ASSOCIATIONS OF LOCATIONAL, INSTITUTIONAL, HOUSEHOLD AND PERSONALITY FACTORS WITH TRANSPORT BEHAVIOR

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1. INTRODUCTION AND BACKGROUND

The presentation in this paper is a compendium of published and unpublished analyses from a sample of 1420 respondents to a 1989 survey of Chicago suburbs. The objective is to bring together and summarize the results from several different investigations of the same data. All investigations aimed at enhancing the understanding of transport behavior by revealing associations between potential causal factors and transport behavior characteristics.

The author regrets the fact that the data base is not large and comprehensive enough so that all or most of the revealed associations can be integrated in a common transport behavior framework for use in planning and/or forecasting applications. He hopes that the findings may be useful to others for incorporating more detail (and knowledge) into their models and frameworks.

The data include extensive demographic and socioeconomic information about households as well as detailed information on the automobile fleet available to each household. The data also include limited retrospective information on these variables, for two years before the time of the survey (i.e., 1987). In addition, an one weekday travel diary was completed by almost each respondent (typically an adult household member).

Four suburbs were included in the survey. Two outer-ring, low density, growing suburbs and two inner-ring, high density, stable suburbs. This classification of suburbs and survey selection is taken from earlier findings [1,2,3]. The following table illustrates some of the basic characteristics of these two groups of suburbs.

	OUTER-RING LOW DENSITY	INNER-RING HIGH DENSITY	SIGNIF. OF COMPARISON
DENSITY (res/mi2)	2900	5200	99%
INCOME (U.S. $)	59500	67200	97%
HOUSEHOLD SIZE	2.89	2.81	95%
AGE	31.7	37.8	99%
% TRANSIT TO WORK	12.4	19.0	99%
HOUSEHOLD AUTOS	2.07	1.96	96%

Compared with nationwide averages, the sample contains marginally older people and larger households. The households in the sample earn a much higher income compared with the nationwide average which was around $30,000 in 1989.

Younger, larger and less affluent households reside in outer-ring, low density suburbs. More outer-ring suburb households have children living at home. Outer-ring suburb households have more workers, and their auto ownership is higher compared with inner-ring suburb households.

Three main sections follow this introduction. Section 2 presents effects of location-

al and institutional factors on transport behavior. Section 3 presents the effects of household, personality and occupational status factors on transport behavior, followed by a brief conclusion. Note that during the entire paper: 1) All dollar figures refer to 1989; and 2) All variables in the models and text are explained in an appendix (section 6).

2. LOCATIONAL AND INSTITUTIONAL FACTORS

The effects of factors such as location in the metropolitan area (i.e., inner or outer-ring suburb), residential density, public transportation availability and use, and the availability of company-subsidized cars on transport behavior are examined in this section.

Work Patterns The overwhelming majority (78%) of full-time employed outer-ring suburb residents are employed in the suburb where they live or in another suburb, and less than 20% are employed in the central city (Chicago); a small percentage declared multiple destinations. In contrast, 45% of inner-ring suburb residents work in the central city.

Only 16% of full-time employed inner-ring suburb residents work in their home suburb. In contrast, about 29% of full-time employed outer-ring suburb residents are employed in their home suburb. The statistics support the hypothesis that part-time workers tend to work closer to home compared with full-time workers (i.e., 68% and 44% for outer and inner-ring suburbs, respectively, work in their home suburb).

This may contribute to local traffic congestion in outer-ring suburbs (i.e., more commuting on arterials and local streets than on expressways). This pattern may be attributed to the fact that suburbs experiencing recent growth spurts (i.e., the outer-ring suburbs in the study) have been willing and able to accommodate employment as well as residential development. Specifically, the employment-to-residents ratio is higher in the outer-ring (1.06), and lower in the inner-ring suburbs of the sample (0.89).

Distance, speed and congestion Average auto speeds for trips within the same suburb and to other suburbs [4] are similar for outer and inner-ring suburbs. The data do not support the hypothesis that congestion in outer-ring suburbs is worse (i.e., average speed is higher for travelers residing in outer-ring suburbs). Also, speeds are higher for outer-ring suburb residents who travel to Chicago; these are mostly trips on expressways.

On the other hand, outer-ring suburb residents who work in the city are exposed to traffic and congestion for longer times. A resident of an outer-ring suburb will sit in his/her car for 54 minutes for a typical commute to Chicago's CBD during the rush period, while a resident of an inner-ring suburb will do the same within 35 minutes. In addition, due to low densities, commutes of outer-ring suburb residents to the same or other suburb tend to be longer. All and all, residence location in an outer-ring suburb adds on average 6 miles to the daily distance traveled by automobile. This estimate is substantial and significant. It translates into roughly 15 more minutes exposure to traffic, plus added pollution and fuel consumption.

Hence, the uproar about traffic congestion in outer-ring suburbs may be because: i) outer-ring suburb residents are exposed to traffic over longer times; as a result they are more inconvenienced, so they tend to be more critical of the performance of the roadway system; and ii) ten years ago the traffic conditions in most outer-ring suburbs were acceptable if not really good; these conditions have worsened dramatically over the past few years, which may have created the impression of a crisis to residents. In contrast, worsening of traffic in inner-ring suburbs came much more gradually, so people had more time to adapt and accept them.

The model of distance to work shown below indicates that the longest commutes are from low density suburbs to high density locations (i.e., high density suburbs or the City of Chicago; LH). These partly represent long commutes from outer-ring suburbs to Chicago's CBD. Second longest commutes are those from high density residences to employment places in low density suburbs (HL). These are reverse commuting trips, although with the increasing scattering of origins and destinations (largely due to the growth of outer-ring suburbs), a dominant commuting direction may be hard to establish.

$$\text{DISTANCE TO WORK} = 11.52 + 1.11 \cdot \text{MALE} + 7.29 \cdot \text{TRANSIT} - 0.51 \cdot \text{NTRIPS} + 5.41 \cdot \text{HL} + 14.02 \cdot \text{LH} + 1.42 \cdot \text{LL} \quad (1)$$

[R^2=0.35; all parameters significant at 95%]

Men's trip to work is approximately one mile longer than the work trip for women. Transit has a large positive effect because it largely represents long commutes by rail transit. The number of trips has a large negative contribution on the distance of the primary trip to work. This reflects the fact that full time workers tend to make one long trip to work, while part time workers make several short trips (some of which are work-related). Household life-cycle stage and other household variables have no significant effect on the dependent variable and they were excluded from the final specification (see second paragraph of section 3 for an explanation).

The number of unlinked trips variable (NTRIPS) in the model makes it particularly useful for energy consumption, pollution estimation applications (if speed and proportion of cold starts are known) and for planning applications when trip rates are known.

Transit and auto shares As expected, the automobile mode dominates by far. However, the shares vary substantially across locations: 81.0% for inner-ring suburbs and 87.6% for outer-ring suburbs. Auto share exceeds 95% in one of the two outer-ring suburbs in which no rail transit is available. The rest of the market share is picked up by public transportation, mostly commuter rail (METRA): 12.4% of outer and 11.7% of inner-ring suburbs. Rapid transit is not available to any outer-ring suburb, but it is available to most inner-ring suburbs, including the two suburbs of the sample. Thus, in inner-ring suburbs another 7.3% is picked up by public transportation via rapid transit.

Interestingly, the difference in automobile share between males and females is significant, with suburban females exhibiting a behavior opposite to that of central city females. The former use autos more than males (i.e., 93.7% versus 88.7%); in contrast, both old and recent studies [5] suggest that central city females use public transportation more than males. This is partly an outcome of work destinations: A larger proportion of suburban females works in the suburbs compared with males (i.e., 78% versus 67%), and public transportation hardly exists for intra or inter-suburban travel.

The increasing number of working women and mothers further contributes to congestion because long work trip(s) are added to the 'traditionally' large number of household maintenance trips by women (see *gender* in section 3). Besides the women's gains of self-sufficiency through earning an income, increasing cost of living and opportunities for consumption may require multiple workers per household to make ends meet or to improve the standard of living (i.e., pay for education, fitness, goods, etc).

Residential density Specific trip-rate adjustments were derived to account for different densities at the place of residence and place of work as well as the type of application (i.e.,

trip rates from residential or employment sites). As model (1) indicates, distances between places of different density are highly dissimilar. An adjustment to trip rates is necessary to reflect the utilization of the roadway network in terms of either distance or time. The illustrated adjustments are distance based [6].

Distance is a fixed, easy to use characteristic but it does not represent actual travel conditions. Another way to adjust trip rates is by travel time exposure, which is a dynamic characteristic capable of representing travel conditions. Travel time tends to change over time in response to demand and supply characteristics. Such information was not available, thus adjustment according to travel time was not possible.

An example for trip rate adjustment may be as follows: A large downtown employment center may attract several low density suburbanites; these trips should be increased by 14% to reflect the added effect of the long travel distances and the greater (i.e., over space and time) network utilization involved.

DENSITY OF SITE OF APPLICATION	APPLI-CATION	ORIGIN OF TRIPS	ESTIMATED ADJUSTMENT
H	R	H	n/a
H	R	L	-21%
H	E	H	n/a
H	E	L	+14%
L	R	H	+27%
L	R	L	n/a
L	E	H	-12%
L	E	L	n/a

NOTES
H=high density
L=low density
R=residential
E=employment
n/a=not applicable

(suggested adjustments for trip rates from the TRIP GENERATION manual [7], local MPOs or other sources)

Company cars The availability of company cars causes several, substantial and significant differences in transport behavior. Tow of them are shown below. (Note: $N \geq 1$)

NUMBER OF AUTOS	% DRIVE ALONE	DAILY AUTO DISTANCE
N - 1 + C.CAR	97	55 mi
N	75	35 mi

Thus, the automobile becomes the exclusive mode of transportation, and daily distance increases dramatically. The total distance traveled by automobile is significantly higher for owners of company cars compared with respondents from households without a company car available. This seems to happen largely because company car owners need to travel more for work-related purposes: Company car owners travel 29.4 miles for work-related purposes, whereas respondents from similar households without a company car travel 11.0 miles for work-related purposes.

Model (2) indicates that the availability of a company car increases the auto ownership of households by 0.27 autos, which corresponds to an average increase of about 9%. Thus, only 9% of the households maintain the regular household fleet plus the company car; the rest of them (91%) substitute a household owned automobile with the company car. This means that the cost of owning and operating a second or third household automobile (the company car) is partly or entirely absorbed by a company, therefore, the annual household income effectively increases by the amount of the subsidy (which is taxable by IRS [8]), thereby increasing the overall ability of the household for activity participation and travel.

$$\text{NAUTOS} = 0.39 + 0.27 \cdot \text{COMPANY} + 0.10 \cdot \text{LOW DENSITY} + 0.13 \cdot \text{CHILD DEP} + 0.14 \cdot \text{FULLTIME} - 0.19 \cdot \text{TRANSIT} + 0.10 \cdot \text{SUBURBS} + 0.59 \cdot \text{DRIVERS} - 0.14 \cdot \text{SENIOR} \quad (2)$$

[R^2 = 0.53, all parameters significant at 95%]

The proportion of households with a company car available is 13.5% and 10.4% in outer and inner-ring suburbs, respectively; the 3.1% difference is statistically significant at the 91% level. The outcome that more households with company cars were captured in outer-ring suburbs [8] agrees with the outcome of other studies [i.e., 9] showing that company car users tend to live further from work. Furthermore, 12.7% of those households which relocated between 1987 and 1989 had a company car available, whereas only 11.3% of those which did not relocate had a company car available. These may be indications that companies essentially subsidize (affordable) distant housing.

Overall, the availability of company cars may be fueling congestion because high use and long commutes by automobile become affordable.

3. HOUSEHOLD, PERSONALITY AND OCCUP. STATUS FACTORS

The extensive literature in trip generation from early [i.e., 10,11] to most recent [i.e., 12] suggests that household factors such as size, life-cycle stage, income (total and per person), automobile ownership, mass transit availability and LOS as well as location attributes affect both trip rates and trip characteristics (i.e., time and space patterns). Also, respondent-specific characteristics such as gender, age, employment status, occupation and role in the household affect trip rates and characteristics.

Only weak associations were identified between household and travel characteristics. This is largely because of two factors: 1) *Household* characteristics such as size and life-cycle stage are not able to explain much of the variance of trip characteristics of *individuals* (n.b., all travel characteristics available are from the respondent only). Apparently, intra-household *trip trading* is a powerful factor which cannot be captured without having trip diaries from all household members. 2) Factors such as income and automobile ownership do not have a powerful effect either on trip generation (and on auto ownership [8]), the reason being that the surveyed communities have a fairly homogeneous population with upper bracket incomes and almost all households have one auto per worker. These are common characteristics of middle class, white collar suburbia in Chicago and other large urban areas [13].

Gender, employment status and occupation Analysis of trip rates revealed that [4,6]: 1) Females make consistently more trips compared with males in each employment status category (i.e., full time, part time and not employed), while not employed people make roughly 0.5 more trips in a day compared with full-time employed individuals. 2) Part-time employed females indicate a remarkably high trip activity. This may be partly because they have the burden of both household maintenance trips and work related trips. 3) Not employed people make up for their minimal trips to and from work by making more trips to run errands, for groceries, for personal business and for recreation. 4) Employed females make nearly twice as many trips for errands, groceries and shopping than males. Also, females make more trips to serve passengers (i.e., drive children, day-care person, husband to station, etc.) than males. Full-time employed males make slightly more work-related trips since more men (80%) are in travel-intensive jobs than full-time

employed females (58%).

Findings for the three travel-intensive occupations (which are by the far the most common in the sample) on distance, in miles, and travel time, in minutes, are summarized below (travel times in parentheses).

OCCUPATION	MALE	FEMALE
Managerial / Business Owner	45 (105)	47 (115)
Professional / Technical	39 (100)	35 (100)
Sales	56 (145)	37 (105)

Notable differences exist between the genders and across occupations and density characteristics. In most cases males make longer trips compared with females but there are exceptions (i.e., females in managerial/business owner occupations; in contrast, home-makers --all female in the sample-- travel only 22 miles a day on the average). Males employed in sales make, by far, the longest trips.

Noticeable variations are present with respect to the density at the origin and destination of trips as well. Trips from low density work destinations are by far the longest and most time consuming. For example, a professional male residing in a low density location who works at a low density location is expected to tally 60 miles on average, while his high density counterpart will tally only 33 miles. The same applies to females: 54 and 33 miles, respectively, for the aforementioned example.

Age The role of a person's age in his/her travel behavior is rather fascinating, particularly for non-work trips (see model 4). The age of a person, up to 80 years of age, has a positive correlation with the number of trips made in one day. The number of trips contributed by the person's age to the total number of trips is highest at age 40 (i.e., most people at age 40 are at the life-cycle of family with young, dependent children, the needs of which induce a substantial number of trips upon the adults in the household[11]). Age has a much larger effect on non-work trips because the number of work-related trips is largely affected by the type and hours of work, the transportation alternatives and costs.

The natural phenomenon of population aging may offer some relief to traffic congestion not because older people travel less, but because they tend to utilize off-peak periods and make shorter trips [4]. Hence, their travel behavior may equalize the utilization of the roadway infrastructure over the day and thus, it may be less wasteful and polluting. Natural aging (alone) can be expected to contribute to increasing trip rates in outer-ring suburbs, at least for the next decade, since inner-ring suburbs are likely to progress towards higher age cohorts (i.e., beyond 40) which may result in reduced trip activity, while outer-ring suburbs are likely to progress closer to 40 years of average age, which will put them at the highest trip activity age cohort. Precise estimation of the effect of aging cannot be obtained because important information on in- and out-migration rates is not available. The latter information is essential for forecasting applications.

Life-cycle stage Analyses revealed that automobile availability takes a relatively stable value around 1.0 autos per driver over stages describing either families with children who cannot drive or early stage households (i.e., single person or couple-without-children), it decreases to around 0.85 autos per driver at life-cycle stages describing households with children eligible to drive, and it reaches a minimum around 0.77 autos per driver at very advanced life-cycle stages (senior singles or couples).

The trend of automobile availability across life-cycle stages suggests a maturing

over time with respect to automobile acquisition, that is, households in advanced stages seem to be better rationalizing and utilizing their automobile fleet by assigning roughly 0.90 autos per driver, whereas in early stages there is a tendency to own more automobiles than what seems to be necessary (i.e., more than one automobile per driver).

There are indications that changes in life-cycle stage affect auto ownership substantially. The effect is non-linear: change from single person to couple marginally decreases auto ownership, change from couple without children to couple with young children increases auto ownership, change from couple with young children to couple with children some of who are eligible to drive increases auto ownership substantially, whereas most changes to single parent or to senior households decrease auto ownership.

Drivers The number of drivers is the strongest force behind auto ownership. Analogies to economies of scale were clearly identifiable: households with one or two drivers own (roughly) one or two autos, respectively, and households with three or more drivers own roughly 20% fewer automobiles than the respective number of drivers.

Similar analogies were revealed with respect to the average worth of autos owned. For example, in the income category of $10,000 to $20,000 per person in the household, per annum, one driver households (mostly single person, senior single person and single parent with young children households) have no one to share expenses (i.e., rent/mortgage, home equipment). As a result, less capital remains for automobile acquisition, and the average worth of each automobile owned is $5,300. Larger households with two or more drivers are able to realize economies of scale. As a result, more capital becomes available for automobiles, and the average worth of each automobile owned is $6,500.

Overall, the number of eligible drivers was found to be the most significant factor determining household auto ownership across most social groups (also see model below). It is theorized that the causal link lies among the following three facts. Fact one: irrespective of age, people have certain needs and desires, for the fulfillment of which they need a means of transportation. Fact two: public transit diminishes as a transportation option in the suburbs, particularly in outer-ring suburbs. Fact three: most members of today's households are "busy with their lives" (i.e., work, school, individual exercise and social activities) which is partly an outcome of the individualism and freedom of expression in modern society (more so in the U.S. than other western societies). Therefore, there is: i) little time left to serve other members of the household; and ii) less homogeneity in tastes and activities, which limits opportunities to consolidate destinations and share automobile usage. Thus, it is beneficial (if not necessary) to have an automobile available for every person who is eligible to drive.

$$\begin{aligned} \text{NAUTOS} = {} & 0.23 + 0.58 \cdot \text{DRIVERS} + 0.14 \cdot \text{LOW DENSITY} - 0.28 \cdot \text{TRANSIT} \\ & + 0.11 \cdot \text{FULLTIME} + 0.11 \cdot \text{SUBURBS} + 0.11 \cdot \text{CHILD DEP} \\ & - 0.13 \cdot \text{SENIOR} + 0.004 \cdot \text{INCOME} \end{aligned} \quad (3)$$

[$R^2 = 0.54$, all parameters significant at 95%]

While the number of drivers has the largest positive effect, the use of public transportation has the largest negative effect upon auto ownership. Conceivably, the lower auto ownership characteristics in inner-ring suburbs (i.e., auto ownership and availability are 5.6% and 8.9% higher in outer compared with inner-ring suburbs, respectively) can be partly attributed to the fact that public transportation services are much better in these locations: Not only is there more service available, but transit is able to serve the majority

of work destinations of inner-ring suburb workers (i.e., central city destinations).

Residence location in a low density, outer-ring suburb as well as number of workers who are employed in the SUBURBS (n.b., little public transportation for suburb-to-suburb commutes) increase household auto ownership. Being at a child dependent life-cycle stage (CHILD DEP) increases auto ownership, whereas being at a senior life-cycle stage (SENIOR) decreases automobile ownership. Despite the inclusion of major socio-economic, locational and transportation supply variables, the LOW DENSITY variable remains significant.

Personality characteristics Analysis of personality profiles from a set of attitudinal statements [14,15,16] centered on sociability (i.e., degree of social extroversion or introversion), suburbanism (i.e., affinity for suburban living) and materialism (i.e., affinity for material possessions, automobiles in particular) revealed that: 1) socially extroverted people tend to make more trips, more non-work trips and travel substantially longer distances by automobile for non-work trips than socially introverted people; 2) more people with affinity for suburban living (suburbanism) tend to reside in outer-ring, low density suburbs instead of inner-ring, high density suburbs (largely because outer-ring, low density suburbs present a better blend of rural living and big city conveniences and a higher degree of isolation through lower densities); and 3) materialistic people tend to spend a higher proportion of their income on automobiles and own more expensive automobiles (based on the total worth of automobiles owned) than utilitarians. Selected evidence on personality-related findings is presented next.

Model (4) connects the number of non-work trips with several characteristics of individual travelers. Trip generation specifications with personality variables (necessarily from individual household members) displayed a poor fit when all trips were included, because work trips are largely mandatory, whereas most non-work trips are up to the discretion of the individual traveler.

$$\text{NONWORK} = 3.48 + 0.11 \cdot \text{AGE} - 0.0014 \cdot \text{AGE}^2 - 0.45 \cdot \text{MALE} - 3.38 \cdot \text{FULLTIME} + 0.03 \cdot \text{EXTROVERSION} \quad (4)$$

[$R^2 = 0.30$; all except last parameter significant at 95%]

Males make fewer non-work trips than females largely because females make a much higher number of household maintenance trips. Full-time employment has a large negative effect upon the number of non-work trips (note that the model describes week-day travel). Adding the personality attribute of extroversion to the model improves the overall fit from R^2=0.28 to 0.30, although the coefficient for EXTROVERSION is small in size and significant at 85% (n.b., it is not significant when work trips are included).

The model estimations (5) focus on the effect of the personality attribute of materialism on the total worth of household automobiles. Both models have highly significant parameter estimates for all variables. The overall fit of the model, however, is mediocre which may be partly attributed to the large variance of the dependent variable. The large variance of the worth of household autos is caused by the complex economics of the car market (new and used). For instance, the value of most popular autos is non-linear and it tends to depreciate rapidly during the first few years. Thus, the worth of household autos is 'over-represented' for those households which happen to have a brand new automobile, and 'under-represented' for households with somewhat older automobiles of similar

functionality and prestige. The fact that average price catalog values were used also introduced an error since important factors such as mileage, condition and luxury or equipment level could not be incorporated.

$$\$ \text{ AUTOS} = 75.7 + 72.2 \cdot \text{COMPANY} - 17.1 \cdot \text{TRANSIT} + 29.0 \cdot \text{DRIVERS} \quad (5)$$

$$\$ \text{ AUTOS} = 32.7 + 62.6 \cdot \text{COMPANY} - 22.2 \cdot \text{TRANSIT} + 37.1 \cdot \text{DRIVERS} + 20.9 \cdot \text{MATERIALISM}$$

[all parameters significant at 95%, top model R^2=0.14, bottom model R^2=0.22]

The use of public transit has a strong negative effect (larger than that of income) because it directly affects the number of autos owned. For example, an affluent working couple may own one automobile only, if one of the members regularly commutes to work by public transit, which is a good alternative for workers of several Chicago suburbs who are employed in the central business district. Company cars tend to be new and fairly large cars, and they increase the average worth of household autos by nearly $5,000.

T-tests showed that despite the different levels of auto ownership in low and high density suburbs, affinity for material possessions remains a factor affecting the worth of household autos and correspondingly, the sum of money spent for automobile acquisition.

The average incomes of households with utilitarian and materialistic respondents are $60,500 and $70,700, respectively; the difference between incomes is significant at 99%. The corresponding worth of each automobile owned is $6,200 and $8,600; the difference between the two is significant at the 99% level. Thus, although households with utilitarian respondents have a 17% lower income compared with households with materialistic respondents, they tend to own 38% less expensive automobiles.

It is surmised that certain personality characteristics correlate well with residence location, auto ownership and daily travel characteristics. Personality characteristics improve the understanding of people's travel behavior and allow for the development of econometric models which have a potential to explain a larger portion of the observed variance. On the other hand, values for personality variables are hard to gather and predict, while personality characteristics cannot be affected by policy measures. However, it has been shown that ratings of a relatively small number of personality-related statements can result in useful insights to people's decisions and behavior [15].

Occupational status Occupation is considered as the most adequate single indicator of position in a complex social classification framework; it is an indicator of socioeconomic status, thereby often called occupational status. If education is a prerequisite of occupation, and income is the reward of occupation, then occupation may be viewed as an intervening entity between the two variables, thus, a good indicator of status [17].

OCCUPATION	POWERS & HOLMBERG STATUS SCORE [17]	SAMPLE	
Professional, technical and kindred	82	375	*high*
Managers and administrators	80	493	*status*
Sales workers	55	158	
Clerical and kindred	51	65	*low*
Craftsmen and kindred	55	33	*status*
Service workers and laborers	24	28	

Status and prestige, however, are viewed as two different dimensions of occupation. The two most important elements of status are education and income, while prestige is largely assigned by the public on the basis of the influence, job security, scarcity and similar attributes of each type of occupation.

Homemakers, retired, unemployed and students are not considered occupations and they are excluded from Census reports, literature on occupations and this study.

The variable ($AUTOS / DRIVERS) / (INCOME / HHSIZE) which accounts for the worth of cars per driver over income per household member is significantly different at the 95% level or higher between households with low and high occupational status respondents for more than 70% of the cases tested, as shown below (sample size in parenthesis).

CARS	DRIVERS	LOW	HIGH	% SIGNIF.
1	1	29.6 (39)	23.3 (96)	*85*
1	2	56.1 (10)	41.5 (71)	*NS*
2	2	38.2 (109)	32.9 (384)	*96*
2	3	29.7 (19)	21.8 (58)	*99*
3	2	71.2 (7)	47.5 (51)	*85*
3	3	46.9 (20)	34.2 (57)	*98*

The average incomes of households with low and high occupational status respondents are $57,500 and $70,200, respectively; the difference between incomes is significant at the 99% level. The corresponding worth of each automobile owned is $7,000 and $7,400; the difference between the two is not significant. Thus, households with low occupational status respondents tend to purchase as expensive autos as households with high occupational status respondents (but the latter households have a 22% higher income). Thus, the data suggest that low occupational status respondents tend to spend a higher proportion of income on automobile acquisition, conceivably in an effort to use the car's prestige to elevate their own low status.

Occupational status and affinity for material possessions have a weak and largely negligible effect on automobile ownership per se. These factors, however, have a strong potential to affect automobile purchasing behavior and choice. This, in turn is likely to have substantial effects on intra-household income allocations which may have far reaching social and travel related implications: Since income is the resource pool which makes activity participation possible, a disproportionally high expenditure for automobiles may cause a reduced ability for activity participation and it could affect the choice of residential location (i.e., move to outer-ring suburbs which have substantially lower real estate costs compared with inner-ring suburbs may allow personality or status-dictated automobile ownership goals to be reached by increasing the proportion of income which could be spent for automobiles).

4. CONCLUSION

This compendium of research results may serve as a manifest of the large number of factors which affect transport behavior: From macro-scale (such as urban structure, transport infrastructure and supply, economy, etc.) to micro-scale (traveler age, gender, personality, occupation, etc). More importantly, each of these factors is definitely interconnected with a subset of other factors: From effects of national or regional economy interconnecting with household income and employment, to interconnections between gender, age and employment status with household role, structure and life-cycle stage.

Known connections or associations between causal factors and transport behavior were verified and several others were revealed. The creation of a comprehensive, quantitative framework connecting all or most findings of this series of studies as well as the findings from other transport behavior studies is in order. This will not happen before plentiful, complete (and preferably dynamic) micro and macro level data become available.

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6. APPENDIX: DEFINITIONS OF VARIABLES

$ AUTOS=total worth of household autos taken from used car price catalogues; in hundreds U.S. dollars (i.e., 120 reflects $12,000); **AGE**=age of the respondent in years; **CHILD DEP**=1 if household in a life-cycle stage with children younger than 16 years of age, 0 otherwise; **COMPANY**=number of company-subsidized cars available to the household (typically 0 or 1); **LOW DENSITY**=1 if low density suburb, 0 if high density suburb; **DRIVERS**=number of household members eligible to drive (age 16 or older) irrespective of whether they possess a license and/or utilize the privilege to drive; **EXTROVERSION**=a compound index resulting from factor analysis [15]; ranges between -0.4 (introverted) to 2.0 (extroverted); **FULLTIME**=1 if full-time employed, 0 otherwise; **HH**=1 if residence in high density and work in high density location, 0 otherwise (base case for regression, thus not shown in the model); **HHSIZE**=household size; **HL**=1 if residence in high density and work in low density location, 0 otherwise; **INCOME**=total gross household income in thousand U.S. dollars (i.e., 57 reflects $57,000); **LH**=1 if residence in low density and work in high density location, 0 otherwise; **LL**=1 if residence in low density and work in low density location, 0 otherwise; **MALE**=gender variable: 1 for male, 0 for female; **MATERIALISM** =a compound index resulting from factor analysis [15]; ranges between -2.0 (utilitarian) to 1.5 (materialistic); **NAUTOS**=number of all automobiles available to the household (owned, leased, rented, company-subsidized); **NTRIPS**=number of unlinked trips as reported in the travel diary; **SENIORS**=1 if household in a life-cycle stage without children but with at least one member at the age of 65 or older; **SUBURBS**=number of household workers employed in suburbs other than their home suburb (SAME and CITY variables are complements of SUBURBS); **TRANSIT**= proxy for use of public transit: 1 if at least one trip in diary made by transit, 0 otherwise.

ABBREVIATIONS
CBD=Central Business District, IRS=Internal Revenue Service, LOS=Level Of Service, MPO= Metropolitan Planning Organization, TRB/NRC=Transportation Research Board (a unit of the) National Research Council.