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Author
Crane, Randall

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Is There a Quiet Revolution in Women's Travel?
Revisiting the Gender Gap in Commuting

Randall Crane

Gender is both an archetypal and adaptive dimension of the urban condition and thus remains a key moving target for planning practitioners and scholars alike. This is especially true of women's growing, if not revolutionary, involvement in the economy. A familiar exception is the trip linking work and home – the commute – which has been consistently and persistently shorter for women than men. That said, new reports suggest that the gender gap in commuting time and distance may have quietly vanished in some areas. To explore this possibility, I use panel data from the American Housing Survey to better measure and explain commute trends for the entire U.S. from 1985 through 2005. They overwhelmingly indicate that differences stubbornly endure, with men's and women's commuting distances converging only slowly and commuting times diverging. My results also show that commuting times are converging for all races, especially for women; women's job access remains poorer than men's, and women's trips to work by transit are dwindling rapidly. Thus sex continues to play an important role explaining travel, housing, and labor market dynamics, with major implications for planning practice.

Randall Crane is a professor of urban planning at the University of California, Los Angeles, School of Public Affairs, where he teaches courses on urban development and the built environment. His PhD is from the Massachusetts Institute of Technology.

Almost thirty years ago Rosenbloom (1978) explained how travel differences by gender[1] might matter for future urban planners:

What kind of housing choices will families with two paid workers make? Will higher income families still tend to live further away from the central city, as is the current U.S. pattern, leaving one worker (presumably the male) with a longer home-to-work commute, the other worker (presumably the female) with the shorter worktrip commute? Or will two salaried worker households locate homes, or even jobs, to effect a compromise in worktrip lengths? Will such households continue to seek a certain type of housing stock (in the U.S. typically detached single family houses) in the child bearing years? Will the necessity of fulfilling domestic responsibilities in less disposable time create a demand for higher density living in places with mixed land uses in order to facilitate access to needed services?

What impact will either employment or residential location decisions have on household allocation of travel resources; who will get the car, will a second car be purchased, who can or will use mass transit or join a car pool? What impact will the performance of household domestic and child care responsibilities have on the mode choice of either or both workers?

…Whether it is the travel behavior of women workers which is in question, or possible long-run changes in the decision-making processes of the entire household, such concerns are central to the planning and development of responsive and equitable transportation systems. (pp. 347-348)

She warned planners to expect change as women worked more, affecting choices they and their families made about how and where to live and work. Commuting, the clearest link between work and home, should have responded to these changes; but how much and in what respects remains ambiguous nearly 30 years later.

Consider, first, what happened on the employment side of this equation. Claudia Goldin, author of the benchmark economic history of earnings differentials, *Understanding the Gender Gap* (Oxford, 1990), characterizes developments from the 1970s on as "The quiet revolution that transformed women's employment, education, and family" (Goldin, 2006). Before about 1970, women largely took the workforce decisions of their partners as given, while gradually ratcheting

up their participation in the labor market. Since roughly 1970, however, a woman negotiated such choices on more equal footing within the household, had a greater expectation of working regularly over a longer time horizon, and increased her attention to "individuality in her job, occupation, profession, or career." (Goldin, 2006, p. 1)

Why? Some explanations emphasize higher returns to college and professional educations than for earlier generations of women, the availability of the birth control pill, and a somewhat-related marriage delay.   One consequence is that the proportion of women in white-collar professions since 1970 has doubled, and the gender gap in college enrollments has reversed, with 1.3 female graduates for each male in recent years (Goldin, Katz, & Kuziemko, 2006). As all this unfolded, travel differences by sex changed surprisingly little. Rather, female drivers' licensing rates and trip lengths remained substantially below those of males, as they have been historically (Wachs, 1987, 1991). Indeed, this consistent and persistent gap has formed much of the basis for the vigorous argument that the transportation needs of women require separate attention, even as work patterns converge (Giuliano, 1979; Rosenbloom, 1978, 2006).

However, recent data contradict this view and thus challenge the idea that it is important for transportation planners to take sex into account. One study, an outlier at the time, argued that commute times, arguably more indicative of behavior than simple distance, converged for many combinations of sex, race, age, and mode combinations as early as the mid-1990s (Doyle & Taylor, 2000). More recently it was reported that San Francisco journey-to-work times in 2000 were the same for women and men in all age groups except those in their 50s (Gossen & Purvis, 2005). By 2001, commute distances in the Quebec Metropolitan Area had also converged, as "most gender differences in length of work trips diminished or even disappeared when controlling for modal choice, type of households, presence of children and number of cars in households…." (Vandersmissen, Thériault & Villeneuve, 2006, p. 15).

While these studies suggest that women's travel may quietly have caught up, no research has examined the question across the entire U.S. over an extended recent period, controlling other sources of difference that could cloud the issue, such as family type, demographics, and community features. Thus to understand whether travel differences between the sexes are shrinking or growing nationwide, I examine a detailed panel of individual level data from the American Housing Survey for the entire metropolitan U.S. over the period 1985 to 2005. After describing debates over these issues in the planning literature, I analyze commuting trends by

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gender, and find continuing differences in commutation by men and women. This argues for continuing to study women's travel issues and incorporate the results into planning practice. Behind that clear result, however, are a number of telling details.

The next section summarizes the planning debates that provide the backdrop for this study, followed by a descriptive analysis of commuting trends by gender in the American Housing Survey over the past two decades. My statistical analysis that follows both confirms and clarifies these results. The final section highlights my key findings that raise questions for planning research and practice.

Planning Debates on Gender Differences in Travel <1>

This work builds on two related transportation planning debates, one primarily concerned with the proper measurement of travel differences by sex, and the other more focused on explaining them.[2]

For the first, some patterns appear fairly robust over different places and times. These include a steady increase in driving by women, whose trips nonetheless remain shorter in both distance and duration than men, and involve more nonwork trips and trip chaining than men. The interesting research here has tried to deconstruct these averages by race and ethnicity, occupation, age, family structure, and income (e.g., Andrews, 1978; Barbour, 2006; Gordon, Kumar & Richardson, 1989; Hanson & Pratt, 1988; Johnston-Anumonwo, 1992; Madden & White, 1978; Mauch & Taylor, 1998; Pisarski, 2006; Preston, McLafferty, & Hamilton, 1993; Pucher & Renne, 2003; Singell & Lillydahl, 1986).   Virtually all find significant and even striking differences by gender, with women making more but shorter trips (in both time and distance), exhibiting a higher propensity to trip-chain, and undertaking more child- and home-oriented travel. There has also been an important side-debate over the significance of commute length versus commute duration differences, with the former almost always proportionately larger than the latter. For example, Doyle and Taylor (2000) used 1995 Nationwide Personal Transportation Survey (NPTS) data to argue that gender commute time differences are better characterized as differences between race/income/mode groupings, with gender differences small or absent among non-Whites who use the same travel mode.

The second body of research explores gender as a structural determinant of these trends, consistent with other work in planning that treats sex as a cross-cutting policy theme (e.g., Fainstein, 2005; Law, 1999; Sandercock & Forsyth, 1992). For example, do women take shorter

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trips because of gender-specific family or household responsibilities, because they are disproportionately employed part-time and in occupations with different spatial patterns, or because of other demographic influences?

Not surprisingly, the literature indicates that all these factors appear to matter somewhat. There is considerable evidence that household- and child-oriented responsibilities are key factors, as are race, income, and occupational/labor market issues (e.g., Chapple & Weinberger, 1997; Clark, Huang, & Withers, 2003; Ericksen, 1977; Giuliano, 1979; Hanson & Johnston, 1985; Hanson & Pratt, 1991, 1995; Johnston-Anumonwo, 1992; Madden, 1981; Madden & Chue, 1990; Madden & White, 1978; McLafferty & Preston, 1997; Hanson & Pratt, 1991; Rosenbloom, 1980, 1993; Singell & Lillydahl, 1986; Rouwendal & Nijkamp, 2004; Rutherford & Wekerle, 1988; Turner & Neimeier, 1997; Wachs, 1987, 1991; White, 1986). These issues have also been examined outside North America with similar results, as in Blumen (2000) and Blumen and Kellerman (1990) in Israel, Cristaldi (2005) in Italy, Kawase (2004) in Japan, Lee and McDonald (2003) in Korea, and Nobis and Lenz (2005) in Germany.

MacDonald (1999) and Rosenbloom (2006) contain particularly rich, concise assessments of the evidence to date and the associated research hypotheses and challenges. As explanations for different versions of a gender gap in travel, MacDonald (1999) lists, among others, (a) lower wages for women, which do not justify longer commutes, (b) women having primary responsibilities as mothers and household workers, constraining scheduling and distance options, and (c) full- and part-time opportunities that are more evenly distributed in space in the historically female occupations, such as retail, education, and health. More recently, Rosenbloom (2006) notes signs of convergence in some of these determinants as well as several aggregate travel patterns in the 2001 National Household Travel Survey and other data sources, but concludes,

> (a) women's and men's aggregate travel behavior is still far from equal on a number of measures whereas trends toward convergence may be slowing, (b) disaggregating behavior often reveals distinct differences between the sexes, and (c) so many potentially explanatory variables are tied to sex in society that it may not be relevant whether sex or other intensely gendered variables, such as household role or living alone in old age, explain differences between men and women. (p. 7)

In the following analysis I revisit these issues using a highly disaggregated, national time-series dataset running through 2005, and consider the implications for planning practice.

New, Improved Data <1>

The American Housing Survey (AHS) is a panel survey of housing units produced by the Census Bureau for the U.S. Department of Housing and Urban Development.[3] Eleven waves covering every odd year from 1985 through 2005 are now available, with detailed data on nearly 40,000 metropolitan households and 100,000 individuals per year. Each housing unit represents about 2,000 other units in this nationally representative sample.[4] These data provide rich detail on individuals occupying those units, including the reported distances and durations of their trips to work, their incomes, educations, marital statuses, ethnicities, ages, genders, family structures, and other demographic and economic characteristics. The data record even greater detail on the physical condition and characteristics of the housing units they occupy.[5]

This dataset has important strengths: it is collected at the individual level and now makes up a lengthy time series; it accounts for relationships among members of families and households; and it is national in scope. Its chief limitation is that its only travel behavior information is on commuting, and it includes no information on trip frequency, occupation, or whether work is part- or full-time. Nor does it permit a complete picture of each person's travel or of all travel by a household.

This is a relatively large dataset, in terms of individual records. The random sample of metropolitan households in the U.S. includes around 80,000 persons each year. Table 1 reports the sample size by sex and year, and the share of the sample used for the commuting analysis to follow.

[Table 1 about here]

Commuting, 1985-2005 <1>

Table 2 reports average one-way commute distance and duration for part- or full-time workers reporting non-zero commutes by all travel modes. Average commutes for both women and men climbed steadily between 1985 and 2005 whether measured in time or distance, but females' travel times are substantially shorter in every instance. Average male work trip distances rose by a smaller percentage (22%) than did those of females (30%), evidence of gradual convergence. The gap between women's and men's commutes fell from 2.5 to 2.3 miles

over these two decades. The opposite is true for mean commute times, which have diverged very slightly between 1985 and 2005, widening the gender gap from 2.0 minutes to 2.4 minutes. This is consistent with several studies reporting that the gender gap is more pronounced for commute distance than for commute time, a result often attributed to women's tighter time budgets (as discussed by Doyle and Taylor, 2000). So while the journey to work is longer across the board in both time and distance, in 2005 the gender gap was 19.5% of the female distance (falling by about 4% per decade), and 11.4% of the female time (rising by about 12% per decade).

[Table 2 about here]

That said, there are many sound reasons to be distrustful of these results. We know travel modes to be characterized by considerably different travel times and distances, and that mode choice often has gender components. In addition, the national data conceal gender differences in residential location and occupation, as well as in demographic, social, and economic characteristics such as income, race, age and family structure. Any one of these individual traits might matter more than gender alone, at least for some subgroups.

Figure 1 provides an example of how to cut the data to reveal underlying trends, in this case showing the mean work trip distance for women and men by their places of residence. The AHS provides little geographic detail, but does use 1983-era Census geography and terminology to divide residential locations in the metropolitan portion of the sample among 1) the central city of a metropolitan area; 2) the urbanized portion of a metropolitan area outside the central city (*urban metropolitan*); or 3) outside the urbanized portion, but inside a metropolitan area (*rural metropolitan*). Both male and female residents of central cities have shorter commutes than others, with some limited convergence. Commute trips by female workers living in central city, urban metropolitan, and rural metropolitan neighborhoods lengthened by 37%, 26%, and 18% respectively, while those of their male counterparts grew substantially less, at 32%, 18%, and 9% respectively.

[Figure 1 about here]

Figure 2 shows the same information for commute times. First, note there is much less variation by year, both by residential location and by gender, with men's commute durations only about 10% longer than women's in 2005. So women's distances are lengthening faster than men's, but these distances do not cost them as much time. As mentioned above, the broader trend of men's and women's commute durations diverging less than their commute distances,

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especially when all modes are combined in the analysis, is consistent with the empirical literature (MacDonald, 1999).

[Figure 2 about here]

Differences by Mode and Race <2>

Taylor and Ong (1995), Mauch and Taylor (1998), and Doyle and Taylor (2000) argue that work trip time differences by gender may be better explained by race and travel mode. They present data from the AHS and from the NPTS indicating that minority women disproportionately rely on transit, which is perhaps twice as time consuming as car trips on average. Minority households are also disproportionately poor and located in central cities, increasing the likelihood that they are both transit dependent and have good access to transit. I explore these issues in turn.

I find time differences by mode in my data as well as distance differences. Figure 3 compares the average trip distance by mode, in order of initial distance. Walking trips are shortest in distance, not surprisingly, followed by bicycle, bus, subway, and finally car or truck trips, in that order. Averages by mode vary in any given year, even among motorized modes and particularly by travel times. All distances rise steadily through the period except those for bus trips, which exhibit a slight dip from 1985 to 1995.

[Figure 3 about here]

Walking and bicycle trips are the shortest in minutes, followed by private vehicle trips. The overall pattern of travel times is difficult to characterize in a few words, except to say that bus and subway trips average about twice those by car or truck, and fluctuate quite a bit. (There may be some sample size issues here, and it would be worthwhile to examine the major transit-share cities, especially New York City, separately.) Car or truck commute distances rise 25% over this period, while times rise by less than half that rate. As elsewhere in the literature, these results are consistent with workers relocating their home and/or work locations over time at least partly to avoid congestion and keep travel time growth down, at the cost of commuting longer distances (e.g., Levinson & Kumar, 1994).

Tables 3a and 3b summarize the gender gap in time and distance for racial and ethnic groups for all available modes, then separately for travel by personal vehicle and by transit. First note in Table 3a that a statistically significant gender gap in work trip distance persists in each race or ethnic category for all commuters, and for those using personal vehicles in both 1985 and

2005. This gap is absent for travel by transit, with the one exception of Asian males traveling significantly further to work by transit than females in 2005. While virtually all commutes lengthened over this period, the largest increase for those in cars and trucks was reported by Latinos of both sexes, followed by Blacks of both sexes.

[Tables 3a and 3b about here]

In 1985, gender differences in commute duration (Table 3b) were slim for Whites and statistically nonexistent for others. This is the kind of result that led to Doyle and Taylor's (2000) remark that, "In other words, the widely acknowledged sex differences in travel behavior appear to apply primarily, if not exclusively, to whites" (p. 203). Note, however, that women's and men's commute times are significantly different among those using personal vehicles for all races by 2005. The largest increases by far were, again, nearly 17% and 22% for Latinas and Latinos, respectively. Thus, by 2005, women and men of all ethnic groups had significantly different trip durations except among Blacks, who remained barely a minute apart on average.

This raises the questions of how mode shares differ by race, and how those shares have changed, if at all, in recent years. To address the mode share issue, Figure 4 presents the transit share by sex and race. Here, the differences are dramatic. In general, women were much more likely to commute by transit, especially until 1995, and especially if non-White. The mode share difference by sex was greatest for Blacks in 1985, and much more similar for the other three racial categories. A whopping 22% of Black women took transit to work in 1985, while the mode share was only about half that for Latino and Asian women, and a fifth that for White women at 4.4%. Only 12% of Black men, just over 8% of Latino and Asian men, and 3% of White men commuted by transit that year. However, the transit share dropped substantially over this period for virtually every sex/race grouping, with a smaller share of Black women traveling by transit in 2005 than did Black men in 1985, leaving Black women only slightly more likely to use transit than other women.

[Figure 4 about here]

Summarizing these data thus far, the average woman's work trip is consistently shorter in distance than the average man's, whether we separately control for race, year, mode, or metropolitan status. Everyone's commutes also increase over time, with women's rising somewhat faster, so that the gender gap in commuting distance is shrinking very slowly. Travel times follow a somewhat different pattern for the commuting population overall, with the gender gap increasing for most racial groups, but that result is heavily influenced by changes in the

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mode split. Indeed, many commute times are higher for female racial subgroups traveling by transit throughout the period.

Combined with the finding that a much smaller share of women traveled by transit in 2005 than in 1985, it appears that the gender gap in work trip time is increasing at least partly because of women's lessened use of transit, especially among Black and Latino women. That is, commutes will become quicker the less women use transit, as they have.

The implications of these trends for transit policy are potentially quite significant. Black women dramatically decreased their use of transit (a comparatively slow mode) and also live further from work. This relates to the spatial mismatch literature (see note 2), examining whether minority households remain in central cities by choice or due to housing- or labor-market discrimination when jobs decentralize (e.g., Ihlanfeldt & Sjoquist, 1998; Kain, 1968; Stoll, 2006). Relatedly, Blumenberg (2004), Ong and Blumenberg (1998), and Chapple (2001), among others, examine how differences in travel behavior by gender affect the prospects for work-to-welfare mandates in different communities. If minority women are migrating away from transit as a commute mode, as it appears in these data, perhaps it is because it does not link their changing homes to changing job opportunities.

Personal Vehicle Commutes, by Age and Family Status <2>

Other factors often thought to play substantial roles in travel pattern sex differentials which I have ignored here thus far, are age and family status. Since my analysis of mode split identifies it as a factor of diminished importance, the remainder of this section will only examine travel by personal vehicles, mostly private cars.

Starting with age, licensing rates fall steeply among older women, as does driving in general (Rosenbloom, 2005; Spain, 1997). However, these trends are also evolving. Figure 5 illustrates average commute length by age. While there is much variation by age, the pattern is still overwhelmingly that men drive further to work than women. The smallest gap is among 16 to 25 year-olds, where women have a 24% shorter trip. The largest is among 46 to 55 year-olds, at 37%. Distances also rise with the age of the commuter up to age 46-55. Figure 6 presents shows how the gender gap in commute distance fell over this period only among 16-54 year-olds, while it rose for older commuters.

[Figures 5 & 6 about here]

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Another way to bring more than one key variable into a simple graph is to jointly examine sex and family structure. The presence of a child in the household is associated with disproportionate parenting responsibilities for women, while having a partner has similar household-oriented constraints on women's participation in labor markets and overall mobility (Law, 2002; Preston, et al., 1993; Rosenbloom, 1985). Figure 7 reports work trip distances by a number of household types revealing substantial differentiation and several interesting patterns. The household types are: single adults living alone, single parents living with children but no other adults, married couples living together with no others, and married couples living together with children.

[Figure 7 about here]

I highlight two patterns. First, the gender gap remains. The women in each category report shorter commutes than their male counterparts throughout the period. Women in all household types have shorter average commutes than their male counterparts in both 1985 and 2005. That is, the longest commutes among women (married women living only with a spouse) are 24% shorter than the shortest commutes among men (single males) in 2005. Married men living with wives and children have the longest commutes throughout the period.

Second, growth rates vary quite a bit. Single women with and without children and married women with children saw their work trips lengthen by 30 to 34% over the two decades. Married men with children experienced half that growth. Adding children to single adult households lengthens the commute for both sexes by 2005, as does adding children to married men's families. The time trend also shows another pronounced pattern.

In Figure 8, the largest proportional increases in commute distance by all modes between 1985 and 2005 are reported by the two categories of women with children, with the largest by single mothers. Moreover, the two corresponding categories of male commuters experienced the *least* growth, at about a third the rate of women in those household types. That is, women with children are gaining on men with children in their commute lengths. Still, at these rates, it would take a few decades to catch up. In addition, I am not yet controlling for the other influential variables in a way that properly measures the independent effect of each traveler characteristic, as I do in the next section.

[Figure 8 about here]

Figure 9 illustrates the percentage difference between men's and women's commute distances for these four household types for 1985 and 2005. The gender gap fell in two

household types, and grew in two. In 1985, one-way trips to work by single women with children were 9.4% shorter than those of their male counterparts. By 2005, this gap increased to 19.5%. The gap between married women without children in the household and their male counterparts rose from 15.8% in 1985 to 21.1% in 2005. The gap fell, however, for singles and especially for married couples with children, where it fell by nearly half. Put another way, the commutes of married women with children rose the most, and those of their husbands rose th*e* least, between 1985 and 2005.

[Figure 9 about here]

Perhaps, mothers are seeking housing in the suburbs in greater numbers, and/or mothers are seeking employment at greater distances from their homes, and/or fathers are working closer to home than in years past. If women continue to have shorter commutes than men, this suggests that commuting may either favor or limit women (depending on whether a shorter commute is considered an advantage or an obstacle) leading to differences in how urban land, housing, and labor markets operate, affecting urban densities, rent and wage gradients, and in the long run, overall urban form (Crane, 1996; Zax, 1991). How cities will evolve can depend, then, on whether one commute within the household will dominate, and if so, which.

A Multivariate Analysis <2>

These data indicate that commute behavior varies by gender, race, age, and family structure. Why they vary is another matter entirely, as is how these attributes simultaneously interact. They have so many permutations that possible explanations are not easily discerned by stratifying and comparing means across two factors at a time as I have done thus far. Rather, this section uses multivariate analysis to statistically isolate the influence of each commute determinant, including gender.

In this model, I explain work trip distance as a function of the demographic and economic characteristics of individuals and households, such as income, the presence of dual earners, sex, race/ethnicity, and educational attainment.[6] I also include the respondent's age, and life cycle and family characteristics (e.g., whether the respondent is married and the number of children in the household). Other household characteristics I expect to affect chosen trip length include housing tenure, participation in a carpool, and the number of automobiles owned by the household. In line with conventional urban demand theory, I include housing costs and income as explanatory variables as well.[7]

The estimation method I use is random effects Generalized Least Squares panel regression.[8] This approach separately accounts for cross-sectional variation (between the workers in different housing units) and variation over time (for each housing unit over the 21-year period). The estimation results for commute distance are presented in Table 4 for three models: all individual commuters in the entire panel, and for women and men separately. The independent variables are listed in the left-hand column, with the estimated coefficients and absolute values of z for each in the right-hand columns. The dependent variable is the log of trip distance, measured in miles. Estimating the models with work trip time as the dependent variable gives virtually identical results for sign and significance, though model fit is somewhat weaker. One possible explanation for this poorer fit is that travel times vary considerably day-by-day, and tend to be reported rounded off to the nearest 5 minutes.

[Table 4 about here]

The results are quite consistent with the comparisons of means in the previous section, but underscore the independent role of several variables. Even with all key controls, sex maintains its significant independent influence when estimating the model on all commuters: men commute longer distances, all things considered. While not reported here, this result is robust across the most obvious alternative specifications and population subgroups. Longer trips are also associated with higher housing prices, higher incomes, faster travel speeds, being married, being older, having more years of education, having moved recently, owning one's home, living in a single-family house, belonging to a smaller household, having more children, participating in a carpool, owning a car, and living outside the central city within the metropolitan area. Whites have statistically longer commutes than Blacks or Latinos, but not Asians.

Put another way, these data indicate that the gender gap extends across differences in income, marital status, age, housing tenure, parenthood, and location within the metropolitan area, and perhaps across occupation as well (i.e., to the extent education and income jointly proxy for occupation). The gap appears rather pervasive through the past two decades, rather than being limited to White women, women with children, or to earlier years only.

Most results for factors other than gender held up when I estimated the model separately for women and men. The important exceptions were marital status, ethnicity, mover status, children as a percentage of the household, and car ownership (shown in the table in bold). While married men have longer commutes than single men, as in the pooled data, married women have

shorter trips than single women. This is similar to results I reported in the previous section and to results of earlier studies such as Ericksen (1977) and White (1986). One explanation is that marriage leaves the average woman with additional family responsibilities, encouraging greater proximity between work and home, while doing just the opposite for men. Another is that married women are more likely to work part-time than single women. Long commutes are less justified for part-time work for a number of reasons, including lower hourly pay and transportation costs making up a larger share of work-related expenses. To repeat, this holds regardless of income, race, or presence of children.

In addition, the pooled result that White commutes are shortest does not hold up for White men, who have the same length trips as Asian men. In this case, it is the shorter trips of White women driving the pooled result. White married women appear to have the shortest journey to work among the ethnic/marriage combinations tested, controlling for other differences among workers.

Men who report moving within the past year do not have different commutes than other men, while women who moved recently travel further. I have no obvious explanation for this result. To the extent that women initially work nearer their homes than men, perhaps a residential move is more likely to lengthen women's work trips than men's, at least in the short run. Alternatively, if men's jobs are spread more equally over space than women's, their work trips might be less affected by a home move. I do not have data on job changes, which limits my capacity to test these accounts.

Men living in single-family homes travel no differently than those who do not, but women in such homes report longer trips. Again, it is easy to imagine that this variable picks up some of the explanatory influence of family responsibilities or high-density living that marriage, children, and geographic variables do not fully capture. That said, it is interesting that men in the high-density environments often associated with multifamily housing do not have appreciably shorter trips to work. Without data on other trip purposes, though, we cannot say if this carries over to discretionary travel.

Also interesting is the result that the proportion of children in the household has no influence over the lengths of women's commutes, but indicates longer trips for men. Taken at face value, it suggests that parenting responsibilities play little role in the determination of women's journey to work, or at least less than marriage alone does. On the other hand, larger

families indicate shorter commutes for both male and female workers, and may in some ways proxy for the presence of children.

Finally, women with cars report longer trips than carless women. This makes intuitive sense. Having to borrow a car or be driven to work limits one's options, and may have an effect on the ability to accept jobs at greater distances. Which leaves the result that men's commute lengths are unaffected by car ownership more interesting still. Perhaps men who commute in cars they do not own are more likely than women to carpool, for which I have a separate explanatory variable.

The multivariate results are thus largely consistent with the earlier results, except that the presence of children has no effect in these data on women's commute distances once I control for other individual and community variables. This does not necessarily mean that children have no influence on women's choices of where to live relative to where they work, though it does support the argument that marital status and other family status factors might count more, or might be difficult for the model to separate from motherhood. This set of questions should be further investigated.

Concluding Remarks on Practice and Research <1>

There is no revolution in women's commuting behavior, quiet or otherwise, evident in these data. Even with substantially more women participating in the economy in recent decades, the average woman's trip to work differs markedly from the average man's. Possible explanations run the gamut, from labor and housing market dynamics, to the circumstances of and preferences for travel, to the ways in which families negotiate the tradeoffs among these internally.

I highlight here a few of my key findings that raise specific questions for planning practice and research:

1. All commutes are lengthening on average. How much is due to longer commutes in the extreme tails of the distribution (e.g., commuters traveling 60 miles or more each way in search of affordable housing) or income growth that leads to suburbanization generally is unclear. In addition, distances are rising faster than durations, a pattern consistent with the argument that rather than passively accepting increased traffic congestion (or slow modes of travel), workers will relocate their jobs or homes to

commute greater distances. Finally, both these trends are more characteristic of women than of men. The distance between work and home for women is increasing faster than their commute durations, compared to men. Do women have tighter time budgets than men, and are thus more willing to change residential or work locations to save time, even if this means lengthening work trip distance?

2. While the commutes of women with children are lengthening at three times the rate of their husbands, the absolute amount of the difference remains great. Whether women choose shorter commutes or they are limited by their options in labor markets remains an open question. This has implications for smart growth planning policies, particularly their strategic use of land regulation to achieve transportation planning ends. Goddard, Handy, and Mokhtarian (2006) have studied whether gender might influence the effectiveness of smart growth. Do women respond to neighborhood and urban design features differently than men? Should mixed use or compact development policies appeal to systematic differences in travel tastes by gender, much as commercial branding of many products does? This research is still in its infancy, but if gender differences remain significant, asking such questions might reasonably inform a number of transportation and land use planning problems.

3. Reliance on transit, by far the slowest average path to work, is diminishing quickly all around but particularly for minority women. This points to a lessened role for transit, nationally, as a means of transportation to work. But whether female workers are shifting from transit because they prefer cars, because their employment location requires cars, or because they have moved to the suburbs poorly served by transit is unclear. Each has different implications for transit planning and spatial mismatch trends.

There are of course many other planning policies to which these results are applicable, ranging from such disparate issues as travel by the elderly (Rosenbloom, 2004; Rosenbloom & Burns, 1993) to substance abuse by youth (Elliot, Shope, Raghunathan, & Waller, 2006). That said, if gender is used to rationalize one planning strategy over another, this should be done with a good understanding of both the status quo and emerging trends. Against the backdrop of these national trends, the approach used here can be applied to a particular metropolitan area or time period to focus case studies of specific planning challenges in individual communities.

Notes

1. For convenience, this paper uses *sex* and *gender* interchangeably to refer to biological sex differences, as is traditional. An extensive literature does draw a sharp distinction between such differences and the "social construction of gender" (e.g., Lorber, 1994).

2. A third debate applies these measures and explanations to policy problems, whether transportation policy in general or for low-income households, as in Blumenberg (2004), Ong and Blumenberg (1998), Chapple (2001), and Weinberger (2007); the elderly, as in Rosenbloom (2004) and Rosenbloom and Burns (1993); neighborhood land use, as in Goddard, Handy, and Mokhtarian (2006); or substance abuse, as in Elliot et al. (2006). A fourth focuses more generally on determinants of the journey to work, including spatial mismatch and spatial market compensation for commutes, often without specific attention to household structure or gender roles (e.g., Cervero, 1996; Chapple, 2006; Crane, 1996; Crane & Chatman, 2003; Fernandez & Su, 2004; Giuliano & Small, 1993; Ihlanfeldt & Sjoquist, 1998; Kain, 1968; Levine, 1998; Shen, 2000; Stoll, 2006; Zax, 1991).   Some implications of this study for these latter two planning debates are developed in my concluding section.

3. The U.S. Census Bureau home site for the AHS, where recent waves and their documentation can be downloaded, is http://www.census.gov/hhes/www/housing/ahs/ahs.html.

4. The AHS is a panel of housing units, not people, and samples both metropolitan and nonmetropolitan areas in the U.S. However, in this study I use only the data for occupied units (households) in metropolitan areas. The sample is adjusted each year to account for new construction and attrition.

The National AHS has employed the basic sample and questionnaire since 1985, with periodic revisions, and has used the same metropolitan boundaries since 1985 (Shiki, 2007). The weighting was changed from 1983 Census geography to 1993 Census geography starting with

the 2001 Survey, and the metropolitan "place" definitions do not yet conform to the 2003 Census geography described, for example, in Blakely, Lang and Gough (2005). More problematic for compiling these waves for analysis, is that the format, definition, and coding of many variables varies slightly from year to year, with an especially extensive modification starting with 1997. In some cases, such as the 1997 reduction of metropolitan categories from four to three, information must be discarded in order to construct a longitudinally consistent variable. In other cases, recent waves contain more detail, such as finer grained racial categories, which must be collapsed to construct consistently defined variables for the full 21-year panel.

5. Kiel and Zabel (1997) overview many of the advantages and limitations of the AHS for housing studies.

6. Formally, I specify the commute as a reduced form model of the demand for housing and supply of labor, $C = f[h(p, y, Z), w, t] + \varepsilon$, where C is the equilibrium commute, f is a reduced form equilibrium relation, h is housing demand, p is a vector of relative housing prices, y is household permanent income, Z is a matrix of amenity, demographic, and other taste variables, w is a vector of relative wage rates, t is the per-mile commute cost, and ε is an error term to account for measurement and other random errors.

7. In most housing markets, we expect unit property values to vary directly with income and inversely with the distance to work, as land and housing prices are bid up to reflect the locational advantages of lower transport costs. Total housing prices will also rise with the journey to work if people sort by their demand for housing. On the other hand, wages may also compensate for longer commutes, and the existence of multiple-earner households, multicentric cities, and amenity gradients mean the house price/commute length relationship is not likely to be as straightforward as this suggests. Other variables are meant to capture demographic aspects of demand, such as the presence of children, age, race, and family structure.

8. The most heralded statistical advantage of panel models over ordinary least squares regression techniques is their potential to control for unobservable cross-sectional differences. As Halaby (2004) writes, "The problem of causal inference is fundamentally one of unobservables, and unobservables are at the heart of the contribution of panel data to solving problems of causal inference" (p. 508). A more technical introduction to and discussion of the limits of panel estimation methods is the panel econometrics text by Woodridge (2002).

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Table 1. Metropolitan households sampled,[a] by sex and year, and the share commuting.

| | | Female | | Male | |
	Households	Persons	% commuters[b]	Persons	% commuters[b]
1985	32,773	45,680	35.6%	42,123	47.9%
1987[c]	30,821	42,535	--[c]	39,564	--[c]
1989[c]	35,024	48,250	--[c]	44,559	--[c]
1991	32,125	43,902	36.6%	40,939	46.5%
1993	38,021	51,626	35.3%	47,710	44.9%
1995	35,324	48,453	36.0%	45,277	44.4%
1997	29,615	39,701	39.7%	37,190	49.4%
1999	35,840	47,848	39.1%	44,771	49.7%
2001	31,595	41,836	38.6%	39,491	49.0%
2003	37,315	49,604	36.9%	46,563	47.3%
2005	31,757	41,914	48.4%	39,148	59.4%
Total	370,210	501,349		467,335	

Source: American Housing Survey, national survey.

Notes:
a. These are unweighted raw sample counts, and do not include noninterviews, or persons living in institutional housing, which is not in the universe of housing sampled by the AHS.
b. Commuters are working age individuals reporting non-zero journeys to work. At-home workers are not included in commuters.
c. The AHS did not collect commuting data in 1987 and 1989.

Table 2. Average commute distance and duration, by sex and year.

| | Female | | | | Male | | | |
| | Mean | | Median | | Mean | | Median | |
	Miles	Minutes	Miles	Minutes	Miles	Minutes	Miles	Minutes
1985	9.1	19.4	6.0	15.0	11.6	21.4	8.0	15.0
1995	10.9	20.1	8.0	15.0	12.8	21.5	10.0	15.0
2005	11.8	21.1	8.0	15.0	14.1	23.5	10.0	20.0
% change, 1985-2005	29.7%	8.8%	33.3%	0%	21.6%	9.8%	25.0%	33.3%

Source: American Housing Survey, national survey.

Notes:
These are probability-weighted sample means so the statistics represent the metropolitan U.S. as a whole. Female and male means for both miles and minutes are significantly different by sex in each year shown with 99% confidence.

Table 3a. Average commute distance, by race & mode (miles).

	All female commuters				All male commuters			
	White	Black	Asian	Latino	White	Black	Asian	Latino
1985	9.3**	8.8**	9.8*	8.5**	12.0**	10.1**	11.4*	10.6**
2005	11.8**	12.2**	12**	11.6**	14.4**	13.1**	13.7**	14.6**
% change	26.9%	**38.6%**	22.4%	36.5%	20.0%	29.7%	20.2%	**37.7%**
	Female by car and truck				Male by car and truck			
1985	9.7**	9.6**	10.7*	9.0**	12.5**	10.8**	12.5*	11.4**
2005	12.2**	12.8**	12.9**	12.2**	14.9**	13.8**	14.4**	15.4**
% change	25.8%	33.3%	20.6%	**35.6%**	19.2%	27.8%	15.2%	**35.1%**
	Female by transit				Male by transit			
1985	8.7	7.7	10.2	9.3	9.7	8.3	7.9	7.9
2005	9.2	10.6	9.6*	10	10.7	9.3	13.0*	10.9
% change	5.7%	**37.7%**	-5.9%	7.5%	10.3%	12.0%	64.6%	**38.0%**

Table 3b. Average commute duration, by race & mode (minutes).

	All female commuters				All male commuters			
	White	Black	Asian	Latino	White	Black	Asian	Latino
1985	18.2**	22.7	21.4	19.9	20.5**	21.9	23.3	20.2
2005	20.3**	22.9	23.4*	21.7*	23.1**	23.4	25.0*	24.6**
% change	**11.5%**	0.9%	9.3%	9.0%	12.7%	6.8%	7.3%	**21.8%**
	Female by car and truck				Male by car and truck			
1985	17.4**	19.3	19.9**	17.3**	20.1**	20.1	22.6**	19.0**
2005	19.9**	21.2*	22.3*	20.2**	22.8**	22.4*	24.2*	23.9**
% change	14.4%	9.8%	12.1%	**16.8%**	13.4%	11.4%	7.1%	**25.8%**
	Female by transit				Male by transit			
1985	37.4	35.8	40.9	38.4	37.8	37.3	37.8	36.6
2005	35.7	39.2	35.1*	38.2	38	38.1	41.8*	37.4
% change	-4.5%	**9.5%**	-14.2%	-0.5%	0.5%	2.1%	**10.6%**	2.2%

Source: American Housing Survey, national survey.

Notes:
Significance refers to difference between sexes for that category, in that year. Ethnic group with the highest percent change for each sex in each category is shown in bold.

*$p < .05$; **$p < .01$

Table 4. Random effects Generalized Least Squares panel regression, predicting the log of one-way commute distance by personal car or truck.

Independent variables	All workers Coeff.	z	Women Coeff.	z	Men Coeff.	z
Male (0,1)	0.134**	49.7	--		--	
Log of real monthly total housing costs	0.032**	10.7	0.034**	8.7	0.035**	9.5
Log of real household income	0.015**	6.1	0.023**	8.1	0.015**	5.4
Log of trip speed	1.133**	356.1	1.054**	232.3	1.146**	267.3
Married (0,1)	**0.015****	3.9	**-0.025****	4.2	**0.055****	10.0
Age (16-93)	0.014**	19.7	0.007**	7.4	0.020**	21.4
Age squared	-0.001**	18.4	-0.001**	8.3	-0.001**	20.1
Asian and Pacific Islander, non Latino (0,1)	**n/s**		**0.048****	3.7	**n/s**	
Black, non Latino (0,1)	0.089**	13.4	0.127**	13.8	0.056**	6.4
Latino (0,1)	0.044**	7.0	0.050**	5.3	0.043**	3.3
Education level (0-11)	0.011**	11.1	0.018**	12.2	0.004**	2.4
Moved during the previous year (0,1)	**0.020****	4.5	**0.033****	5.2	**n/s**	
Tenant (0,1)	-0.033**	6.2	-0.018*	2.4	-0.043**	6.3
Multifamily unit (0,1)	**-0.015***	2.4	**-0.025****	3.0	**n/s**	
Size of household (1-18)	-0.012**	7.4	-0.021**	9.3	-0.006**	2.9
Children as percentage of household	**0.030****	3.3	**n/s**		**0.027***	2.2
Own a car (0-1)	**0.017****	3.1	**0.025****	3.0	**n/s**	
Carpool member (0,1)	0.144**	31.0	0.120**	17.9	0.159**	25.8
Live in central city part of SMSA (0,1)	-0.067**	9.5	-0.056**	7.4	-0.082**	11.6
Live in rural part of SMSA (0,1)	0.205**	28.4	0.237**	24.3	0.191**	21.7
N (persons)		230,515		103,473		127,042
N (households)		46,141		36,598		39,923
R^2		0.42		0.40		0.43
Wald χ^2		146,066		60,611		83,799
Probability $> \chi^2$		0		0		0

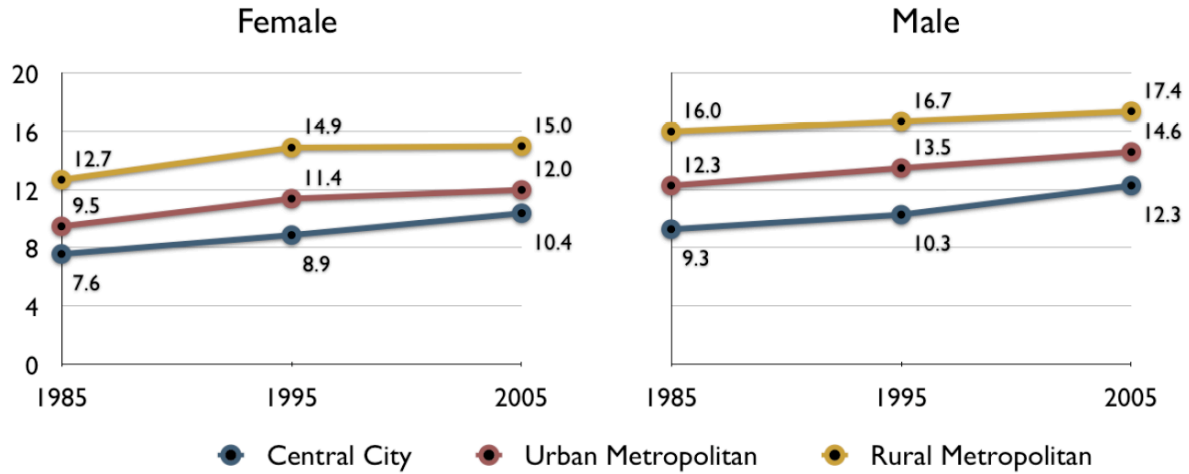Source: American Housing Survey, national survey.

Notes:
Estimated using the *xtreg/re* procedure in Stata 9.2/MP. Housing costs are measured as cash flow and do not include either potential tax benefits or capital gains associated with home ownership. Coefficients that vary in sign by sex are given in bold. A Chow/Wald test shows the female and male coefficients to be different with 99% confidence. I suppressed results for regional and SMSA dummies to save space.

*$p < .05$; ** $p < .01$

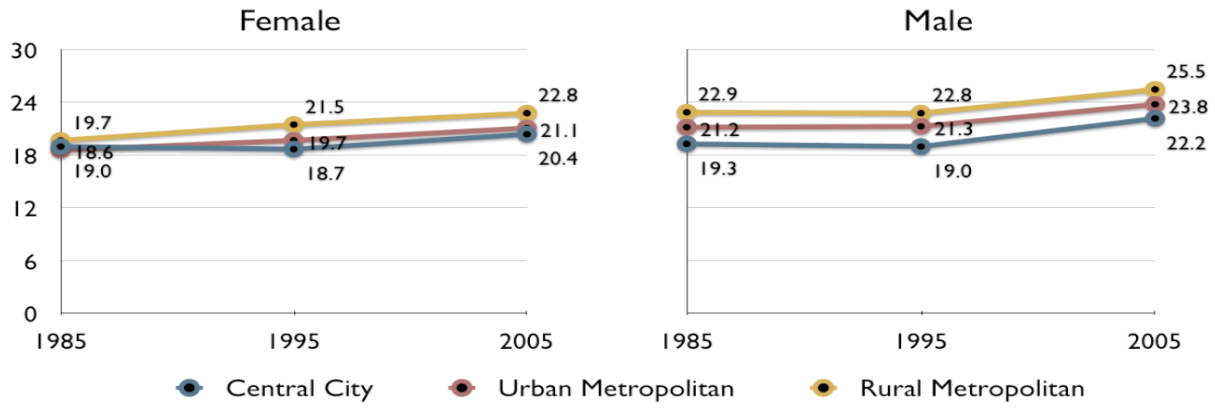Figure 1. Mean commute distance[a] by residence location, 1985-2005 (miles).

Source: American Housing Survey, national survey.

Notes:
a. Female and male mean distances are significantly different in each year shown with 99% confidence.

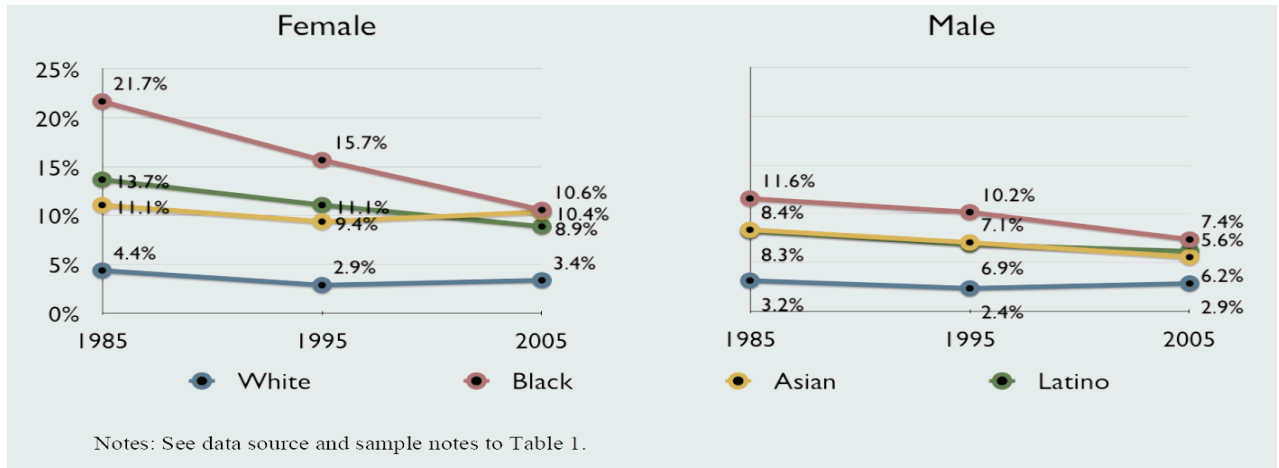Figure 2. Mean commute duration[a] by residence location, 1985-2005 (minutes).

Female

	1985	1995	2005
30			
24	19.7	21.5	22.8
18	18.6 / 19.0	19.7 / 18.7	21.1 / 20.4
12			
6			
0			

Male

	1985	1995	2005
	22.9	22.8	25.5
	21.2	21.3	23.8
	19.3	19.0	22.2

● Central City   ● Urban Metropolitan   ● Rural Metropolitan

Source: American Housing Survey, national survey.

Notes:
a. All means are significantly different by sex in every year shown with 99% confidence, except those of central city residents in 1985 and 1995.

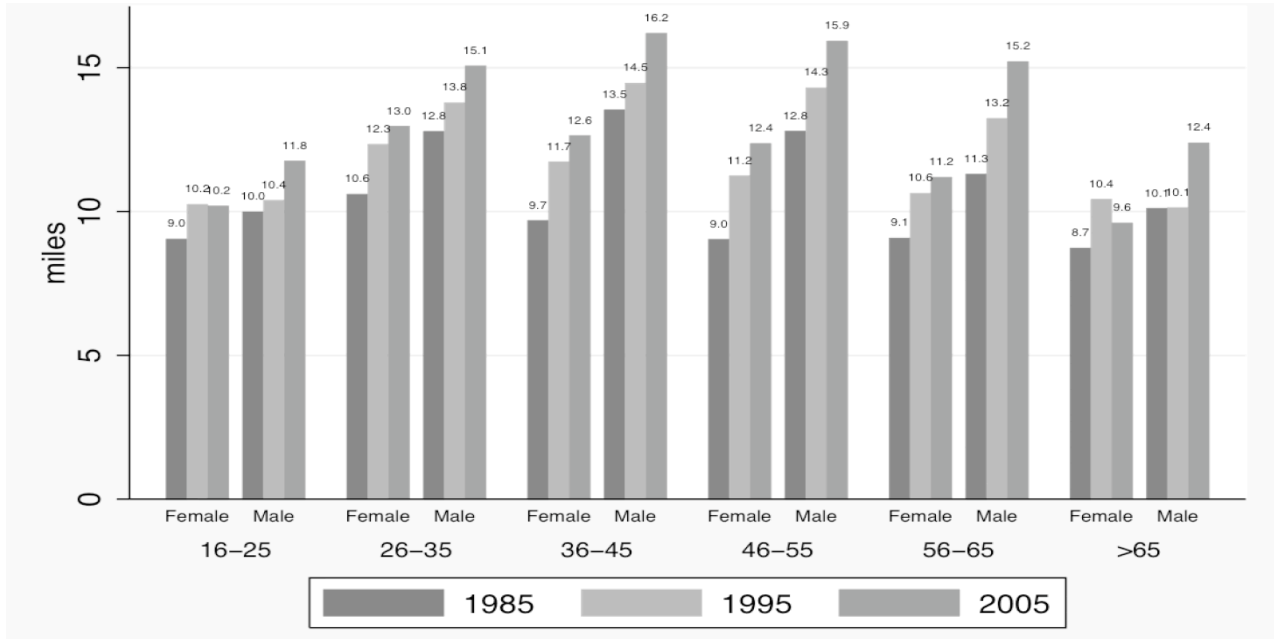Figure 3. Average commute distance and duration by mode.
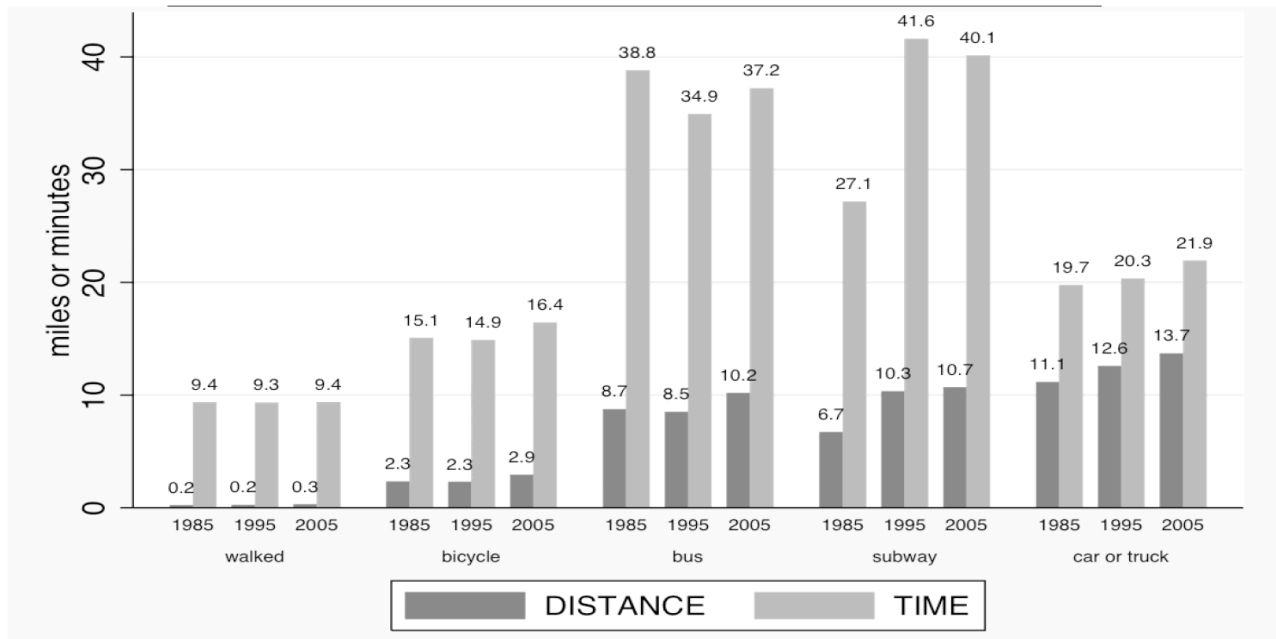
Source: American Housing Survey, national survey.

Figure 4. Transit commute mode share by race or ethnicity and sex.

Female

	1985	1995	2005
Black	21.7%	15.7%	10.6%
Latino	13.7%	11.1%	10.4%
Asian	11.1%	9.4%	8.9%
White	4.4%	2.9%	3.4%

Male

	1985	1995	2005
Black	11.6%	10.2%	7.4%
Asian	8.4%	7.1%	5.6%
Latino	8.3%	6.9%	6.2%
White	3.2%	2.4%	2.9%

Notes: See data source and sample notes to Table 1.

Source: American Housing Survey, national survey.

Figure 5. Average commute distance in cars and trucks, by sex and age.
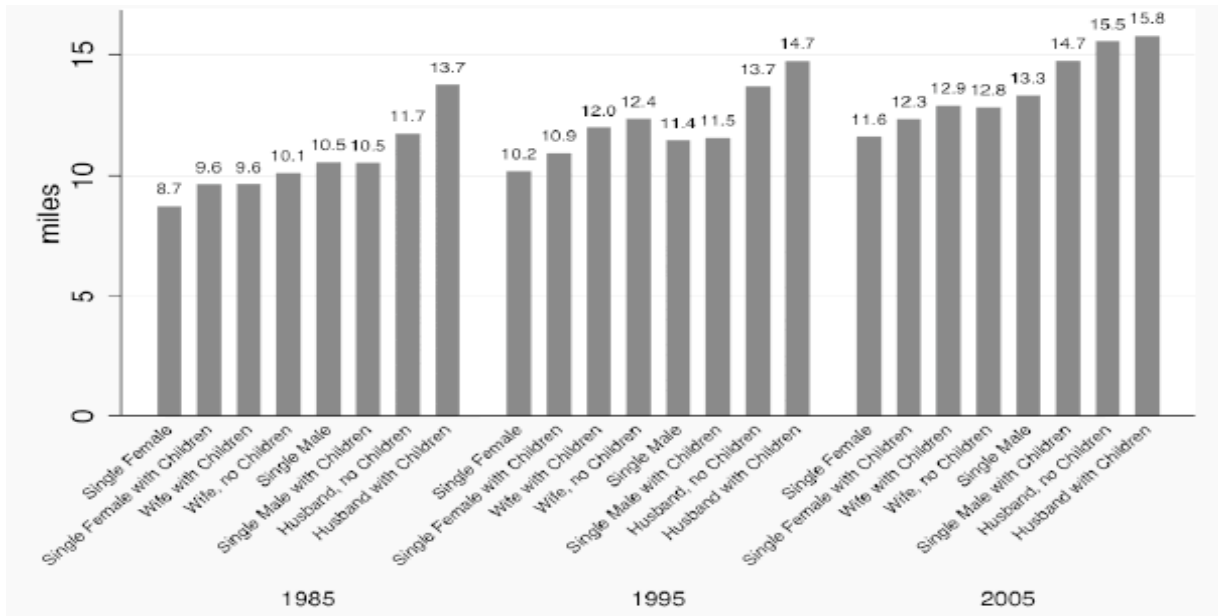

Source: American Housing Survey, national survey.

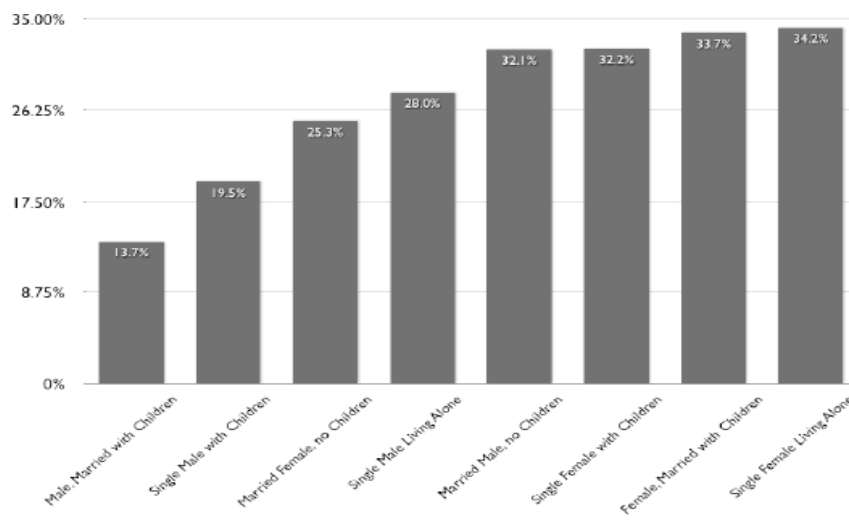Figure 6. Percentage differences in women's commute distances from men's, by age, 1985 and 2005.
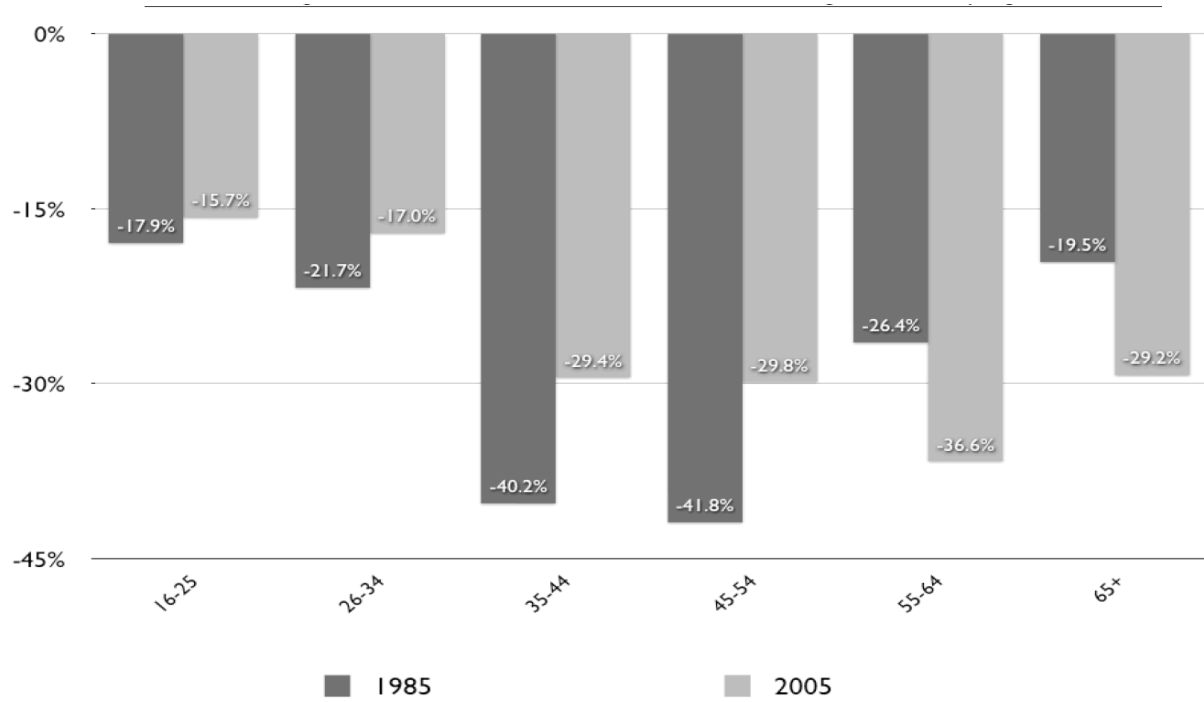
Source: American Housing Survey, national survey.

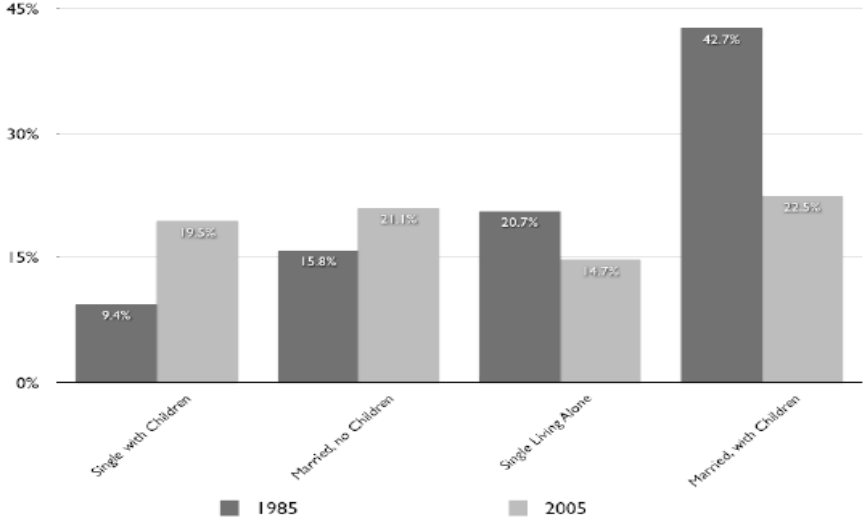Figure 7. Average commute distance by sex and family structure.

Source: American Housing Survey, national survey.

Figure 8. Growth rate in commute distance, by household type, 1985-2005.

Source: American Housing Survey, national survey.

Figure 9: Female commute distance as a percentage of male commute distance, by household type, 1985 and 2005.

	1985	2005
Single with Children	9.4%	19.5%
Married, no Children	15.8%	21.1%
Single Living Alone	20.7%	14.7%
Married, with Children	42.7%	22.5%

Source: American Housing Survey, national survey.