere). For example, a U.S. Federal Mass transit Administration study found that only 14 percent of jobs in the high-growth suburbs of Boston were within one hour's mass transit ride of inner-city low-income areas. [34] This is in a metropolitan area with one of the nation's most comprehensive mass transit systems.

A study by the Progressive Policy Institute, a research organization affiliated with the Democratic Leadership Council (of the Democratic Party), noted:

> *In most cases, the shortest distance between a poor person and a job is along a line driven in a car. Prosperity in America has always been strongly related to mobility and poor people work hard for access to opportunities. For both the rural and inner-city poor, access means being able to reach the prosperous suburbs of our booming metropolitan economies, and mobility means having the private automobile necessary for the trip. The most important response to the policy challenge of job access for those leaving welfare is the continued and expanded use of cars by low-income workers.*[35]

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[32] Steven Raphael and Michael Stoll, *Can Boosting Minority Car-Ownership Rates Narrow Inter-Racial Employment Gaps?* (National Science Foundation, June 2000).
[33] Evelyn Blumenberg and Margy Waller, "The Long Journey to Work: A Federal Transportation Policy for Working Families," Center for Urban and Metropolitan Policy, Brookings Institution, July 2003, p. 2.
[34]Annalynn Lacombe, *Welfare Reform and Access to Jobs in Boston* (Washington, D.C.: U.S. Department of Transportation, Bureau of Transportation Statistics, 1998).
[35] Margy Waller and Mark Alan Hughes, "Working Far from Home: Transportation and Welfare Reform in the Ten Big States," Progressive Policy Institute, August 1, 1999. See also Anne Kim, "Why People Need Affordable Cars," Blueprint: Ideas for a New Century, February 11, 2003, at www.ndol.org/ndol_ci.cfm?contentid=251220&kaid=114&subid=143.

The recognition of this reality led President Clinton to propose reforms to encourage greater automobile ownership among welfare recipients.[36]

Densification: Separating Access with Less Mobility

Throughout history, access and mobility have been virtually the same thing. Improving telecommunications, as noted above, has, for the first time, allowed access to be improved without a corresponding improvement in mobility. However, the influence of telecommunication on urban travel has been limited (above).

Urban planning initiatives now seek to reduce mobility, while maintaining or improving access in an attempt to combat suburbanization.[37] The theoretical mechanism for this would be densification of urban areas ("smart growth"), which it is suggested, would reduce the amount of travel (mobility) necessary without losing the economic and social benefits of present access levels. In fact, however, densification initiatives do not generally improve access because they result in slower travel times that nullify travel distance gains. More importantly, densification is associated with three substantial negative externalities.

(1) The risk of reduced economic growth from the resulting loss in mobility from increased traffic congestion.
(2) Health threats from resulting more intense automobile air pollution emissions.
(3) Fewer middle-income households from the resulting reduced housing affordability.

These issues are discussed in greater detail in the "Appendix: Densification: Negative Externalities."

The Geometric Rewards of Speed Improvement

An obvious, but often neglected characteristic of urban mobility is that, as traffic speeds increase, there is a geometric increase in the land area that can be accessed. Conversely, as traffic speeds decline, there is a disproportionate reduction in the area that can be accessed. For example, at 15 miles per hour, 700 square miles can be accessed in one-hour. If the speed is doubled to 30 miles per hour, 2,800 square miles can be accessed, four times as much as at 15 miles per hour (Figure 8).

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[36] Press release, "President Clinton Announces Transportation Grants to Help Low-Income Families," White House, October 16, 2000.

[37] Suburbanization is pejoratively referred to as "urban sprawl." Contrary to popular understanding, suburbanization has been the dominant form of urbanization (including Western Europe and Japan) throughout the high-income world for decades. See: http://www.demographia.com/db-highmetro.htm.

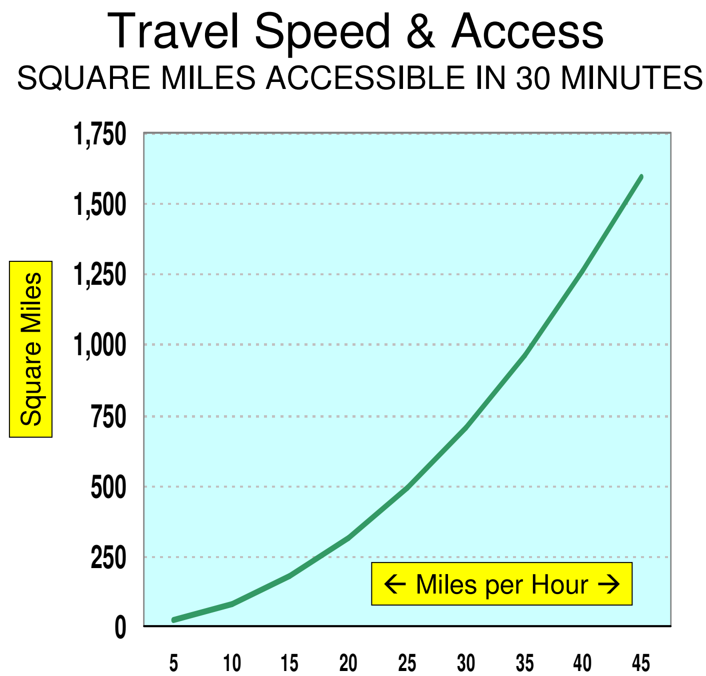

Figure 8

The mechanisms of individual mobility, principally the automobile, have a great advantage over mass transit in this regard. Mass transit requires longer travel times for most trips in urban areas. In the United States, the average work trip travel time by public transport was 70 percent more than that of the automobile in 2000.[38] In 2005, the average mass transit work trip travel time was 80 percent higher in Canada than the average automobile commute.[39] Mass transit work trip travel times in the Paris area are approximately double the automobile commute time.[40] Thus, the research indicates that the efficiency of urban economies is improved as travel speeds are improved and mobility maximized, whether for people or freight. Greater mobility can assist is reducing poverty.

URBAN ACCESS INDICATORS

Given the importance of mobility to economic growth and poverty alleviation, it is important to have urban access indicators. There are two principal uses for urban access indicators.

- First; urban access indicators provide important information that can be useful in making transportation investment decisions. This would be of interest to transportation planners and public officials.

- Second; urban access indicators can provide data that can be used in comparing transportation performance between urban areas. An urban area with better access

[38] Calculated from US Census data. See http://www.demographia.com/db-msajtwtime2000.pdf.
[39] Calculated from Statistics Canada data for 2005. See Turcotte, 2006.
[40] Gerondeau, Christian (1997), *Transport in Europe,* Boston, MA: Artech House.

indicators is likely to be more successful in attracting new businesses and new residents. This would be of interest to economic development agencies and business organizations, such as chambers of commerce.

In recent years, improvements in transportation modeling have created the potential to effectively evaluate the mobility and access that is provided within metropolitan areas and urban areas. Current models are already being used to evaluate mobility by car and mass transit from low income areas, in response to environmental justice planning requirements. An example of employment access indicators would be the number of jobs that can be reached from a particular part of the urban area within 30 minutes and the share (percentage) of jobs in the planning area that can be reached within 30 minutes.

Work Trip Access Indicators

Perhaps the best access indicators would be those related to work trips. It is true that work trips do not represent the majority of travel in urban areas. However, it is the concentration of work trips during peak hours that is responsible for creating most of the traffic congestion that occurs in urban areas. Thus, it is likely that any program successful in improving employment mobility will improve mobility for most, if not all trips. Thus, work trip access indicators serve as a surrogate for the worst recurring travel conditions for all types of trips in the urban area.

There are at least two promising work trip access indicators:[41]

- **Work Force Access Indicators**: Work Force Access Indicators would provide data the number or share of jobs that can be reached in a particular period of time (such as 30 minutes) by the work force.

- **Job Access Indicators**: Job Access Indicators would provide data on the number or share of the work force that can reach job locations in a particular period of time (such as 30 minutes).

Separate Work trip Access Indicators would be developed for automobiles (the road system) and mass transit. Further, with the expansion of toll roads and proposals for congestion charging, parallel Work Trip Access Indicators could be developed for lower income populations consistent with environmental justice requirements (Table 2).

[41] A detailed analysis of similar concepts is in Ahmed M. El-Geneidy and David M. Levinson, "Access to Destinations: Development of Accessibility Measures," Minnesota Department of Transportation, 2006 http://www.lrrb.org/pdf/200616.pdf.

Table 2
Urban Access Indicators

	Work Force	Jobs
GENERAL POPULATION		
Access Indices		
Automobile	X	X
Mass transit	X	X
Access Measures		
Automobile	X	X
Mass transit	X	X
ENVIRONMENTAL JUSTICE (Low-Income Households)		
	Work Force	Jobs
Access Indices		
Automobile	X	X
Mass transit	X	X
Access Measures		
Automobile	X	X
Mass transit	X	X

Work Trip Access Indicators would be developed between Transportation Analysis Zones (TAZ) based upon particular time definitions. For example, if 30-minutes is used as a standard, those TAZ combinations that are accessible would count as "1" toward the Work Trip Access Indicators, while those where there is not accessibility would count as "0."

The TAZ could then be accumulated to develop subregional and regional (planning area, urban area or metropolitan) area Work Trip Access Indicators. In addition, subregional Work Trip Access Indicators could be developed at the municipal or county level.

The following Work Trip Access Indicators would seem to be most appropriate.

- **Market Shares:** The TAZ data could be combined into market share data for and subregions and combinations of subregions. The data would also be combined to develop regional indicators. This would be accomplished by a weighted average of the jobs (Job Access Index) or work force (Work Force Index) that are accessible to other TAZ's. A simplified example is illustrated in Table 3.

Table 3
Simplified Example
EMPLOYMENT ACCESS INDICES
Specified Travel Time: 30 Minutes (Maximum)

WORK FORCE ACCESS INDEX								
TAZ: Work Force		TAZ: Jobs Accessible to Work Force						
TAZ	# in Work Force	1	2	3	4	5	6	Jobs Access Index
1	500	1	1	0	0	1	0	0.50
2	700	0	1	1	1	0	0	0.50
3	50	1	0	1	1	1	1	0.83
4	50	1	0	1	1	1	0	0.67
5	100	1	0	0	1	1	1	0.67
6	600	1	0	1	1	1	1	0.83
Area	2,000							0.62
Jobs Accessible to Work Force in Specified Travel Time: 1=Yes 2=No								

JOB ACCESS INDEX								
TAZ: Jobs		TAZ: Work Force Accessible to Jobs						
TAZ	# Jobs	1	2	3	4	5	6	Jobs Access Index
1	100	1	1	0	0	1	0	0.50
2	200	0	1	1	1	0	0	0.50
3	700	1	0	1	1	1	1	0.83
4	500	1	0	1	1	1	0	0.67
5	200	1	0	0	1	1	1	0.67
6	250	1	0	1	1	1	1	0.83
Area	1,950							0.72
Work Force Accessible to Jobs in Specified Travel Time: 1=Yes 2=No								

- **Gross Indicators:** Numeric indicators could be developed for subregions using the number of jobs that can be accessed by the work force (Gross Work Force Access Indicator) or the work force that can access jobs (Gross Jobs Access Indicator).

The relationship of Work Trip Access Indicators to the Texas Metropolitan Mobility Program (TMMP) can be illustrated by an analysis of present and future mobility in major urban area in Texas and around the nation. The analysis is simplified, based upon the center of the urban areas, since more detailed Work Trip Access Indicators would require the use of travel demand models that are not immediately available. The indicators used in the example are for automobiles. The analysis compares Work Trip Access Indicators based upon 2002 urban and travel time data[42] and provides 25 year projections (2027), both with and without the TMMP mobility objectives.

The analysis includes the 50 largest urban areas in the United States and the four largest Texas urban areas, Dallas-Fort Worth, Houston, San Antonio and Austin. The number of jobs accessible from the core of the urban area is based upon the average urban area job density, using a peak period speed estimate[43] and assuming a travel period of 30 minutes.

Work Force Access Index: Work Trip Share Indices would be most useful for comparing access and trends within and between urban areas. The simplified example yields the following results (a similar analysis could be provided for the Job Access Index).[44]

- In Dallas-Fort Worth, a Work Force Access Index of 0.50 is estimated (50 percent of employment is accessible to the urban area work force within 30 minutes). In 2027, without the TMMP, this would fall to 20 percent. With achievement of the TMMP traffic congestion reduction objectives, 43 percent of employment would be accessible within 30 minutes. While this is a decline from 2002, it principally occurs because of the continuing expansion of the urban area (Figure 9).

- In Houston, a Work Force Access Index of 0.50 is estimated (50 percent of employment is accessible to the urban area work force within 30 minutes). In 2027, without the TMMP, this would fall to 30 percent. With achievement of the TMMP traffic congestion reduction objectives, 48 percent of employment would be accessible within 30 minutes (Figure 10).

- In San Antonio, a Work Force Access Index of 1.00 is estimated (100 percent of employment is accessible to the urban area work force within 30 minutes). In 2027, without the TMMP, this would fall to 93 percent. With achievement of the TMMP traffic congestion reduction objectives, 100 percent of employment would be accessible within 30 minutes (Figure 11).

- In Austin, it a Work Force Access Index of 1.00 is estimated (100 percent of employment is accessible to the urban area work force within 30 minutes). In 2027, without the TMMP, this would fall to 88 percent. With achievement of the TMMP traffic congestion reduction objectives, 100 percent of employment would be accessible within 30 minutes (Figure 12).

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[42] Uses the 2002 Texas Transportation Institute Travel Time Index and 2000 Census employment and land area data for the corresponding urban areas.

[43] Estimated for peak travel periods using a base of 40 miles per hour and the Travel Time Index. Urban Access Indicators could also be developed for different times of day or weekends.

[44] The analysis assumes that the Travel Time Index would increase from 2002 to 2027 at the same annual rate as from 1982 to 2002 in each urban area. A population growth rate, based upon the US Bureau of the Census 1995-2025 projections is used to project 2027 employment in each urban area.

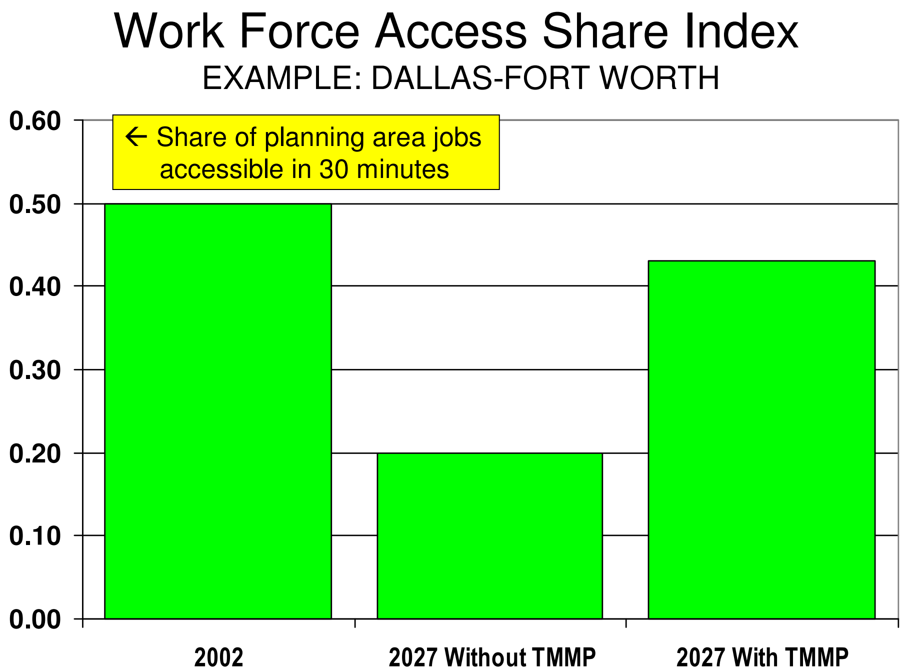

Figure 9

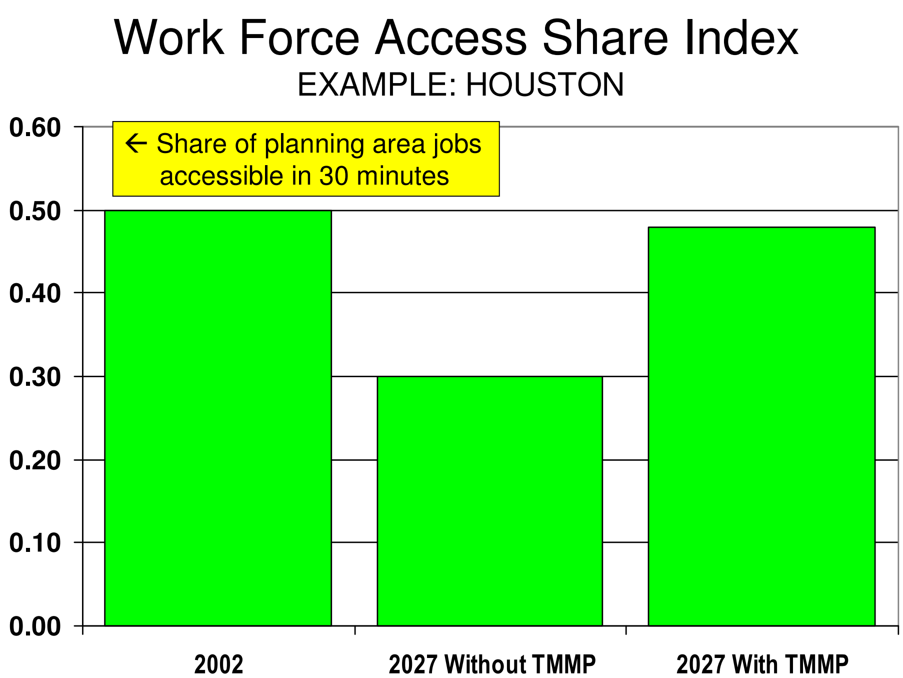

Figure 10

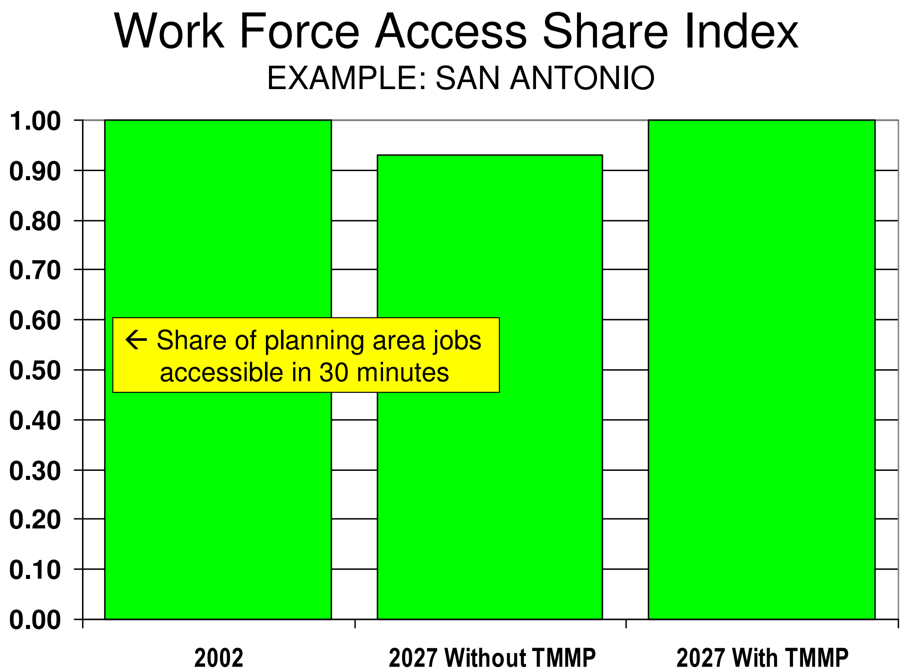

Figure 11

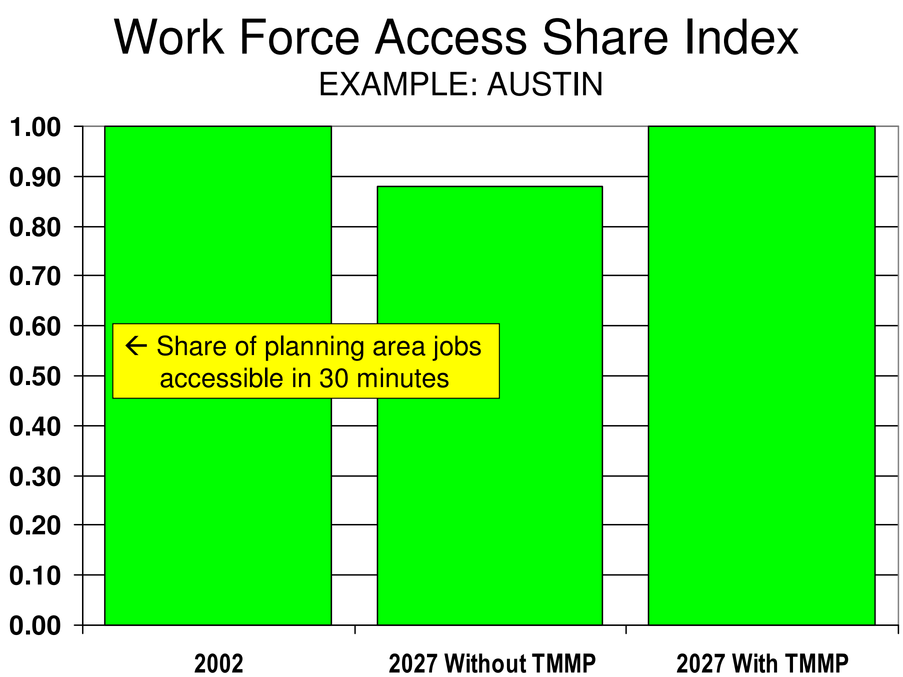

Figure 12

Gross Work Force Access Indicator: A similar analysis is provided for the Gross Work Force Access Indicator. Again, the analysis is focused upon the core of the urban area and estimates the total number of jobs that are within 30 minutes access by automobile.

- In 2002, it is estimated that Dallas-Fort Worth ranked 9th out of the top 50 urban areas. Houston ranked 17th, while San Antonio ranked 32nd and Austin ranked 37th. The latter two ranked comparatively low simply because they have smaller labor markets (Figure 13).

- In 2027, it is estimated that, without the TMMP, San Antonio would rank 7th out of the top 50 urban areas. Houston would rank 14th, Austin would rank 15th and Dallas-Fort Worth would rank 24th (Figure 14).

- In 2027, it is estimated that meeting the TMMP traffic congestion reduction objectives, the Texas urban areas would rank far better. Dallas-Fort Worth would rank 1st, Houston 2nd, San Antonio 5th and Austin 10th (Figure 15).

Overall, achieving the TMMP objectives would increase the Gross Work Force Access Indicator in all of the major Texas urban areas: 25 percent in Dallas-Fort Worth, 32 percent in Houston, 48 percent in San Antonio and 61 percent in Austin. In the four urban areas, approximately 1.1 million additional jobs would be accessible within 30 minutes compared to 2002. Among the 46 urban areas outside Texas, approximately 6.5 million fewer jobs would be accessible in 30 minutes in 2007 compared to 2002 (Table 5).

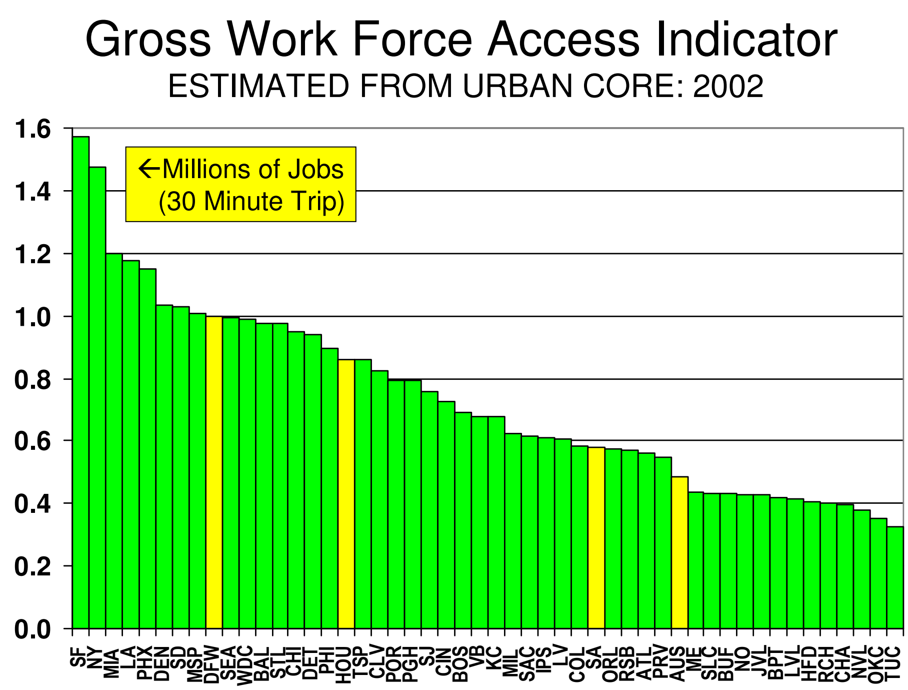

Figure 13

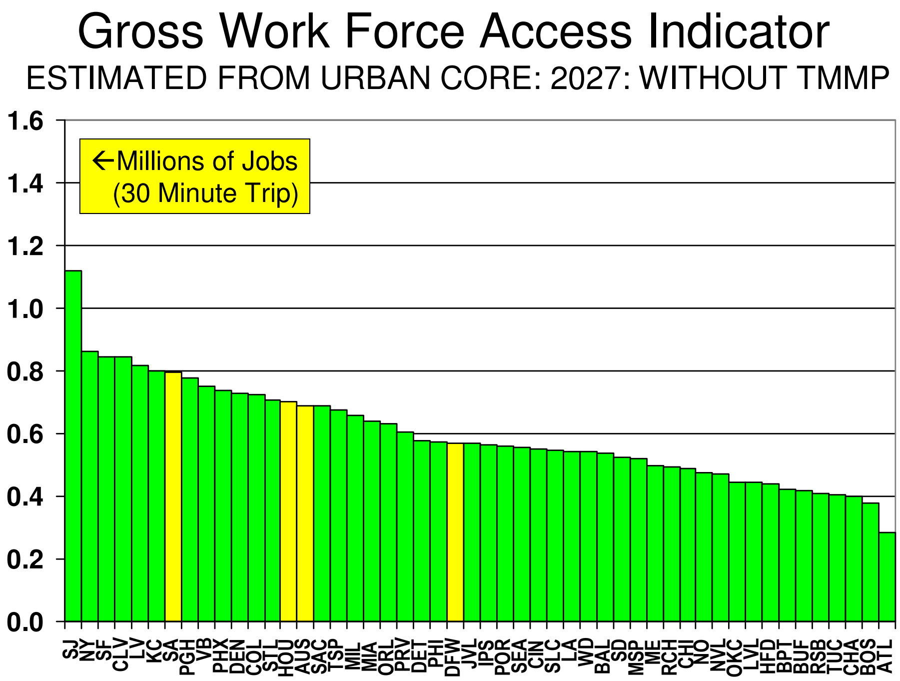

Figure 14

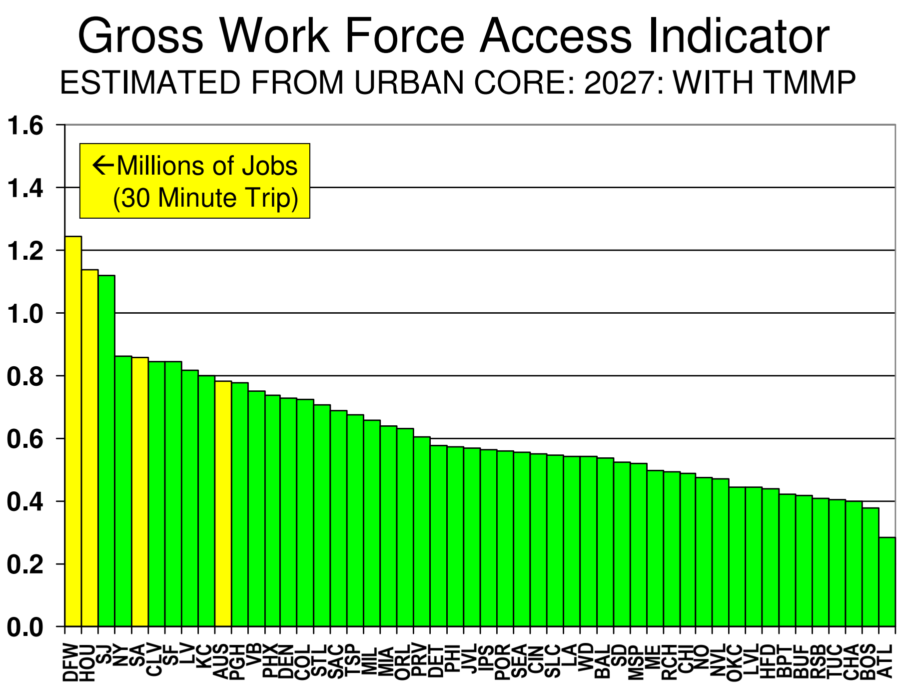

Figure 15

Urban Access Indicators can be powerful tools to be used in investment decisions involving scarce public resources. Their use is also likely to lead to more successful marketing efforts to attract additional business, economic growth and affluence to Texas.

APPENDIX:
DENSIFICATION (SMART GROWTH): NEGATIVE EXTERNALITIES

There is a view that access might be substituted for mobility by improvements in land use planning. Theoretically, this would involve maintaining the ability of people to obtain the same goods, services by increasing urban population densities and thereby presumable reducing the travel distances. Densification and the expected greater proximity between origins and destinations are a principal objective of "smart growth." Densification, however, does not necessarily meet its access or travel reduction objectives. More importantly, smart growth is characterized by significant negative externalities.

Reducing Travel Distances

A principal strategy has been to seek a "jobs and housing" balance, through "self-contained" areas in which people would generally work nearer to their residences, reducing work trip travel distances. These initiatives have been generally unsuccessful. Urbanologist Peter Hall documents the failure of urban planning to design self contained communities of jobs and housing within the Stockholm area. The balance of jobs and housing was achieved, but commuting patterns were little different than in other parts of the urban area, with many people commuting to jobs outside the community and many commuting to inside the community from the outside.[45]

The British government attempted to establish self-contained new towns after World War II, and as in Sweden, accomplished the desired balance. However, the travel behavior of residents and employees did not conform to the planning intentions. The 2001 census indicates that the average work trip travel distance of new towns residents is approximately double the diameter of the new towns. Thus, residents were traveling well beyond the confines of the new towns to reach their work locations.[46]

Generally, people tend to seek the opportunities that most suit them throughout a metropolitan area (labor market). They are not constrained by planning conceptions of self-contained new towns or communities. As a result, any attempt to develop self-contained communities within a metropolitan area is likely to fail.

Further, the hope that people will abandon their cars and use mass transit instead is not justified by any significant experience. The problem, as noted above, is that mass transit is much slower than the car. Moreover, it is not feasible for mass transit service to be improved and expanded throughout the urban area so that it is automobile competitive. Automobile competitive mass transit service is principally limited to urban cores and to the largest central business districts (downtowns).[47]

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[45] Peter Hall, *Cities in Civilization* (New York, NY: Pantheon Books, year), pp. 842–887.
[46] http://www.demographia.com/db-seuknewtowns.htm,
[47] See: http://www.publicpurpose.com/illusion.pdf.

Higher Urban Density and Travel Times

Moreover, higher densities are not generally associated with shorter travel times. For example, Atlanta, which is the least dense urban area of more than 4,000,000 in the world, has an average one-way work trip travel time slightly less than Sydney, Australia, which is more than three times as dense.[48] Work trip travel times are even less in the Texas urban areas, which have densities less than one-half that of Sydney (Figure 16). Total daily travel times per person in Sydney are approximately 10 percent higher than in Atlanta.[49]

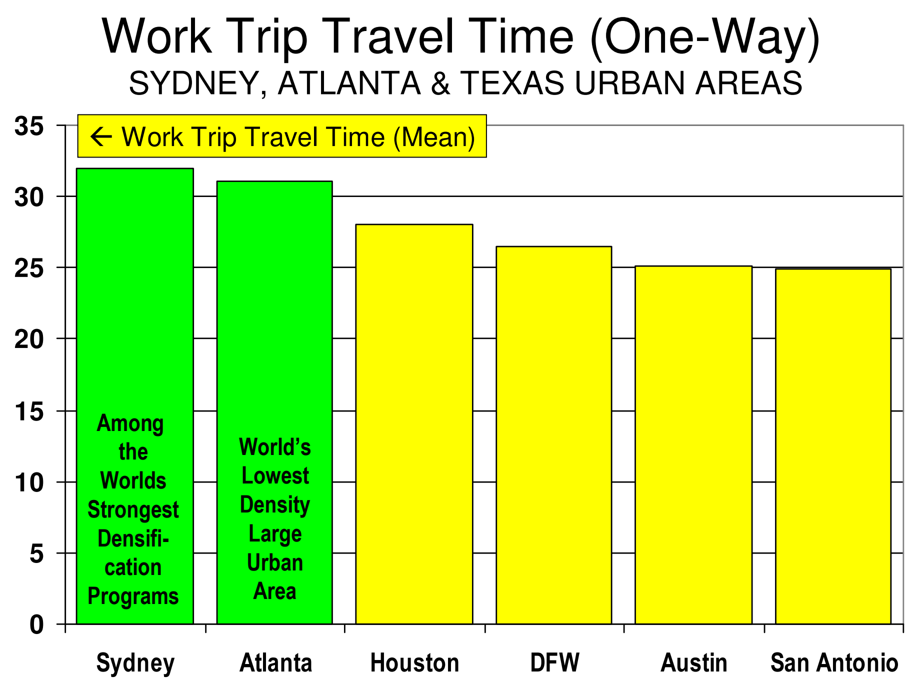

Figure 16

Finally, data from the New York Consolidated Statistical Area indicates that travel times to jobs in the outer suburbs are less than to inner suburbs or the core. The average one-way trip to an outer ring suburban job is 20 minutes, compared to 23 minutes to inner ring suburban jobs and 38 minutes to core jobs (Figure 17).[50]

[48] Data from the American Community Survey and the New South Wales Department of Transport.
[49] Data from Atlanta Regional Council and the New South Wales Department of Transport.
[50] http://www.demographia.com/db-nyc-employ.pdf,

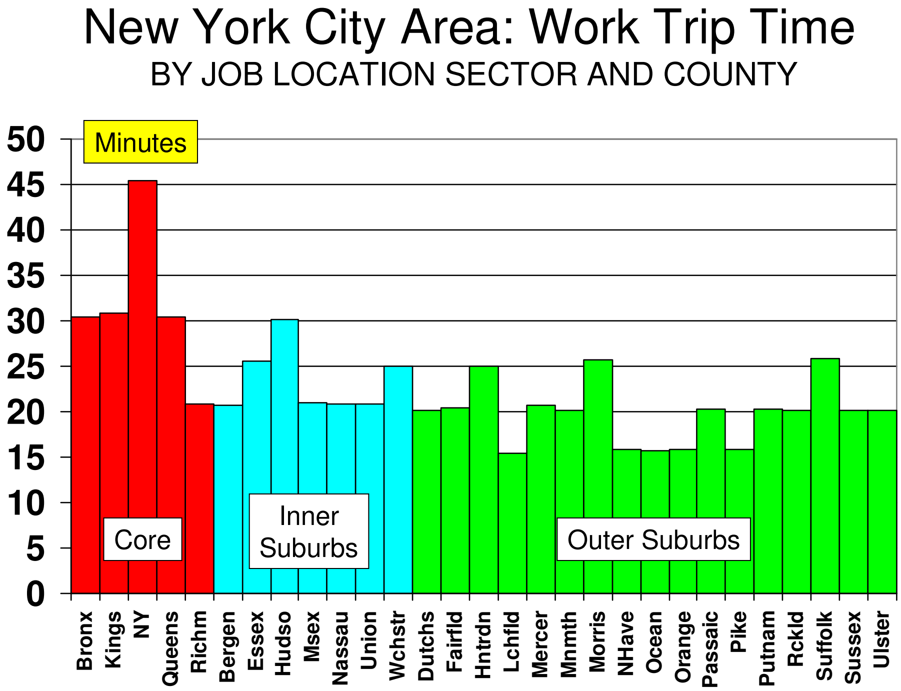

Figure 17

Other evidence can be found in comparing two nearby large urban areas that have had materially different land use and transport policies. Since World War II, the London area has been subject to strict land use policies that included development of a wide greenbelt that has forced all growth to the outside. The London area is relatively poorly served by highways, with most freeway length in the single M-25 Orbital (beltway). In contrast, contiguous urbanization has been permitted in the Paris area (following the natural development pattern typical of the United States), which has also built the greater portion of three freeway standard beltways, as well as up to 12 lane freeways that connect them.

Despite the strong financial core of London, data indicates that the Paris area is substantially more productive than the London area. A report commissioned by the Corporation of London found that major contributing factors were the better urban transport system of Paris, including both highways and mass transit.[51] The research showed that labor markets were substantially larger in Paris than in London because of higher operating speeds and greater capacity. For example, 60-minute labor markets in the Paris area average at least one-quarter more employment than in the London area. This is despite having highway systems that exhibit similar speeds.[52] Labor markets have been kept artificially small in the London area by its urban

[51] Center for Economics and Business Research, Ltd and Observatoire de l'Economie et des Instiutuions Locales University of Paris XII (1997), *Two Great Cities: A Comparison of the Economics of London and Paris.*

[52] To have equaled the size of Paris labor markets with its green belt, London could have compensated with huge highway investments, which would have made it possible for drivers to travel further in the same period of time. Generally more robust roadway systems, combined with the lower traffic intensity from lower population density, has allowed more geographically expansive urban areas in the United States to retain some of the best work trip

planning policies, which, with the greenbelt, force many commuters to travel much longer distances than in a metropolitan area in which the preponderance of the population lives in a large, contiguous central urban area (such as Paris).

SMART GROWTH NEGATIVE EXTERNALITIES: DESCRIPTION

Densification produces substantial negative externalities.

Negative Externality #1: Less Economic Growth from More Intense Traffic Congestion

The first negative externality of smart growth arises from the resulting greater traffic congestion. Generally, higher densities are associated with more intense traffic congestion. An analysis prepared for the United States Department of Transportation indicated that traffic volumes in small sectors (census tracts) rise with population density.[53] This research leads to the conclusion that vehicle miles traveled increase at approximately 0.7 the rate of increase in population density. This relationship can be observed in Federal Highway Administration data as well as international data.

In the United States, the highest density urban areas have traffic intensities (vehicle miles per urban square mile) approximately 2.6 times those in the lowest density urban areas (Figure 18). The lowest density urban areas have traffic intensities approximately one-quarter below the average.[54]

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travel times in the high-income world and correspondingly large labor markets. For example, see: http://www.publicpurpose.com/ut-intljtwtimesize.htm.

[53] Derived from Catherine Ross and Anne E. Dunning (1997). "Land Use and Transportation Interaction: An Examination of the 1995 NPTS Data," *Searching for Solutions: Nationwide Personal Transportation Survey Symposium.* Washington, DC: U.S. Federal Highway Administration.

[54] http://www.publicpurpose.com/ut-trafficintense.htm

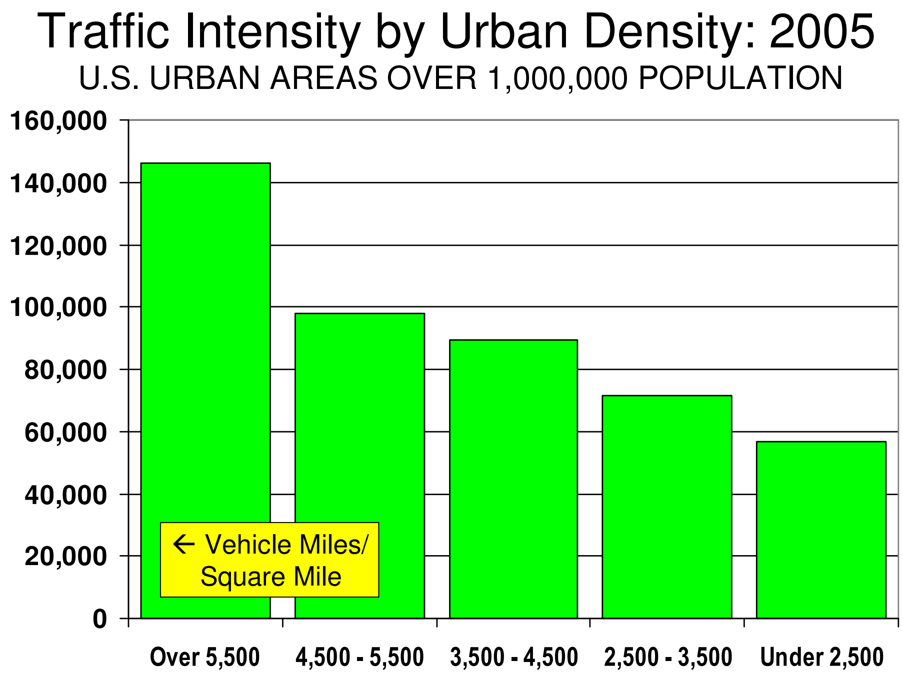

Figure 18

The international data indicates that as population densities increase, there is a greater intensity of vehicle miles traveled per square mile of urbanization. Generally, vehicle miles are three times as intense in the most dense urban areas than in the 3,000 per square mile and below density urban areas typical of Texas. Average speeds are approximately one-half as fast in the highest density urban areas. The result is that vehicle hour intensity (vehicle hours per square mile) is more than seven times as intense in the highest density urban areas (Table 4). Finally, the more dense urban areas are less affluent and a lower share of households has cars. Higher densities in the United States context would very likely result in even greater traffic congestion, because of the much higher automobile ownership rates.

Table 4
International Population Density and Traffic Intensity: 1990[55]

Density	Vehicle Mile Traffic Intensity	Average Speed	Vehicle Hour Traffic Intensity	Number of Urban Areas in Sample
20,000 & Over	153,590	15.2	11,373	7
10,000-19,999	118,000	19.3	6,187	11
5,000-9,999	98,111	24.2	4,183	10
3,000-4,999	69,510	30.0	2,340	13
Under 3,000	49,432	31.7	1,540	5
Average/Total	97,936	24.1	4,948	46

Source: Calculated from data in Kenworthy & Laube[56]

[55] This is the latest comprehensive international data.
[56] Calculated from Jeffrey Kenworthy, Felix B. Laube, and Peter Newman, *An International Sourcebook of Automobile Dependence in Cities, 1960–1990.* Boulder CO: University of Colorado Press, 1999.

As has been indicated above, there is a strong association between mobility and economic growth. Thus, smart growth densification policies can be expected to make traffic congestion more intense, thereby retarding economic growth and increasing levels of poverty.

Negative Externality #2: Health Threats from More Intense Air Pollution

The second negative externality of smart growth densification arises from the resulting more intense vehicle emissions. As noted above, traffic congestion is intensified by higher densities, while traffic speeds are slower. Generally, automobile emissions increase as travel speeds slow from normal urban operating speeds (Figure 19). Moreover, the greater intensity of traffic can be expected to lead to more stop and go traffic conditions. This type of intermittent operation can increase emissions exponentially. The result is that local air pollution is far more intense in higher density areas. Thus, smart growth densification strategies threaten the health of residents, especially those most sensitive to air pollution. Finally, more intense traffic congestion also produces higher levels of carbon dioxide emissions.

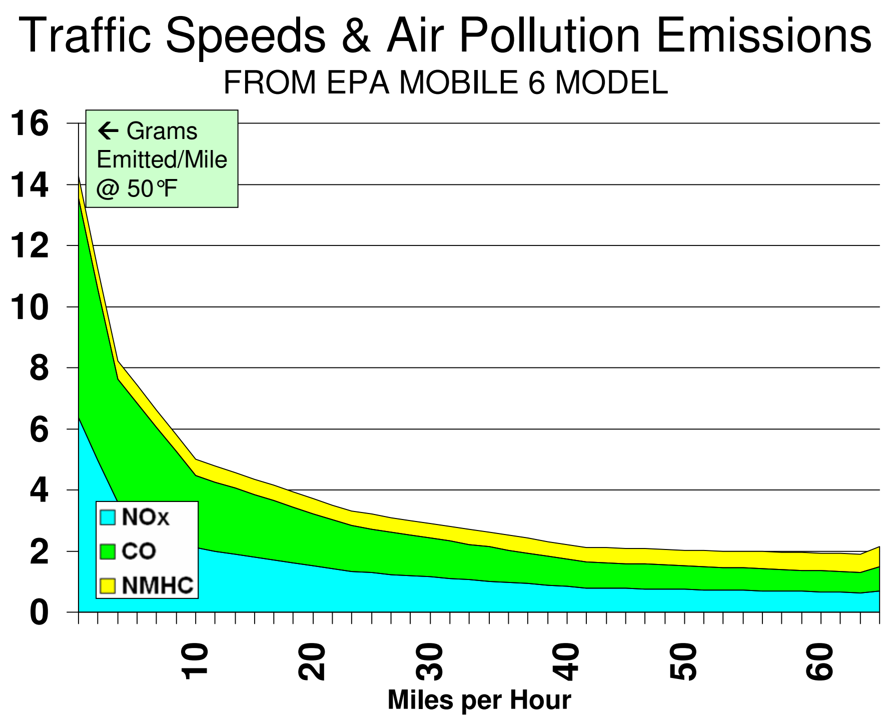

Figure 19

Negative Externality #3: Greater Concentration of Wealth from Less Affordable Housing

The third negative externality of smart growth densification arises from the house price escalation that inevitably follows from land rationing policies. Urban areas can only be densified if land use regulations are enacted to enforce higher densities. Urban areas that have adopted smart growth policies typically establish "urban growth boundaries," outside of which development is not allowed to occur. They may restrict the number of detached houses that can be built, or otherwise limit residential or commercial development on or beyond the fringe of the urban area. Urban areas may impose large lot (rural) zoning in an attempt to make it more difficult for urban residents to move to the suburbs or exurbs, in an attempt to support higher urban densities.

The inevitable result of such regulation is to create a scarcity of land (ration land) for residential development. Generally, in economics, prices rise inordinately when there is interference with supply. This is the principal difficulty with smart growth.

The higher price of land flows through to make housing costs higher. A number of urban areas have established densification programs in recent years. At the same time, there has been an unprecedented loss in housing affordability. For example, in 1995, the median house price to median household income ratio ("Median Multiple") in major US metropolitan areas ranged from 1.9 to 4.0, with none of the 53 markets with more than 1,000,000 population above a Median Multiple 4.0. By 2006, the Median Multiple range had expanded to from 2.0 to 11.4, with the price of housing in the least affordable markets tripling relative to incomes. By 2006, 27 of the 53 largest markets had Median Multiples over 4.0. In virtually markets experiencing the inordinate loss in housing affordability, strong land use regulations worked to seriously limit the land available for residential development.[57]

Higher house prices are a serious concern, because home ownership has represented an important means for households to enter the mainstream of economic life and have served to significantly expand the size and wealth of the middle income households since World War II. This has been strongly associated with suburbanization --- the development of new housing on inexpensive land on urban peripheries.

Consistent with the economic theory, a strong body of international research makes the connection between restrictive land use policies and higher housing costs relative to incomes.

- The United Kingdom government *Barker Reports* cited land regulation and the resulting land scarcity as a principal factor in inordinate housing price increases the and associated loss of affordability.[58]

- An Organization for Economic Cooperation and Development (OECD) report found an association between strongly regulated land markets and higher housing prices.[59]

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[57] See *Third Annual Demographia International Housing Affordability Survey,* http://www.demographia.com/dhi-ix2005q3.pdf.
[58] Kate Barker (2004 and 2006). *Review of Housing Supply: Delivering Stability: Securing Our Future Housing Needs: Final Report—Recommendations.* Norwich, England: Her Majesty's Stationery Office. www.hm-treasury.gov.uk/consultations_and_legislation/barker/consult_barker_index.cfm and *Barker Review of Land Use Planning,* http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf.
[59] "Recent House Price Developments: The Role of Fundamentals," *OECD Economic Outlook #78* (2005), www.oecd.org/dataoecd/41/56/35756053.pdf.

- A United Kingdom government report places the blame for that county's housing affordability problem on excessive land use restrictions, which are similar to "smart growth" policies in some US markets. The author is a member of the Monetary Policy Committee of the Bank of England.[60]

- A government report authored by the Chairman of the Board of the Reserve Bank of New Zealand attributes the loss of housing affordability in the Auckland area to land use restrictions that are similar to "smart growth policies in some United States markets.[61]

- The Harvard University Joint Center for Housing Studies *State of the Nation's Housing Report 2005* notes that "development constraints drive up land and construction costs as well as prevent new housing from keeping pace with rising demand."[62]

- Two 2006 Australian studies place the blame for rising residential land costs on public policies that create land shortages.[63]

- A report for the New Zealand government attributes much of that nation's house cost inflation to land price rises, which it suggests has a strong relationship to regulation of land supply.[64]

- Glaeser found that Boston area house prices had been inflated 60 percent by policy driven land scarcity.[65]

- A report by the Royal Institution of Chartered Surveyors (RICS) in the United Kingdom attributed housing supply difficulties to land use regulation in some Western European nations, as well as the United Kingdom.[66]

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[60] Kate Barker (2004 and 2006). *Review of Housing Supply: Delivering Stability: Securing Our Future Housing Needs: Final Report—Recommendations.* Norwich, England: Her Majesty's Stationery Office. www.hmtreasury.gov.uk/consultations_and_legislation/barker/consult_barker_index.cfm and *Barker Review of Land Use Planning,* http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf.
18 "Recent House Price Developments: The Role of Fundamentals," *OECD Economic Outlook*
[61] Arthur Grimes with Andrew Aitken, Ian Mitchell & Vicky Smith, *Housing Supply in the Auckland Region 2000-2005,* Center for Housing Research Aotearoa New Zealand (CHRANZ), December 2006, http://www.hnzc.co.nz/chr/pdfs/housing-supply-in-the-auckland-region-2000-2005.pdf.
[62] *State of the Nation's Housing Report 2005,* Harvard University Joint Center for Housing (2005), www.jchs.harvard.edu/publications/markets/son2004.pdf.
[63] Macroplan Australia Pty. Ltd, *Australian Broad Hectare Land Supply Study,* report prepared for the Residential Development Council of Australia, October 2006 and David Poole, *The 2006 UDIA State of the Land Report* Urban Development Institute of Australia, 2006.
[64] Arthur Grimes and Andrew Aitken, *Regional Housing Markets in New Zealand: House Price, Sales and Supply Responses,* Center for Housing Research Aotearoa New Zealand (CHRANZ), November 2005, http://www.hnzc.co.nz/chr/pdfs/regional-housing-markets.pdf.
[65] Edward L. Glaeser, Jenny Schuetz, and Bryce Ward, *Regulation and the Rise of Housing Prices in Greater Boston*, Pioneer Institute for Public Policy Research and Rappaport Institute for Greater Boston, Kennedy School of Government, Harvard University (2005).
www.ksg.harvard.edu/rappaport/downloads/housing_regulations/regulation_housingprices.pdf.
[66] Michael Ball, *RICS European Housing Review 2005*, Royal Institution of Chartered Surveyors, (2005), www.rics.org/NR/rdonlyres/FE69252B-B62E-47BD-820E-471AA2072C65/0/ehr_2005_full_report.pdf.

- In a comprehensive review of US markets, Glaeser and Gyourko characterized land use controls as playing the "dominant role" in the housing costs differences.[67]

At the same time, the restrictive land use policies that have destroyed housing affordability in some markets do not exist in many markets of the United States and Canada, including Texas. Consistent with the research cited above, a Federal Reserve Bank of Dallas article characterized the superior housing affordability of Texas to its more liberal zoning and the consequent greater supply of land for building houses.

> *The Texas market presents a marked contrast to such areas as the Pacific Coast, where tight supplies of vacant land and tougher zoning make building difficult. In Texas, the ready availability of land and low entry costs attract homebuilders, creating a competitive marketplace that helps keep a lid on price increases.*[68]

This is indicated by the Median Multiple in Texas urban areas, which remains near or below the historic norm of 3.0. By comparison, the Median Multiple has escalated sharply in highly regulated housing markets. For example, the average Median Multiple among the four largest Texas urban areas was 2.6 in 1995. By 2006, housing affordability had declined somewhat, though the average Texas urban area Median Multiple remained slightly below 3.0. By contrast, in 1995, the average Median Multiple among Portland, Boston, Miami and San Diego was 2.9 in 1995. By 2006, the average Median Multiple had deteriorated to 7.3 in these markets, representing a massive loss in purchasing power for home buyers (Figure 20).

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[67] Edward L. Glaeser and Joseph Gyourko (2002). *The Impact of Zoning on Housing Affordability*, Cambridge, MA: Harvard Institute of Economic Research.

[68] D'Ann Peterson, "Texas Housing: A Boom with no Bubble," *Southwest Economy,* Federal Reserve Bank of Dallas, May/June 2006. http://dallasfed.org/research/swe/2006/swe0603b.pdf.

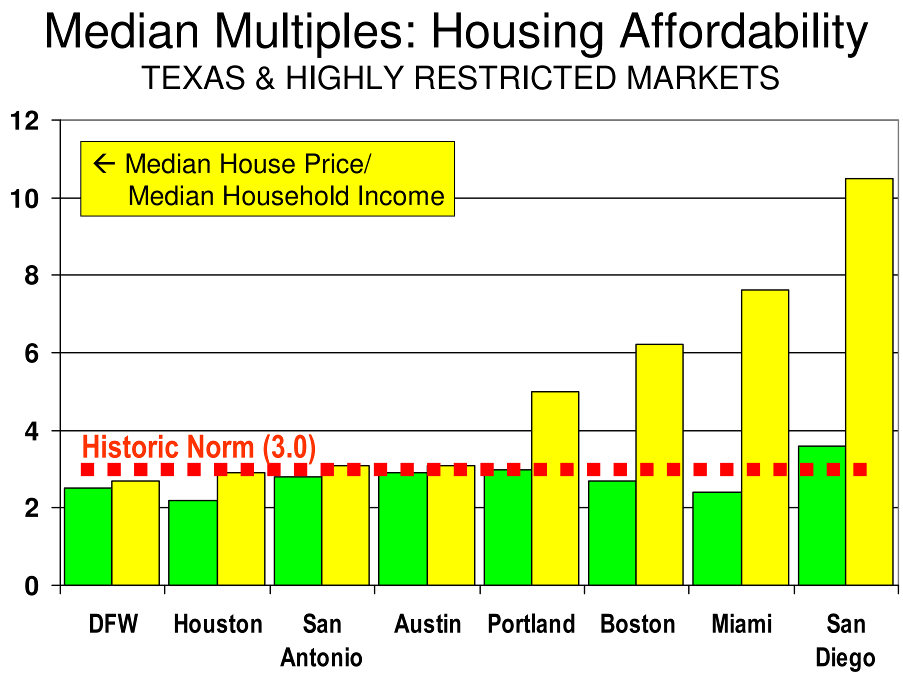

Figure 20

The depth of the problem is illustrated by comparing the similar markets of Austin and Perth, Australia, which have experienced similar population growth (Figure 21). Housing affordability has been seriously eroded in Perth. Between 1996 and 2006, Perth's Median Multiple (median house price divided by median household income) rose from 3.7 to 8.0. Over the same period of time, Austin's Median Multiple has declined slightly, indicating a small improvement in housing affordability (Figure 22). As a result, the median house in 2006 is approximately $575,000 more costly than in 1996, including mortgage interest (adjusted for income growth and current interest rates). This additional cost is equal to 11 years of gross pre-tax income for a household with the median income.[69]

[69] *Third Annual Demographia International Housing Affordability Survey,* pages 25-27.

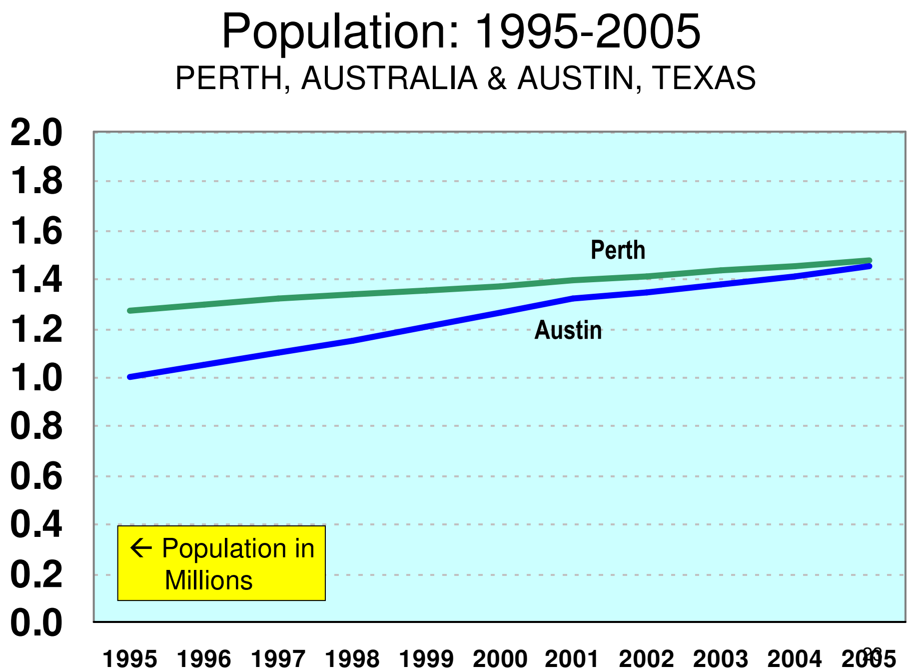

Figure 21

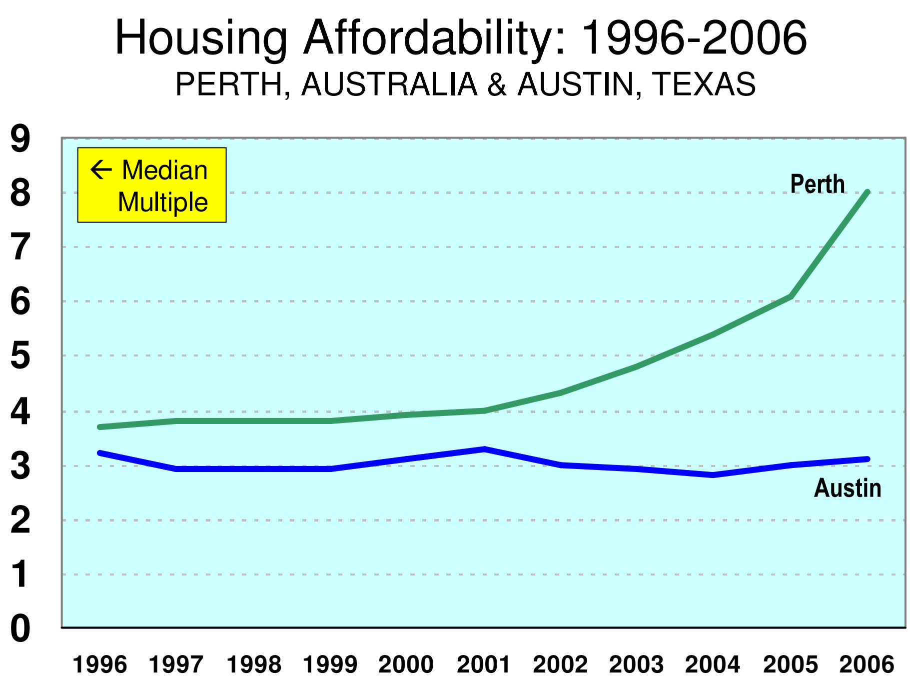

Figure 22

In some US urban areas, the loss of income has been even greater. For example, the cost, including mortgage interest, of the median priced house in San Diego has risen more than $800,000 compared to the Median Multiple in 1996. This equates to approximately 14 years of additional gross pre-tax income for the median income household.[70] By comparison, housing affordability has improved slightly in Dallas-Fort Worth over the same period of time (Figure 23).

The housing price escalation associated with urban densification and smart growth policies cannot help but reduce home ownership rates and working family affluence in the longer run. This will disproportionately affect lower income households, which are disproportionately minority. Today, White-Non-Hispanic home ownership rates are a full 50 percent higher than African-American and Hispanic home ownership rates. The gap has been narrowing, but smart growth policies are likely to widen the gap.

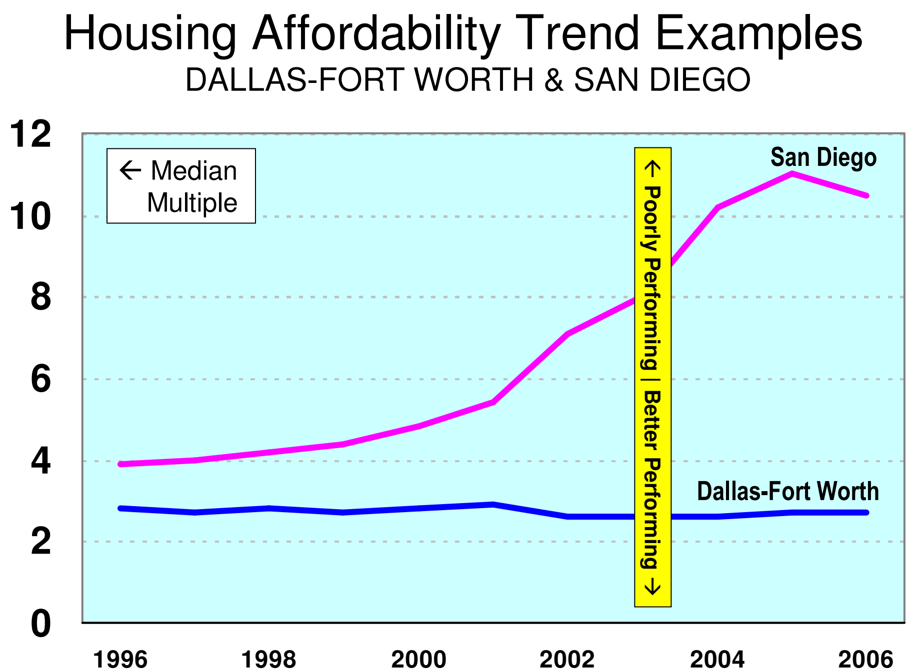

Figure 23

It appears that this housing affordability crisis is having a significant impact on growth. Long standing domestic migration[71] trends in the United States have changed significantly in the new century. Approximately 1,700,000 people moved from higher cost housing markets to lower cost markets between 2000 and 2005. These higher cost markets are principally in the Northeast and the West, which had grown rapidly in recent decades, but has since seen anemic growth.[72] By

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[70] The calculations in this section assume a 30 year mortgage with a currently prevailing fixed rate over the term of the loan. In some nations, long term fixed rates are not the norm, which could result in higher or lower interest costs depending upon the longer term trends. Moreover, present interest rates are comparatively low by historic standards and as a result it is likely that this analysis understates the additional years of income that is necessitated to pay the mortgage in an environment of housing inflation.

[71] Excludes international migration.

[72] *Domestic Migration & Housing Affordability: US Metropolitan Areas over 1,000,000: 2000-2005* http://www.demographia.com/db-metmigramm.htm.

contrast, the Texas urban areas have continued to experience net domestic in-migration (Figure 24).

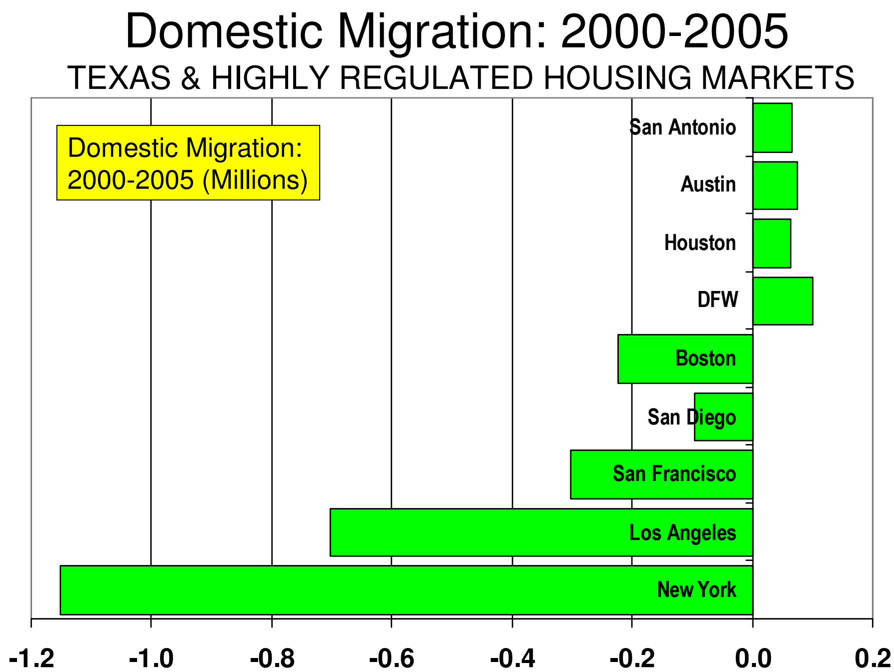

Figure 24

The "slowdown" in the United States economy during 2006 has been blamed, in part, on a decline in housing activity. From 2005 to 2006, existing house sales declined in the more regulated states at five times the rate of liberally regulated states.[73]

Finally, economist Raven Saks of the US Federal Reserve Board has published research indicating the potential for economic loss from restrictive land use policies.[74]

> *… with stringent development regulations generate less employment growth than expected given their industrial bases.*[75]

TOO HIGH A PRICE?

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[73] USA *House Sales by Level of Land Use Regulation: 3rd Quarter 2006: Annual Change*, http://www/demographia.com/db-xsales2005-6.htm.
[74]Raven E. Saks, *Job Creation and Housing Construction: Constraints on Metropolitan Area Employment Growth,* http://www.federalreserve.gov/pubs/feds/2005/200549/200549pap.pdf. .
[75] *State of the Nation's Housing Report 2005,* Harvard University Joint Center for Housing (2005). p. 6., www.jchs.harvard.edu/publications/markets/son2004.pdf

Thus, despite claims that urban densification or smart growth will lead to better urban areas, the evidence of negative externalities is clear. Smart growth threatens to hobble the economy and increase poverty by reducing mobility (and access) and by reducing home ownership. Smart growth is also associated with a less healthy urban environment, by virtue its more intense air pollution.

Table 5

Urban Area Projections: Gross Jobs Access from the Core & Share of Jobs Accessible

Urban Area	PRESENT				2027 NO TMMP			2027 TMMP		
	2002	Rank	Share	Rank	2027	Rank	Share	2027	Rank	Share
New York-Newark NY-NJ-CT	1,475,000	2	19%	50	863,000	2	10%	863,000	4	10%
Los Angeles-Long Beach-Santa Ana CA	1,177,000	4	24%	49	544,000	31	8%	544,000	31	8%
Chicago IL-IN	948,000	14	25%	48	487,000	38	11%	487,000	38	11%
Philadelphia PA-NJ-DE-MD	896,000	16	38%	45	575,000	23	23%	575,000	24	23%
Miami FL	1,198,000	3	57%	40	641,000	19	23%	641,000	20	23%
Dallas-Fort Worth-Arlington TX	998,000	9	50%	43	569,000	24	20%	1,245,000	1	43%
Boston MA-NH-RI	692,000	24	34%	46	379,000	49	17%	379,000	49	17%
Washington DC-VA-MD	989,000	11	48%	44	543,000	32	22%	543,000	32	22%
Detroit MI	939,000	15	54%	41	578,000	22	32%	578,000	23	32%
Houston TX	861,000	17	50%	42	701,000	14	30%	1,137,000	2	48%
Atlanta GA	561,000	35	32%	47	283,000	50	12%	283,000	50	12%
San Francisco-Oakland CA	1,572,000	1	99%	33	846,000	3	36%	846,000	6	36%
Phoenix AZ	1,151,000	5	86%	36	738,000	10	40%	738,000	13	40%
Seattle WA	996,000	10	72%	39	557,000	28	31%	557,000	28	31%
San Diego CA	1,031,000	7	83%	37	524,000	34	32%	524,000	34	32%
Minneapolis-St. Paul MN	1,007,000	8	78%	38	522,000	35	34%	522,000	35	34%
St. Louis MO-IL	974,000	13	99%	34	705,000	13	67%	705,000	16	67%
Baltimore MD	978,000	12	100%	32	537,000	33	45%	537,000	33	45%
Tampa-St. Petersburg FL	861,000	17	91%	35	677,000	17	57%	677,000	18	57%
Denver-Aurora CO	1,035,000	6	100%	7	728,000	11	57%	728,000	14	57%
Cleveland OH	825,000	19	100%	24	846,000	3	100%	846,000	6	100%
Pittsburgh PA	794,000	21	100%	19	780,000	8	100%	780,000	11	100%
Portland OR-WA	795,000	20	100%	5	559,000	27	51%	559,000	27	51%
San Jose CA	759,000	22	100%	22	1,121,000	1	100%	1,121,000	3	100%
Riverside-San Bernardino CA	572,000	34	100%	15	411,000	46	49%	411,000	46	49%
Cincinnati OH-KY-IN	726,000	23	100%	8	549,000	29	70%	549,000	29	70%
Sacramento CA	615,000	28	100%	3	687,000	16	64%	687,000	17	64%
Virginia Beach VA	679,000	25	100%	21	753,000	9	100%	753,000	12	100%
Kansas City MO-KS	676,000	26	100%	18	800,000	6	100%	800,000	9	100%
San Antonio TX	581,000	32	100%	13	797,000	7	93%	857,000	5	100%
Las Vegas NV	605,000	30	100%	25	817,000	5	94%	817,000	8	94%
Milwaukee WI	623,000	27	100%	20	658,000	18	100%	658,000	19	100%
Indianapolis IN	609,000	29	100%	16	566,000	26	82%	566,000	26	82%
Providence RI-MA	547,000	36	100%	14	605,000	21	100%	605,000	22	100%
Orlando FL	575,000	33	100%	11	629,000	20	74%	629,000	21	74%
Columbus OH	584,000	31	100%	9	725,000	12	100%	725,000	15	100%
New Orleans LA	429,000	41	100%	6	477,000	39	100%	477,000	39	100%
Buffalo NY	432,000	40	100%	10	419,000	45	100%	419,000	45	100%
Memphis TN-MS-AR	436,000	38	100%	12	498,000	36	100%	498,000	36	100%
Austin TX	485,000	37	100%	23	689,000	15	88%	782,000	10	100%
Bridgeport-Stamford CT-NY	419,000	43	100%	30	421,000	44	87%	421,000	44	87%
Salt Lake City UT	434,000	39	100%	4	548,000	30	100%	548,000	30	100%
Jacksonville FL	426,000	42	100%	27	568,000	25	100%	568,000	25	100%
Louisville KY-IN	414,000	44	100%	28	443,000	42	100%	443,000	42	100%
Hartford CT	404,000	45	100%	17	439,000	43	100%	439,000	43	100%
Richmond VA	403,000	46	100%	29	492,000	37	100%	492,000	37	100%
Charlotte NC-SC	395,000	47	100%	26	401,000	48	91%	401,000	48	91%

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Urban Area Projections: Gross Jobs Access from the Core & Share of Jobs Accessible

Urban Area	**PRESENT**				**2027 NO TMMP**			**2027 TMMP**		
	2002	**Rank**	**Share**	**Rank**	**2027**	**Rank**	**Share**	**2027**	**Rank**	**Share**
Nashville-Davidson TN	377,000	48	100%	31	472,000	40	100%	472,000	40	100%
Oklahoma City OK	352,000	49	100%	2	444,000	41	100%	444,000	41	100%
Tucson AZ	324,000	50	100%	1	403,000	47	100%	403,000	47	100%
Total	36,634,000				30,014,000			31,279,000		