

LAND USE POLICY AND TRANSPORTATION: WHY WE WON'T GET THERE FROM HERE

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The purpose of this paper is to consider the effectiveness of land use policy as an instrument for reducing environmental and other external costs associated with ownership and use of the private automobile. Emphasis is placed on the long run, since land use change is a slow process, and consequently can potentially have significant effects only in the long run. I will argue that land use change is driven by factors over which we have little policy control, and that current trends of decentralization will continue in the future. Although the link between urban form and travel behavior may be significant, it is highly unlikely that policy actions could shift urban form to patterns associated with less private vehicle travel. The paper begins by presenting some information on international trends in travel and land use patterns. Then I discuss explanatory factors associated with these trends. The final part of the paper addresses the future, and considers the potential of land use policies in the context of long run trends.

URBAN TRAVEL TRENDS

Urban travel trends are easily summarized. Car ownership and use is increasing, total travel is increasing, and both public transit use and non-motorized modes are decreasing.

Car Ownership and Use

Throughout the developed world, people own more private vehicles, use them more frequently, drive more miles, and are more likely to drive alone than ever before. The world's motor vehicle fleet has grown immensely over the past two decades. The total number of cars and trucks increased from 246 million in 1970 to 617 million in 1993, with most of the growth occurring outside the United States, as illustrated in Figure 1 (U.S. Department of Transportation, 1996). Average annual growth rates in the motor vehicle fleet over this period are 2.6 percent for the United States, 4.4 percent for other OECD countries, and 6.5 percent for non-OECD countries.

Patterns of vehicle ownership are further illustrated in Table 1, which gives average annual growth rates for car registrations in selected countries, grouped by level of per capita income and weighted by population. The low and low-middle income countries have the lowest car ownership rates, but the highest growth rates. These numbers suggest that absent severe policy intervention, the world car fleet will grow enormously in the coming decades as developing countries achieve higher levels of per capita income. It bears noting that China has the lowest 1992 car ownership rate (car per population ratio of 0.00162), even though the vehicle fleet increased by more than a factor of ten between 1970 and 1992. Another increase of this magnitude or greater is quite possible in the coming decade. At the opposite end of the spectrum,

the United States continues to have the highest car ownership rate (car per population ratio of 0.6), but it had the slowest growth rate (2.2 percent) during this period, suggesting that car ownership in the United States may finally be reaching saturation.

TABLE 1 Growth in Car Ownership, by Country Per Capita Income Category, 1970–1992

	Annual Growth Rate 1970 - 1992, percent		Cars/Pop. 1,992
	Cars	Population	
Low Income Economies (<i>Examples: India, China, Nigeria</i>)	9.4	2.3	0.0034
Lower Middle Income Economies (<i>Examples: Peru, Thailand, Turkey</i>)	9.6	2.5	0.0350
Upper Middle Income Economies (<i>Examples: Mexico, South Korea, Brazil</i>)	7.2	2.4	0.0860
High Income Economies (<i>Examples: U.S., Japan, Germany</i>)	3.3	0.9	0.4760

Source: USDOT (1996), p. 219.

Car ownership is significantly related to per capita income. Figure 2 plots car ownership per 1000 population against the natural log of 1992 GDP in U.S. dollars for several European countries (east and west), the United States, Canada and Japan. The graph suggests that as economic well-being improves in lower income countries, car ownership will increase. The graph also shows that the greatest dispersion of car ownership rates is found among the higher income countries, with the United States at one extreme and Denmark and Japan at the other. In addition to per capita income, differences in car ownership and use across countries are attributed to population density, the density of cars relative to land area or road supply, and car ownership and fuel costs. High population density and limited land area may promote implementation of auto restraint policies to reduce congestion and other negative effects associated with auto travel in densely developed areas. Pucher (1988) associates the generally lower levels of car ownership and use outside the United States to public policies that make car ownership and use more costly and less convenient. Despite these policies, however, car ownership continues to increase.

More car ownership means more car use; annual vehicle-kilometers traveled has increased at about the same rate as car ownership. To illustrate, Table 2 gives annual average VKT growth rates for the US, Japan, and selected European Conference (EC) countries. Figure 3 shows VKT growth for 6 European countries, 1970 to 1995. Total VKT nearly doubled over the period, and the greatest growth occurred in private vehicle travel; the private vehicle share increased from 79 percent in 1970 to 85 percent in 1995.

TABLE 2 Growth in Car Use, by Country 1970–1993

Country	Avg. Annual Growth Rate (%)	
	VKT	Cars
United States	2.7	2.2
France	3.2	3.0
West Germany	3.0	3.6
Great Britain	3.8	3.2
Japan	6.5	6.9

Source: USDOT (1996), p. 209.

Mode Shifts

Table 3 gives information on mode shares for urban areas in various countries. Care must be taken in making such comparisons, because data are collected differently, and mode and trip definitions may differ across countries and across years. Data for all trips are not available for urban areas in the United Kingdom; hence only data for London and for the journey to work for Manchester are presented. Because London is such a large metropolitan area, it is not representative of the general level of car use in other U.K. urban areas. In all countries, the trend of increasing car use is obvious, but the rate of increase varies greatly. In the United States, where car use was already very high in 1969, increases have been quite small. In contrast, large increases have occurred in the urban areas of Norway and West Germany.

Increased car use has come at the expense of both public transport and non-motorized travel, depending on the urban area. In Germany, the public transport share has remained quite stable, while the non-motorized share has decreased. In the other countries, both public transport and non-motorized shares decreased. Decreases in non-motorized trips suggest substitution of longer trips for short trips, as well as population shifts out of core city areas to less dense (and therefore less bike or pedestrian accessible) areas. Although much of the transportation public policy debate focuses on car vs public transport, the observed decline in non-motorized trips is probably far more consequential from an environmental perspective.

Explanatory Factors

In addition to rising affluence, major explanatory factors for these trends include changing demographics and household structure, labor force participation, and changing land patterns. Higher income implies higher value of time, making travel time relatively more important in travel choice decisions. As the value of time increases, faster modes will be preferred, hence the increase in private vehicle travel. Higher income also implies greater demand for goods and

services, and therefore more total travel. The relationship of car use, distance traveled, and trip frequency with household income is extensively documented. (e.g. Hu and Young, 1993; Pisarski, 1996).

TABLE 3 Mode Share Trends, All Person Trips, Selected Urban Areas

London	1975-76	1985-86	1989-91
Car	41	44.3	47.8
Public Transport	20	17.3	17.0
Bike	3	2.8	1.7
Walk	35	35.0	32.7
Manchester ^a	1971	1981	1991
Car	32	50	64
Public Transport	39	24	16
Bike	2	2	2
Walk	21	19	16
Norwegian city regions	1970	1985	1990
Car	32	60	68
Public Transport	20	11	7
Walk & Bike	48	29	25
W. Germany urban areas	1972	1982	1992
Car	34	43	49
Public Transport	17	17	16
Bike	8	10	12
Walk	41	30	23
US urban areas	1969	1977	1990
Car	79.8	82.3	84.3
Public Transport	4.9	3.4	2.8
Bike	0.7	0.7	0.7
Walk	11.5	10.7	9.1

^a Journey to work only

Source: Pucher and Lefevre (1996); Hervick, Tretvik and Ovstedal (1993); Brog and Erl (1995).

Household size has declined both in the US and in Europe for several decades. Average number of persons per U.S. household was 2.75 in 1980 and 2.63 in 1990. Household composition has also changed: the most rapid increase in household growth was among non-family households, e.g. persons living alone or with other non-family persons (Pisarski, 1996). Similar patterns prevail in Europe; among the "EURO12, household size declined from 2.8 in 1981 to 2.6 in 1991 (ECMT, 1995). Declining household size is attributed to declining fertility rates, rising divorce rates, breaking up of the extended family system, aging of the population, and growing economic independence of women and young people (Masser, Sviden and Wegener, 1992). As birthrates continue to decline, smaller household size should be observed in less developed countries as well.

Declining household size means more travel for personal or household needs. Regular household activities (food shopping, laundry and cleaning, home maintenance, social visits, etc.) are shared among fewer household members. In addition, non-family households are less likely to share resources; consequently we would expect such members to behave more like individuals living alone, hence generating more household trips.

In both the United States and European countries, observed increases in the labor force participation rate are mainly due to increased participation by women. Increased participation in the labor market by women has at least two significant effects on travel. First, more working women means more households with multiple workers. In the U.S., 70 percent of all working households had two or more workers in 1990 (Pisarski, 1996). Housing location choice decisions are more complex for households with multiple workers; all else equal, it is more difficult for such households to live close to work, given dispersed job locations. Although research shows that women travel shorter distances to work than men, it seems reasonable to attribute some of the observed increase in commute travel distance to the rise in multiple worker households.

Second, increased participation of women in the workforce has not been accompanied by any major changes in household responsibilities. All else equal, working women are subject to greater time pressure, and consequently attribute high value to the efficiency of driving alone. The value women place on driving alone is demonstrated in the United States by the higher likelihood of women driving alone than men when household income is controlled (Rosenbloom, 1995). Also, although United States women in 1990 still drove fewer annual VMT than men, the rate of increase in VMT since 1983 has been higher for women (Pisarski, 1992).

LAND USE TRENDS

The major trend in urban spatial patterns for several decades has been decentralization. Suburbanization of population and employment has been evident in the United States throughout the Twentieth century. Large scale population suburbanization was followed by large scale employment decentralization and by the emergence of major agglomerations outside the traditional downtown (e.g. Muller, 1995). More recently, decentralization has been accompanied by dispersion, with most growth occurring outside major centers.

Table 4 gives population growth rates for United States metropolitan areas with 1 million or more population, by decade, 1960 through 1990, using United States census data. In each decade, population growth was more rapid in suburban counties than in central counties. In 1960, central counties accounted for a majority of the metropolitan population, but by 1970 the majority shifted to suburban counties. The suburban county share continued to increase through 1990.

TABLE 4 Population Growth for U.S. Metro Areas with 1 Million or More Population, Central and Suburban Counties

Population Growth Rates, Percent			
Years	Total Area	Central County	Suburban Counties
1960 - 1970	18.50	10.20	27.35
1970 - 1980	7.78	2.82	12.35
1980 - 1990	11.81	9.22	13.79
Population Shares, Percent			
Year	Central County	Suburban Counties	
1960	51.60	48.40	
1970	47.99	52.01	
1980	43.28	56.72	
1990	42.27	57.73	

Source: Rosetti and Eversole (1993)

Population decentralization has been accompanied by employment decentralization. Empirical evidence of this trend is extensive. For example, Gordon and Richardson (1996) calculated average annual employment growth rates for 54 U.S. metropolitan areas for 1976 - 1980 and 1980 - 1986. Areas were segmented into CBD, remainder of the central city, and the remaining metropolitan area excluding the central city. In all cases, growth rates were highest in the suburban county. Similar results were found using annual employment data by county (Gordon, Richardson and Yu, 1996).

A similar process of population and employment decentralization is also evident within most metropolitan areas in Europe, although from a very different starting point and with a wider degree of variability of experience. Indeed, decentralization has been documented in major metropolitan areas throughout the developed world. Table 5 gives population and employment changes for several metropolitan areas, for core city areas and their suburbs. In all but one case (Liverpool employment), population and employment grew faster (or declined slower) in the suburbs than in the core city. Note that the table includes metro areas in several different countries, and that the most recent series ends in 1985 (more recent data are not available). It is possible that more recent data would reveal an acceleration of these trends, given the effects of globalization and the shift to an information-based economy. More recent population data are available for selected cities. Some examples of central city population shares: Paris central city

population share declined from 32 percent in 1968 to 23 percent in 1990; Zurich from 38 percent in 1970 to 29 percent in 1995; Amsterdam from 80 percent in 1970 to 66 percent in 1994. Only London has held approximately steady at 41 percent in 1971 to 38 percent in 1994.

**TABLE 5 Population and Employment Decentralization in Selected European Cities
Average Annual Percentage Change**

City	Population			Employment		
	Years	Core City	Suburbs	Years	Core City	Suburbs
Antwerp	1970-81	-0.8	+1.2	1974-84	-0.7	+0.4
Copenhagen	1970-85	-1.5	+1.0	1970-83	-0.3	+3.2
Hamburg	1970-81	-0.8	+1.9	1961-83	-0.8	+1.9
Liverpool	1971-80	-1.6	-0.4	1978-84	-2.6	-3.1
Milan	1968-80	-0.6	+1.3	1971-81	-0.9	+1.9
Paris	1968-80	-1.1	+1.1	1975-82	-1.1	+0.9
Rotterdam	1970-80	-1.6	+2.2	1975-84	-1.1	+1.5

Source: Jansen (1993)

Land Use and Commuting Patterns

Decentralization of population and employment is reflected in commuting patterns. To summarize, the traditional commute to the center city is no longer the dominant commute flow. Commuting between suburban locations is now the major flow in the United States, and is the fastest growing commute flow in European metropolitan areas. Table 6 gives commute flow data for the United States, drawn again from U.S. census data. Since the census only began asking the work location in 1980, comparisons are available only for 1980 and 1990. The data are compiled by county, a local political jurisdiction that can include one or more cities. Central counties therefore encompass the central city of the metropolitan areas as well as adjacent cities and county areas. Central county therefore overstates the central city portion in nearly every case. Several observations are to be drawn from Table 6. First, central counties were the location of the greatest share of job destinations in both years, but the share declines. Conversely, the share of job destinations in suburban and exurban locations increases. Second, the suburban resident worker share increases. Third, the largest flow is central county to central county in 1980, but is suburban county to suburban county in 1990.

TABLE 6 Commute Flows in U.S. Metropolitan Areas, 1980 and 1990

1980: 31 Metro Areas				
	Place of Work			
Place of Residence	Central county	Suburban county	Outside area	Subtotal
Central county	41.90	2.70	0.83	45.43
Suburban county	12.14	40.90	1.53	54.57
Subtotal	54.03	43.60	2.36	100.00
1990: 39 Metro Areas				
	Place of Work			
Place of Residence	Central county	Suburban county	Outside area	Subtotal
Central county	38.05	3.57	0.83	42.44
Suburban county	11.68	43.52	2.34	57.55
Subtotal	49.73	47.09	3.17	100.00

Source: Computed from Rosetti and Eversole (1993).

Using more disaggregate data, (1996) allocates the *increase* in commute flows between 1980 and 1990 as follows: 58 percent suburb to suburb, 20 percent suburb to central city, 12 percent central city to suburb, and 10 percent city to city. Thus the suburb to suburb commute continues to be the fastest growing commute flow segment.

With more suburban job destinations and fewer central city job destinations comes more use of the private car. Table 7 gives mode share for U.S. journey to work trips by destination location category. Public transit still carries a significant portion of work trips to central city destinations. In contrast, more people walk or bike to suburban jobs than take transit, and the private vehicle accounts for 90 percent of all trips.

TABLE 7 Journey to Work Mode Choice, 1990, by Job Location

	Mode Share, percent				
Job location	Drive alone	Carpool	Pub. Transp.	Walk/Bike	Other ^a
Central City	68.2	13.4	11.0	4.7	2.9
Suburbs	77.5	12.9	2.0	3.5	3.3

^a Includes work at home.

Source: Pisarski (1996), p. 84.

The same trend of dispersing commute flows is evident in the EC. Limited data makes possible only a few examples. Commute flow data for the Paris region, 1975 and 1982, reveal that the greatest decline occurred in the central city to central city flow, while the greatest increase occurred in outer suburb to inner suburb commutes. Other large increases took place in central city to outer suburbs, and inner suburbs to outer suburbs, implying a significant dispersion of travel flows and longer distance commutes, which in turn implies greater use of private vehicles (Jansen, 1993).

In Germany, the share of workers living and working in the same city declined from 72 percent in 1970 to 61 percent in 1988. The increase in commuting by car that occurred is the result of both longer distance commuting and generally increased demand for car travel. For those living and working in the same city, the increase in car use was at the expense of non-motorized modes. For those working in a different city, the shift was from public transit (Jansen, 1993).

WHAT HAPPENED?

Before these trends were clearly evident and documented in Europe and other developed countries, decentralization and the dominance of the private auto were perceived as a uniquely American (U.S.) phenomenon. Explanations centered on public policy, cultural preferences, land availability, and rapid economic growth. Public policy factors include:

- Tax and pricing policies favorable to car ownership and use
- The Federal Interstate Highway construction program and the Highway Trust Fund
- Federal tax and mortgage policies that support home-ownership and favor suburban residential development
- Political fragmentation and powerful local governments that allow suburbanites to escape urban social and fiscal problems

It is claimed that these policies supported deeper social and cultural values:

- The tradition of strong private property rights
- Historical preferences for single family home-ownership
- The suburban ideal
- Ethnic and racial conflicts

It was argued that economic growth occurred throughout the developed world during the post-war era, albeit from a different base, therefore purely economic factors were not a satisfactory explanation for American-style decentralization. In light of similar trends now evident outside the US, however, explanations for decentralization merit further consideration.

If both population and jobs are decentralizing, even in countries where central governments have far more control over land use, cars are more costly to purchase and operate, public transit service is more extensive, and highways do not enjoy earmarked funding sources, then perhaps economic forces—rising per capita incomes and economic restructuring — play a more important role.

Rising Incomes

Rising per capita income increases demand for all sorts of consumer goods, including housing. Therefore, preferences for single family homes may not be so uniquely American after all. A 1985 survey conducted in West Germany provides a small piece of supporting evidence. When respondents were asked about their housing preferences; 59 percent chose single family detached house, 18 percent chose row house, and the remainder chose apartments and condominiums. At the time of the survey, just 40 percent actually lived in detached or row houses (Masser et al, 1992). Other evidence comes from the growing number of households that choose private homes in the suburbs of the United Kingdom, Paris and Australia, *even when such moves reduce accessibility to jobs and other activities* (Cullinane, 1992; Burnley, Murphy and Jenner, 1997, Baccaine, 1997). As demand for housing increases, households are willing to travel more in order to obtain preferred neighborhoods, housing characteristics, etc.

U.S. patterns of shopping and retailing are also evident in other countries. The suburban shopping center, conveniently accessible only by car and typically offering free parking, can be found along expressways in the suburbs of London, Milan, Munich and Paris. The emergence of the suburban shopping mall in European metropolitan areas may be explained by many of the same factors as in the United States: population suburbanization and rising consumer demand creates a market; shoppers are attracted by (relatively) lower prices, more variety, and convenient (car) access. A Royal Commission study of changing shopping patterns observes that shopping has become a leisure activity, and people are less willing to patronize the closest shops. Rather, they are willing to travel further to obtain greater variety, better quality, etc. (Royal Commission on Environmental Pollution, 1995).

Job Decentralization

The process of job decentralization is also evident outside the US, as described earlier. The shift to a service and information-based economy, together with improvements in information and telecommunications technology (ICT), have made firms more “footloose”, and the agglomeration benefits of central locations have become less important for many types of activities. Service activities require less fixed infrastructure than manufacturing, and so are more easily relocated. As the workforce suburbanizes, these firms follow, taking advantage of lower land costs while maintaining or increasing labor force access. Expecting that workers will commute by car, these firms provide free or almost free (to the user) parking, further encouraging auto commuting. Declining agglomeration benefits also imply that congestion and other costs of agglomeration will not be as easily offset, and thus will promote additional

decentralization. Suburban location in the United States has the additional advantages of lower business fees and taxes, as well as lower crime rates. Finally, as decentralization continues, regional accessibility becomes more homogenous, and the relative advantage of central location declines. The value of central location (all else equal) therefore declines for both households and firms.

FUTURE TRENDS

I have argued that rising incomes and changing economic structure have played a key role in the land use and travel patterns we observe today. What about the future? Would it be possible to reverse these trends, and, over time, to foster a reconcentration of activities in metropolitan areas? There are really two questions here. First, what magnitude of change would be required to significantly reduce private vehicle use; and second, is such change feasible?

The Evidence

There is now an extensive literature on sustainable development, and on the expected benefits of compact cities, transit-oriented land use, and pedestrian friendly neighborhoods. Proponents of compact development argue that increasing development densities and providing high quality transit will promote shifts to transit and non-motorized modes, and reduce use of the private auto. These expectations are based on empirically observed cross-sectional correlations between development density and measures of car use (Newman and Kenworthy, 1989a; 1989b). There are many questions about the validity of these findings, such as whether the environmental benefits of less car use are offset by more congestion, whether the relationship is significant at densities that might possibly be achieved, or whether there is any causal validity on which to base policy decisions.

Downs (1992) conducted some simple simulations, and concludes that very large increases in density would result in very small reductions in average commuting distance. Schimek (1996) found the relationship between person travel and residential density to be significant, but of very small magnitude. Specifically, a 10 percent increase in density is associated with a 0.7 percent decrease in VMT. From all the evidence available, it appears that in order to realize significant reductions in car travel, large magnitude changes in development density would be required.

The potential effects of pedestrian-friendly or transit-oriented neighborhood design is more uncertain. Crane (1996) considered the effects of various network designs, and concludes that there are possibilities for increased travel as well as decreased travel. Empirical work that has attempted to link aspects of neighborhood design to transit use or walk trips has yielded very mixed results (Cervero and Gorham, 1995; Ewing, Haliyur and Page, 1994; Handy 1992, 1996; Hanson and Schwab, 1987, Kitamura, Mokhtarian and Laidet, 1997). While in some cases a relationship between transit use or non-motorized travel and neighborhood design is demonstrated, a relationship with auto use is not demonstrated. That is, the effect of pedestrian

or transit accessible designs may be to induce additional trip making, rather than to shift the mode of existing trips.

Implementing Effective Land Use Policies

On the basis of the existing evidence, it is difficult to support the use of any land use policy as a means for achieving environmental objectives associated with private vehicle use. Nevertheless, let me now consider the second question: are land use changes of a magnitude sufficient to significantly reduce private vehicle use feasible?

First, designing pedestrian friendly neighborhoods is quite possible, and indeed is happening in several new planned communities. Typically these communities are located in suburban (or even exurban) locations, often far from major job centers and accessible exclusively via automobile. They have the architectural attributes of New Urbanism--front porches, narrow streets, a town square—but are otherwise rather conventional middle or upper class planned communities, highway accessible and with plenty of room for the family's two or three cars. These new communities may have many benefits, but less private vehicle use is not likely to be one of them.

The real policy question is, therefore, can metropolitan densities be increased to a level that would lead to significantly less private vehicle travel? As noted above, this would require substantial increases in densities from existing levels and a reversal of development trends that have been in progress for many decades. I do not think such increases in density can be achieved, and increases in density that might be achieved would have at best little effect on private vehicle travel for the following reasons.

1. Most firms have no economic incentive to locate in dense, high cost centers.

Agglomeration benefits are declining for all the reasons discussed above. Regulation would therefore be required to shift the incentive structure, either by offering large subsidies to locate in core areas, or imposing additional costs on locations in non-core areas, or imposing outright restrictions on development in non-core areas. In the United States, central city revitalization efforts have had very limited success, despite the large subsidies involved. There are, of course, some major success stories of downtown revitalization, and some types of activities that still value core locations. However, these are not the representative experiences of such efforts (e.g. Teaford, 1990). Furthermore, the metropolitan areas where central city growth has occurred have experienced even greater growth outside the central city (Gordon and Richardson, 1996). If the history of revitalization efforts are any indication, incentives to draw firms to core areas would have to be large indeed. Efforts to limit development in suburban areas have a mixed history; some studies have shown that the primary effect of such policies has been to shift growth to other areas; others have identified restrictions on housing supply that drive up prices. Higher housing prices create incentives for workers to seek less costly housing in more remote areas. (Rosen and Katy, 1981; Gyourko, 1991; Knaap, 1985)

2. Globalization makes it increasingly difficult to impose controls on where firms locate.

Firms may respond in many ways to changes in conditions. As the share of footloose activities increases, more firms will have great flexibility in location choices. Through distributed production methods, out-sourcing, and other new forms of economic organization, firms can exploit the advantages of specific regions throughout the world. They can likewise avoid the disadvantages of specific locations. Large firms have been able to use this flexibility to promote "bidding contests among local communities for their business, as for example occurred in the case of GM's Saturn plant location in Tennessee. Also, if the cost of doing business in one location increases, activities can be shifted to other locations within the firm's spatial network. Examples abound of these shifts. In the United States, several types of product assistance telephone services, formerly performed in-house in central or branch offices, are contracted out to telephone service firms located in small communities in the Southern United States. These locations were chosen because there was a supply of workers willing to work swing and graveyard shifts for relatively low wages. In the United Kingdom, British Air shifted its reservation processing from several sites (including London) to Bangkok, where labor costs are much cheaper. Location flexibility transcends local, state and even national boundaries, and this flexibility can only increase as ICT continues to improve, making it ever more difficult to control the location of business activities via land use regulation.

3. Most households have no incentive to locate in dense, high cost centers. Demand for housing is related to household income. As incomes rise, so does demand for housing services — more living space. We are now observing population shifts to suburban areas in many countries; households are choosing suburban locations to obtain more housing. In doing so, they are willingly giving up access to jobs, downtown amenities, etc. The American Dream of the single family home (and garage) is not uniquely American at all, but rather reflects widely held preferences that can be acted upon as household income rises. There are of course some households that prefer urban living (young single persons, affluent empty nesters), and these niche markets would likely support high-density policies. However, these are niche markets, not mass markets.

Single family structures are not an option, if density must be greatly increased. It is important to note here that I am not arguing that residential densities cannot be increased; simply reducing the number of zoning restrictions that exist in most communities would increase densities and have many other beneficial effects as well. Rather, the issue is one of increasing densities to levels sufficient to reduce private vehicle use.

It is clear that most U.S. households prefer lower density living environments. According to a 1997 Fannie Mae survey, for example, just 9 percent of respondents stated that they preferred living in a "large city. The top two reasons given for not living in a central city were "pace of life and "crowding, traffic congestion. Because lower density living environments are preferred, households, like firms, will use their flexibility to act on their preferences. In the United States, households have historically demonstrated high levels of mobility. As development regulations are imposed to achieve high density in urban areas, households will likely search for more preferable surroundings in non-urban areas. And just as ICT gives firms

more flexibility, it also gives households more flexibility: for example, telecommuting makes long commutes less costly and computers make possible a growing variety of home-based businesses.

4. Density policies required to achieve reductions in private vehicle use have no political constituency. If most firms and households have preferences against high density development, it follows that there would be little political support for the policies required to achieve such development. In the United States, land use control is vested in local governments, which have historically responded to the preferences of constituents. Those preferences have resulted in extensive application of policies that exclude various activities or social classes, limit development density, etc., but very few applications of inclusive policies. Efforts to control land use at the regional level are rare (Oregon, Florida and New Jersey have regional land use policies), and their success in achieving regional or statewide objectives has yet to be determined.

Perhaps more significant for this discussion is the very rapid proliferation of self-governed communities. The local homeowners' association (HOA) is one of the fastest growing types of non-governmental associations (NGOs) in the United States. There were an estimated 150,000 HOAs in 1992 (Kennedy, 1995). These associations typically operate and maintain common facilities, as well as enforce association rules and restrictions, including land use codes. Their authority may cover local (private) streets and other infrastructure, parks and recreational facilities, and policing. In effect, HOAs are taking on and privatizing many traditional functions of the public sector. They make it possible for homeowners to not only purchase their preferred package of housing and associated services (and thereby also restrict their tax contributions), but also assure its maintenance. I view the homeowner association as a means for individual households to exert more control over their local environment. Although governments still have all the traditional powers, including land use control, it is becoming more difficult to enforce policies for which there is little consensus.

The situation is different outside the United States. In Europe, land use control generally resides at the state or national level, and some countries (for example, The Netherlands) have very strict policies to direct and concentrate development. In the United Kingdom, a number of planning policies have been established in recent years to foster location of major traffic generators in existing activity centers, to balance housing and jobs, and to limit the extent of new development. A study of the Oxford region concludes that these policies do affect travel patterns, but their effect is limited (Curtis, 1996). In light of the population and employment trends described earlier in this paper, this conclusion seems reasonable. Land use policy has possibly slowed down the decentralization process.

It could well be argued that this evidence clearly supports land use policy strategies, but we need to get back to the fundamental objective of significantly reducing private vehicle use. Incremental changes in mode shares or distance traveled are not sufficient to measurably reduce vehicle pollution. Even in Europe, there are signs of trouble. For example, the Netherlands' widely acclaimed residential development planning program has encountered difficulties in producing residential communities with high enough densities to support transit because of the

lack of demand for high density housing (Maat, 1999). It also bears noting that despite these policy efforts, private vehicle use continues to increase.

5. Density policies that could be implemented will be swamped by larger trends. The trends I have described — decentralization of population and employment, rising income, and

The growing impact of ICT — overwhelm just about any land use policy option that could be considered reasonably politically feasible. In Schimek's (1996) study, a 10 percent increase in household income is associated with a 3 percent increase in VMT, all else equal, an effect more than four times as great as that estimated for density. What is more likely to happen within the next 20 or 30 years, a 10 percent increase in household income, or a 10 percent increase in metropolitan density?

A Digression

Another way of putting the issue of land use policy efficacy in perspective is to consider pricing policy. The standard economic response to questions of environmental externalities is efficient pricing, or pricing that reflects the full costs of consumption. What kind of pricing policies are required to substantially reduce private vehicle use? The best example we have is Singapore, where, in addition to congestion pricing, permits to own private vehicles must be purchased at auction (the Vehicle Quota Scheme, or VQS), and a variety of taxes and fees are added to the retail price of a new car. Based on 1997 fees, for example, a private car with a retail price of \$10,000 would cost a total of about \$49,000, of which about \$19,000 is the VQS average bid price. The VQS was introduced in 1990, in response to rapid increases in car ownership despite the already existing taxes and fees (the 1980s were a period of rapid economic growth and rising household incomes). A recent study has estimated that the VQS has reduced car ownership by 7 to 11 percent, compared to what would have occurred without the VQS (Chin and Smith, 1997). Note that in this example, the VQS increases the purchase price by 63 percent. Demand is highly inelastic in Singapore due to the very high price of car ownership. In view of the very low price of car ownership in the US, the Singapore example is not directly transferable. Nevertheless, if it takes price increases of this magnitude to further restrict car ownership by a few percentage points *in a very densely developed country with excellent mass transit*, it is difficult to imagine what would be required to do the same in the US or in Europe.

CONCLUSIONS

There are many problems associated with continued decentralization and low-density development. There are also many problems associated with growing private vehicle use. Although recognition of these problems is increasing, policy-makers have enjoyed few successes in reversing either trend. The greatest success in addressing automobile externalities has been realized by regulating the car, rather than regulating the driver. I have shown in this paper that

the trends of car use and decentralization are powerful. They are supported by changing economic structure and rising affluence, and there is no reason to believe that fundamental shifts away from these trends will occur in the future. Land use policies that attempt to reverse these trends will be difficult to implement, and will have little effect on overall travel patterns. There are many good reasons to advocate changes in land use policy. In the United States, certain population segments (poor and minority households) are systematically excluded from many suburban communities; this spatial segregation is associated with a host of social and economic problems. Zoning and other restrictions increase prices, making housing less affordable particularly for lower income households. More specifically, there are good reasons to encourage higher development density and better urban design. With higher densities, a greater mix of housing choices can be offered. Mixed use development provides more opportunities for social and other activities. Pedestrian friendly design may encourage more recreational walking and biking, and perhaps even a few walk trips to the local store. These policies, however, will not help much in solving the environmental externalities of the private vehicle.

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