

Factors Influencing Nondiscretionary Work Trips by Bicycle Determined from 1990 U.S. Census Metropolitan Statistical Area Data

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An extensive range of factors that may have some influence on the selection of the bicycle as the mode for work trips is explored using data from metropolitan statistical areas (MSAs) extracted from the 1990 U.S. census. Only data extractable from the census were used for analysis. The sample included 100 percent of MSAs in the United States. Regression analysis was used to provide insight into the contributory factors. The dependent variable used in the analysis was the percentage of the modal split captured by bicycle for work trips in each MSA. The findings from the analysis indicated that levels of bicycling vary greatly from metropolitan area to metropolitan area within the United States. MSAs with relatively high levels of nondiscretionary bicycling appear to have urban densities that promote shorter trips, relatively temperate year-round climates, and a large proportion of students, particularly college students. The strongest finding reinforces what is already well known about nondiscretionary travel by bicycle: commuting to work by bicycle is a behavior most prevalent in MSAs that have unique communities within their statistical boundaries, such as universities or colleges. According to 1990 U.S. census data, this unique type of MSA has the highest levels of bicycling.

Historically, little regard has been given in the United States to the bicycle-to-work element of the peak-period commute. This may be due in part to the nation's ongoing infatuation with the automobile, which in turn nourishes an unwillingness to embrace travel modes such as public transit, walking, and bicycling. In addition, it is often noted that high levels of automobile commuting can be explained by low fuel prices, nominal parking costs or free parking at trip terminuses, and land use development oriented toward travel by automobile.

Increases in vehicle travel have caused roads to become more congested and energy use continues to increase (1). Transportation planners and engineers are searching for innovative ways to combat these serious problems. The spectrum of travel is very broad, however, and one particular commute mode, bicycling, has unfortunately received relatively little attention from transportation planners and engineers and policy and decision makers.

Commutes by bicycle constitute a small portion of the total trips made in the United States. Komanoff and Roelofs (2) estimate that in the United States for each year between 1990 and 1991 bicyclists rode 9.3 to 34.3 billion km (5.8 to 21.3 billion mi), representing 0.28 to 1.03 percent of total vehicle miles traveled.

Data from the Nationwide Personal Transportation Survey (NPTS) may indicate something about the future of bicycling as a commuting alternative (3). According to the data, the percentage of individuals in the United States who bicycled to work decreased from 0.75 percent in 1983 to 0.72 percent in 1990. This slight

decrease indicates that, as a commuting alternative, the bicycle has not lost ground in competing for a share of the modal split that has long been dominated by the privately owned vehicle (POV).

Moreover, according to NPTS data for this same time period the percentage of individuals using a POV to travel to work increased from 81.78 to 87.35, an increase of 5.57 percent. It is important to note that despite the increase in POV use the bicycle's mode share remained relatively static.

There is considerable agreement that it is desirable to encourage individuals to travel by bicycle more often, no matter what the trip purpose. It is believed that this would diminish various automobile-related problems, such as congestion, pollution, and energy consumption; lessen the prospect of infrastructure expenses for automobile-related facilities, such as roads and parking lots; reduce personal expenditures on automobile-related transportation, such as insurance, fuel, parking, and maintenance; and improve personal health and well being. Clearly, commuting by bicycle to work, or bicycling for any other travel purpose, is regarded as an admirable and health-conscious pursuit (4).

LITERATURE

Review of bicycle-related literature indicates that some heed has been paid to the factors that may influence individuals to commute to work by bicycle instead of by POV or public transit. Commuting by bicycle or any other mode to work, and mode selection for any other trip purpose, is a matter of personal preference and is dependent on many tangential factors that are both within and outside of an individual's control. Although it appears that there has not been an examination at the metropolitan level (macrolevel) using 1990 census data of what factors may influence commuting by bicycle, there have been a few specialized studies (microlevel) that suggest some of the factors that influence an individual's selection of the bicycle for commuting.

In a study of employees at six employment sites in the greater Seattle area, Badgett et al. (5) found that excessive distance; unsafe streets; lack of sidewalks; inadequate trip-end facilities such as showers and bicycle racks; the convenience, speed, and low cost of driving; the need to make multiple trips during the day; and a public perception that biking is not fashionable were all factors that deterred individuals from commuting by bicycle.

In a study that looked at bicycle ownership and use in Amsterdam, Holland, Beck (6) asked bicycle owners what their reasons were for choosing and not choosing to commute by bicycle and found that in most cases the three main reasons for choosing to bicycle were speed, independence from public transit, and the health

advantage. Some of the main reasons reported for not commuting by bicycle were trip distance, discomfort, the inability to travel with other people, and the difficulty of carrying bags (cargo).

In a similar vein, Ohrn (7) made assumptions about factors that may be related to commuting by bicycle in Minneapolis–St. Paul, Minnesota. These factors included flexibility of schedule, average trip length, age of trip maker, availability and cost of automobile storage, cargo needs of trip, street congestion, quality of the pedestrian system, and the availability of public transit.

Hanson (8) compared the effects of daily weather data on discretionary and nondiscretionary travel by bicycle in Uppsala, Sweden. Unlike the nondiscretionary work trip, trips for discretionary reasons can be postponed or cancelled when adverse weather exists. However, because of the inflexibility of the work trip, Hanson points out that “the only travel decision [that an individual] is really free to make (aside from the route to be taken) is the mode of travel to be used.” Specifically, Hanson’s findings on the effects of weather on bicycling to work indicated that daily travel to work by bicycle was affected by the temperature and amount of cloud coverage at 7:00 a.m. She found that the percentage of daily trips to work by bicycle increased as a function of increasing temperature and decreased as a function of greater morning cloud coverage.

Similarly, Ashley and Banister (9) conducted a study that considered an extensive array of factors at the ward level in Greater Manchester, England, that may influence an individual’s choice of the bicycle for a work trip. They found that trip distance, car ownership, transit (bus) availability, rainfall, traffic, hilliness, and social class of head of household were all factors that influenced bicycle commuting.

In two analogous studies conducted in the 1970s, Everett and Hirst (10,11) assumed that the essential ingredients for explaining an individual’s choice not to commute to work by bicycle were based solely on economic grounds. In their analyses they noted that nominal trip costs and travel times encouraged the choice of the automobile instead of the bicycle for commuting.

Goldsmith (12) found that in addition to the many factors already described, family circumstances, personal habits, and topography also affect an individual’s decision to commute by bicycle.

OBJECTIVE

Absent from the literature is a more comprehensive examination focusing on factors that influence travel to work by bicycle. This lack is addressed through the empirical investigation described. Some of the factors that influence the nondiscretionary work trip by bicycle at the metropolitan level were explored using only data extracted from the 1990 U.S. census. The aim of the investigation was to develop a predictive model using regression analysis that suitably depicts the contribution of factors that influence the use of the bicycle for work trips in metropolitan statistical areas (MSAs).

An MSA is a large population nucleus and the adjacent communities that have a high degree of economic and social integration with that nucleus. Some MSAs are defined around two or more nuclei. Each MSA must contain either a city with a minimum population of 50,000 or an urbanized area as defined by the Bureau of the Census and a total MSA population of at least 100,000 (75,000 in New England). An MSA is composed of one or more central counties. An MSA also may include one or more outlying counties that have close economic and social relationships with the central

county. An outlying county must have a specified level of commuting to the central county or counties and also must meet certain standards of metropolitan classification, such as population density, urban population, and population growth. In New England, MSAs are composed of cities and towns instead of whole counties.

SAMPLE

The Bureau of the Census conducts periodic and special studies to describe the characteristics of the U.S. population, its governments, and its businesses. The Bureau compiles and makes available data from the decennial census by political and statistical areas.

Census data include a comprehensive codification of possible travel modes. The travel modes codified by the census include bicycling and walking, as well as the more traditional modes of POV and public transit. The census contains information pertaining only to the nondiscretionary work trip; discretionary trips are not included.

The data used in the analysis described included factors from a sample of 284 MSAs in the United States, including MSAs from Hawaii and Alaska, but not Puerto Rico. This sample represents 100 percent of the MSAs in the United States. The specific 1990 census file and table sources and universes are identified in Table 1 for all variables used; a universe is a segment of the population examined for a specific variable.

FACTORS

Because of the scarcity of previous research on the subject being investigated, the researcher’s own judgment was used to select some of the 27 variables used in the analysis. All the variables are listed and briefly explained in Table 2.

Only data that are extractable from the 1990 U.S. census were used for the described analysis. Factors such as annual rainfall, presence or absence of bicycle amenities (e.g., bike paths), average year-round temperature, parking cost and availability, topography (elevation changes), traffic levels, and other important factors that could contribute to an individual’s choice of the bicycle as the mode for the work trip are not collected for the census and therefore could not be used.

It would be difficult to model individualized travel behavior without first gathering primary data. On the other hand, secondary data, such as the census, are readily obtainable and easily analyzed. However, relying on aggregate and summarized data, such as census data, limits the specificity of an analysis. The acquisition of individualized records is required for maximum analytical flexibility. Therefore, the analysis described cannot fully expose the microlevel determinants that influence the selection of the bicycle for work trips.

METHOD

To analyze the sample of 284 MSAs, multiple regression analysis was performed using the stepwise regression option set at the 0.05 significance level. This low significance level was chosen to guard against the inclusion of any independent variables that may not have contributed to the overall predictive power of the model. The stepwise option performs regression in steps, that is, it substitutes each independent variable one at a time either through backward elimi-

TABLE 1 1990 Census File and Table Sources and Universe

Variable	Source File	Table #	Universe
Total Population	STF1C	P001	all persons
Land Area	STF1C	Geographic	n/a
Age	STF1C	P0013	all persons
Education Level	STF3C	P060	persons age 25+
College and High School Enrollment	STF3C	P55	persons age 3+
Population Density (derived)	STF1C	P001	all persons, land area
Ethnic Origin	STF1C	P006	all persons
Hispanic Origin	STF1C	P008	persons of Hispanic origin
Median Household Income	STF3C	P080A	all households
Poverty Level Status	STF3C	P121	selected persons
Total Workers	STF3C	P049	workers age 16+
Mode Choice	STF3C	P049	workers age 16+
Travel Time to Work	STF3C	P050	workers age 16+
Place of Work	STF3C	P037	workers age 16+
Vehicles Per Household	STF3C	H037	occupied housing units
Workers per Family	STF3C	P112	all families
Labor Force Participation	STF3C	P070	all persons age 16+
Manufacturing Employment	STF3C	P077	employed persons 16+
Agricultural Employment	STF3C	P077	employed person age 16+
Armed Forces To Population Ratio (derived)	STF3C	P070	all persons
Owner Occupied Housing Units	STF3C	H052	occupied housing units
Worker Density (derived)	STF3C	P049	all workers, land area

Note: Land area data was extracted from the geographic identifier tables.

nation or through forward selection in an attempt to find the best model. Stepwise regression analysis is a useful and valid statistical procedure, particularly for attempting to identify a few significant variables that should be included in a model from a multitude of independent variables.

In postulating a regression model the independent variables are often highly related to each other. This problem is termed *multicollinearity*. When two independent variables are highly correlated,

the regression equation cannot accurately estimate their independent effects on the dependent variable. Optimally, a correlation of zero is preferred. Unfortunately, however, multicollinearity is often present. In some instances in the described analysis multicollinearity could have caused the sign of a particular coefficient to be antithetical to that of expectation. There are mathematical techniques for reducing the impact of multicollinearity, but a discussion of these goes beyond the scope of the presentation.

TABLE 2 Labels and Explanations of Independent Variables

Label	Explanation	Label	Explanation
Per1629	Percent of population between the age of 16 and 29	Invpop	Inverse of MSA population (1,000,000/population)
Perasia	Percent of population that is Asian	Perwcc	Percent of workers living in central city
Perfema	Percent of females age 16 and over in the work force	Invwkr	Inverse of MSA workers (1,000,000/workers)
Medincm	Median family income, 1990	Perwrkr	Percent of workers working in central city
Perhisp	Percent of population that is of Hispanic origin	Perpcc	Percent of population living in central city
Permlty	Percent of population in the armed forces	Perblack	Percent of population that is Black
Novehcl	Percent of households with no vehicle available	Perout	Percent of workers working outside place of residence
Owner	Percent of housing units occupied by the owner	Pernowt	Percent of population that is non-white
Nowork	Percent of population that is unemployed	Highsch	Percent of population in high school
Percollg	Percent of population between age 18 and 24 enrolled in school	Invland	Inverse of MSA land area (1,000,000/land area)
Permale	Percent of males age 16 and over in the work force	Perin	Percent of workers working in place of residence
Perpov	Percent of families below the poverty level	Time10	Percent of travel time to work < 10 minutes
Peragri	Percent of population employed in agriculture	Permanu	Percent of population employed in manufacturing
Popdens	Population density (persons per square mile)		

TABLE 3 MSA Modal Split Characteristics

Mode	Max.	MSA	Min.	MSA	Mean
Bicycling	3.92	Chico, CA	0.01	Steubenville-Weirton, OH-WV	0.45
Transit	26.57	New York-Northern NJ-Long Island	0.05	Odessa, TX	1.91
Walking	15.4	Jacksonville, NC	0.94	Pascagoula, MS	3.89
Automobile	96.0	Pascagoula, MS	63.92	New York-Northern NJ-Long Island	90.08

FINDINGS

The dependent variable used in each of the stepwise regression runs was the percentage of work trips in 1990 by bicycle (labeled “perbike”) in each MSA. The mean for perbike for all MSAs in the sample was 0.45. The maximum value of perbike was 3.92 in the Chico, California, MSA, and the minimum value was 0.011 in the Steubenville-Weirton, Ohio–West Virginia, MSA. For simple comparisons Table 3 shows the maximum, minimum, and mean for work-trip percentages for the bicycle, public transit, walking, and the automobile.

Initial inspection of the extracted census data indicates that some regional disparity exists among some of the independent variables. Therefore, in addition to performing a stepwise regression run for the entire sample of MSAs, separate stepwise regression runs were made using the MSAs contained in each of the four main geographic regions as defined by the Bureau. These regions are West, North Central, Northeast, and South. Table 4 shows the number of MSAs in each of the four main census regions and each region’s corresponding percentage of all MSAs.

Table 5 shows the simple correlation coefficients for all variables used in the analysis. None of the 27 variables showed a particularly strong correlation when regressed with perbike. The five variables with the strongest correlations with perbike were, in order of absolute value, “percollg” (0.51231), “owner” (–0.41432), “per1629” (0.35671), “permanu” (–0.35316), and “novehcl” (–0.27342).

Table 6 lists each of the independent variables that entered the five equations. In addition to listing the variables, the table also specifies the standardized regression coefficients (beta weights), *t*-values, and significance level for each variable, and the summary statistics for each equation. A total of eight independent variables entered the equation for all MSAs and had a multiple correlation coefficient of 0.707, meaning that approximately 50 percent of the variation in perbike was accounted for by the equation. The equations for North Central, Northeast, and South contained three variables each and had multiple correlation coefficients of 0.821, 0.831, and 0.764, meaning that the equations explained approximately 67, 77, and 58 percent of the variation in bicycling to work in each region, respectively. Four variables entered the equation for West. The West equation generated a multiple correlation coeffi-

cient of 0.797, meaning that nearly 64 percent of the variation in perbike was explained.

The strongest study finding is that MSAs with a high percentage of persons aged 18 to 24 enrolled in school (percollg) had higher rates of bicycling to work. During the stepwise regression runs, percollg entered into four of the five equations early in the elimination process; however, it did not enter into the equation for Northeast. Percollg was highly significant for all MSAs and for West, North Central, and South, as shown in Table 6. This finding is logical because unique types of MSAs, such as those with universities within their boundaries, are more likely to have higher rates of use of nonmotorized transportation modes such as the bicycle. A precise interpretation of the reason percollg did not enter the Northeast equation is difficult to give. This may be due in part to certain characteristics such as the weather or density of northeastern MSAs, which could have caused modes such as walking and public transit to be viewed as more utilitarian for the work trip than bicycling.

A ranking of all MSAs by percollg and perbike showed that Chico, California; Gainesville, Florida; Santa Barbara–Santa Maria–Lompoc, California; Eugene–Springfield, Oregon; Bryan–College Station, Texas; Fort Collins–Loveland, Colorado; Madison, Wisconsin; Tucson, Arizona; Champaign–Urbana–Rantoul, Illinois; and Sacramento, California, were the 10 MSAs with the highest percentages of persons aged 18 to 24 enrolled in school and the highest percentages of work trips by bicycle; not surprisingly, most of these

TABLE 4 Bureau of the Census Geographic Regions

Geographic Census Region	Cases	Percent
West	n = 48	16.9
North Central	n = 75	26.4
Northeast	n = 43	15.1
South	n = 118	41.6

TABLE 5 Correlation Between Factors and Perbike

Label	Correlation	Label	Correlation
Per1629	0.357	Invpop	- 0.014
Perasian	0.253	Perwcc	0.081
Perfema	0.074	Invwkr	- 0.025
Medincm	0.017	Perwrkr	- 0.089
Perhisp	0.153	Perpcc	0.034
Permity	0.013	Perblack	- 0.208
Novehcl	- 0.273	Perout	0.062
Owner	- 0.414	Pernowt	0.009
Nowork	0.023	Highsch	0.17
Percollg	0.512	Invland	- 0.09
Permale	- 0.088	Perin	0.07
Perpov	0.096	Time10	0.128
Peragri	0.267	Permanu	- 0.353
Popdens	- 0.100		

TABLE 6 Variables in Stepwise Regression Equations

Variables	All MSAs		West		North Central		Northeast		South	
	Coeff.	t Value	Coeff.	t Value	Coeff.	t Value	Coeff.	t Value	Coeff.	t Value
Percollg	0.415	7.746 ^a	0.807	7.903 ^a	0.386	4.043 ^a	--	--	0.676	9.850 ^a
Peragri	0.103	2.078 ^b	0.236	2.021 ^b	--	--	0.232	2.908 ^a	--	--
Nowork	0.431	7.579 ^a	0.566	4.856 ^a	--	--	--	--	0.508	7.358 ^a
Owner	-0.274	-4.422 ^a	--	--	--	--	--	--	--	--
Novehcl	-0.259	-4.341 ^a	--	--	--	--	--	--	--	--
Perwcc	0.797	3.031 ^a	--	--	--	--	--	--	--	--
Perpcc	-0.683	-2.54 ^b	--	--	--	--	--	--	--	--
Perasian	0.098	2.057 ^b	--	--	0.489	5.115 ^a	--	--	0.288	4.047 ^a
Perpov	--	--	--	-3.241 ^a	--	--	--	--	--	--
Pernowt	--	--	--	--	-0.173	-2.492 ^b	--	--	--	--
Per1629	--	--	--	--	--	--	0.757	9.219 ^a	--	--
Permanu	--	--	--	--	--	--	-0.224	-2.665 ^b	--	--
Constant		0.011 ^a		0.005 ^a		-0.00008 ^c		-0.007 ^a		-0.011 ^a
R	--	0.707	--	0.797	--	0.821	--	0.875	--	0.764
R ²	--	0.500	--	0.635	--	0.674	--	0.766	--	0.583
Adj. R ²	--	0.486	--	0.601	--	0.661	--	0.748	--	0.572
F Value	--	34.395 ^a	--	18.729 ^a	--	49.029 ^a	--	42.659 ^a	--	53.208 ^a

^a significant at the 1 percent level, ^b significant at the 5 percent level, ^c significant at the 10 percent level

-- indicates variable did not enter into regression equation.

MSAs have major universities within their statistical geographic boundaries.

For all MSAs there a strong inverse relationship between not having a vehicle available (novehcl) and bicycling to work. This variable was significant at the 1 percent level. It did not, however, appear in any of the regional equations, which is problematic to explain. One possible explanation for these regional differences may be that persons too poor to own and operate a POV are forced to commute to work by bicycle or some other non-POV mode. However, variables such as median family income (labeled "medinc") did not appear in any of the regional equations, and the percentage of families that are poor (labeled "perpov") only entered into the regional equation for West. However, the percentage of the population that is unemployed (labeled "nowork") did enter into the equation for all MSAs, West, and South. Another possible explanation is that workers who live so near to their places of employment do not need to own a POV. If this is the case, it is logical to expect that variables such as "popdens," "perwcc," and "perpcc" would have entered into one or more of the regional equations.

As has been mentioned, there appears to be some relationship between income and the propensity to bicycle to work because nowork, a strong indicator of income, entered into three of the five equations. Contrary to expectation, however, medinc did not enter into any of the equations and perpov entered only into the equation for West, but was inversely related. The variable owner, another strong indicator of income, entered the equation for all MSAs with a negative sign, thus reinforcing the assumption that income may have had some effect on perbike as well.

All MSAs except those in New England—which are an amalgamation of cities and towns—are composed of entire counties and

include some land designated as agricultural. The percentage of persons employed in agriculture (labeled "peragri") appeared in the equation for all MSAs and for West. In both of these equations peragri was significant at the 5 percent level. Somewhat unexpectedly, however, peragri did not enter the equation for South. No interpretation to explain this result was devised. Moreover, peragri was the dominant variable in the equation for Northeast and was significant at the 1 percent level.

The percentage of the population employed in manufacturing (permanu) and the percentage of the population aged 16 to 29 (per1629) entered only into the equation for Northeast; these variables did not enter into the equation for all MSAs or the other regional equations. These two variables were significant at the 5 percent and 1 percent significance levels, respectively.

Interestingly, several variables related to minority status did not enter into any of the equations. The variables labeled "perfema" (percentage of females age 16 and over in the work force), "perblack" (percentage of population that is black), and "perhisp" (percentage of population that is of Hispanic origin) were included as variables to test the supposition that minority status is related to commuting to work by bicycle. None of these variables entered into any of the equations. However, the variable "perasian" (the percentage of the population that is Asian) entered into the equations for all MSAs, North Central, and South. In the equation for all MSAs perasian was significant at the 5 percent level, for the North Central and South equations it was significant at the 1 percent level. The interpretation is that minority status (Asian in this case) does have a small effect on choosing the bicycle as a commuting alternative. This finding may also suggest the possibility that certain minorities have a lower level of opportunity to secure residences

TABLE 7 Regional Differences in Perbike

Region	Mean	Maximum	Minimum
West	1.01	3.92 (Chico, CA, MSA)	0.28 (Yakima, WA, MSA)
North Central	0.364	1.94 (Madison, WI, MSA)	0.01 (Steubenville-Weirton, OH-WV, MSA)
Northeast	0.269	1.19 (State College, PA, MSA)	0.05 (Waterbury, CT, MSA)
South	0.342	3.59 (Gainesville, FL, MSA)	0.03 (Danville, VA, MSA)

close to employment locations because of factors such as low income and housing segregation.

Hanson (8) pointed out that there appears to be some correlation between weather conditions and the level of bicycling. Testing this hypothesis in this study was impossible because weather information is not gathered as part of the census. However, based on historical trends it is possible to draw some inferences pertaining to regional weather patterns and each region's level of bicycling. The regional means for perbike were calculated as West, 1.01; North Central, 0.364; Northeast, 0.269; and South, 0.321. Not surprisingly, the highest levels of bicycling occurred in West, which typically has good year-round weather, and the lowest levels occurred in Northeast, which typically has prolonged and more severe winters. Table 7 shows the regional differences in perbike.

CONCLUSIONS

Within the United States and elsewhere, levels of bicycling vary greatly from metropolitan area to metropolitan area. MSAs with relatively high levels of nondiscretionary bicycling seem to have urban densities that promote shorter trips, relatively temperate year-round climates, and proportionally large student populations. The strongest finding of the study reinforces what is already well-known about nondiscretionary travel by bicycling: commuting to work by bicycle is most prevalent in MSAs that have unique communities within their statistical boundaries, such as universities or colleges. According to 1990 census data this unique type of MSA has the highest levels of bicycling.

A static analysis was presented, and the results reported do not provide much information useful to determining the temporal trends related to bicycle use. Although the data set used was an aggregate it did provide some insight into the different factors that influence bicycling to work at a metropolitan level. It would be hard to model individualized travel behavior without first gathering the requisite data via case studies or travel surveys within particular MSAs. The acquisition of individualized data is required for maximum analytical flexibility and would certainly provide better insight into the final determinants that influence bicycling than is provided through the use of MSA-level data.

The results provide little direct guidance on what can be done to increase the level of bicycling for nondiscretionary trips. Such guidance is more likely to be had from the results of a study of those unique MSAs in which there are high levels of bicycling. With the proper combination of education, publicity, incentives, and planning bicycle use from those MSAs will likely spill over into other metropolitan areas, increasing the bicycle's share of the commute-to-work modal split. As Everett (10) wrote, "Careful planning and establishment of bike-routes where they will enjoy the greatest usage is essential for the long-run viability of bicycle transportation."

Because of the scarcity of similar studies, a set of factors has been presented that has been largely neglected. Planners and engineers are well aware that practical solutions for increasing the use of the bicycle are not often straightforward. Hopefully, others will follow suit with similar studies that use a host of data ranging from future censuses, NPTS and travel surveys, and individualized case studies.

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