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1. Introduction

Since the nineteen-seventies, as a byproduct of our rapidly changing social structure, gender equity has become a major concern. This concern and the increase in the female labor force participation rate and in the female commuting population has motivated scholars to analyze and explain male and female commuting differences. Despite the many studies of gender-based differences in commuting behavior over the past decade, scholars still have not been able to agree on the reasons males commute longer distances than females. A general consensus, except for the concerns of Gordon, Kumar and Richardson (1989), is that socioeconomic and spatial structures constrain females more than males, resulting in women having shorter commuting than males. With regard to socioeconomic constraints, the first thorough examination of those factors which possibly affect gender differences in commuting was done by Hanson and Johnston (1985). Later, the effect of household type was examined by Johnston-Anumonwo (1992) using the same data used by Hanson and Johnston (1985).

In relation to spatial structure constraints, it seems only natural that gender difference in commuting distances have been examined in two-worker household location choice studies, because commuting distance is determined by workplace and residential location[1] and because

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[1] If this location choice behavior is a result of a worker's rational decision making, then we may explain the commuting distance of individuals with a theoretical urban model. If this location choice behavior is the result of an irrational choice, this is, a choice that is either non-systematically arrived at or

males and females are traditional members of two-worker households. In fact, There have been three main approaches to these location choice studies: the residential location choice approach such as that of Alonso (1964), Mills (1972), and Muth (1969), the workplace location choice approach such as that of Madden (1977) and Rees and Schultz (1970), and the simultaneous model approach[2] such as that of Siegel (1975), Simpson (1980), and Singell and Lillydahl (1986). All of these approaches present certain theoretical and practical problems. Among these problems, the exogenous workplace and residence location assumptions are the major problem for the first two approaches, and the identification problem is the major problem for the simultaneous model approach.

Prior to White's (1986) study, there seemed to be a gap between studies focusing on either socioeconomic constraints or spatial structure constraints; however, White linked the two for the first time. Using a rational location choice model, she explains why she uses an individual's socioeconomic status to examine gender differences in commuting. In other words, assuming that wages and housing prices are all at an equilibrium in a metropolitan city, households and workers are indifferent across a range of residential locations, across all job locations involving in-commuting. Therefore, personal and household characteristics are the only factors that explain why people have different commuting journey lengths. Even though the basic rationale of this paper is the same as White's, this paper is different in three ways. First, I use 1991 data from the Los Angeles metropolitan area involving information on individual workplace and residence

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are that is the result of miscalculation, then we would not be able to explain commuting behavior except by calling it as a random behavior. This topic is beyond this paper's scope and I do not discuss it in this paper. See Small and Song (1992) and Kim (1992) for further discussion.

[2] See Paul Waddell (1993) for more criticism on this model.

location; second, my analysis includes not only data on household heads but also data on secondary workers in the households; and, third, I compare male and female commuting distances by household type, race, and the presence of children. I should note that this paper is also the first paper to examine the influence of household type on gender differences in commuting that has control for all personal and household characteristics simultaneously, and it is that which differentiates this study from that of Johnston-Anumonwo (1992). In the first section of this paper, I briefly review the previous studies on two-worker household location choice and the empirical findings of these studies involving gender differences in commuting. In the second section, I describe the data and the analysis method I used. In the third section, I discuss my empirical findings, and in the final section, I present my conclusions.

In sum, my results show that household type, race and housing tenure influence males and females differently. I find that the presence of children contributes to the gender difference in commuting more for whites and for two-worker households than for other groups. However, the effects of the presence of children are not significant on both male and female commuting distances. In fact, I find that two-worker household males behave differently from two-worker household females, and that two-worker household females behave differently from single-worker household females.[3] I also find that there are sharper gender differences among whites than among nonwhites, a conclusion similar to that of Mclafferty and Preston (1991). Finally, I find that housing tenure seems to strongly influence the commuting distances of males, nonwhites, and workers from two-worker households.

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[3] Females in two-worker households have considerably lower commutes than others. See Table 1.

2. Review of the previous studies

2.1 Theoretical studies on two-worker household location choice

Distinctive theoretical models of two-worker household location choice have been developed by Beckmann (1973), White (1977), and Curran, Carlson and Ford (1982). Beckmann (1973), who based his work on a neoclassical land use model, derives an equilibrium residential land use pattern by maximizing a household's utility function. As one of the variations of his model, he examines the effects of the number of workers in a household and aggregate family size on residential location choice. He shows that there will be only transportation cost changes if we change the commuter ratio per household. Beckmann says that residential locations are determined from the center of the city in the order of transportation costs per worker. In other words, according to Beckmann, single persons and childless working couples live closest to the central business district and a large member household which has more than one worker would be situated furthest away. According to Beckmann's simple model, residential location choice for two-worker households without children and single-worker households will be the same because of equal transportation costs per person. Beckmann's model does not match the reality of households situated in urban ghetto areas near main business districts.

White (1977) assumes that two-worker households choose residences with respect to both of the workers' workplaces and not just to the husband's workplace because both workers' commuting distances affect household joint utility and because these householders behave rationally. She also assumes that husbands work at a central business district (CBD) and wives work in the suburbs, assumptions based on the percentage of married women with suburban jobs in six major cities in the U.S. using 1970 Census data. The percentage of married women with

suburban jobs from these data is 54 percent on average for these six cities and that of men is 49 percent. The data used by White show that Los Angeles has less of a difference than the average: 57 percent for married women and 56.1 percent for men. She demonstrates using the bid rent function that, at equilibrium, two-worker households outbid single-worker households for residential locations in the inner suburbs. She points out that the only exception to this occurs when the husband's earnings are extremely high relative to the wife's and to the earnings of single-worker households, which makes two-worker households' bid rent curve steeper than that of single-worker households near the central city, resulting in many two-worker households being located near the central city. She concludes that, in general, wives commute shorter distances than husbands and individuals in single-worker household. Even though her model is mathematically correct, White's strong assumption that husbands work at a CBD and wives work in the suburbs limits the practical application of her theory to cities like Los Angeles. White's assumption has been tested by Madden (1981). Contrary to White's assumption, Madden finds that in two-worker households, the husband's work location exerts a stronger influence on residential location than the wife's.

Curran, Carlson and Ford (1982) attempt to build a slightly more realistic model than White's using a two-dimensional bid-rent surface. The difference between a bid-rent curve and a bid-rent surface is that a bid rent surface is not only a function of distance but is also a function of direction. Unlike Madden's conclusion, Curran, Carlson and Ford's model show that the number of workers in a household and the employment locations of the workers affect residential location decisions. However, their results on the location decisions of the two-worker households with separate employment locations are ambiguous; in their model, residential location choice depends

on the number of two-worker households, both workers' wages, both workers' commuting costs, and the presence of several secondary employment centers. They conclude that secondary employment center (SEC) workers do not necessarily commute shorter distances than CBD workers.

2.2 Empirical studies on gender differences in commuting

Ericksen (1977), using the 1967 Longitudinal Survey of Work Experience, finds that women with demanding home roles, such as ones involving child rearing, have shorter journeys to work, and that black women have longer journeys to work than white women. Using several tabulations of the data and simple regression analyses, she also finds that married women have shorter commutes than unmarried women, and that the presence of children lowers the commuting distance relative to the children's ages. In her regression, she uses travel mode, which is endogenous to travel time, as one of her independent variables to explain commuting time; however, this makes her results unreliable.

Madden (1980) develops a variation of White's (1977) model in which the rent gradient is a given and households can choose the location of their residences, the type of jobs they have, a amount of land, and the quality and type of housing. Using 1976 Panel Study of Income Dynamics data, she empirically analyzes the location choice differences between two-worker and single-worker households. With regard to residential location choice, she finds that two-worker households behave similarly to single-worker households that have two family members in residence. However, she does point out that unmarried single-worker household individuals live closer to their jobs and purchase smaller but higher quality housing units than married persons.

She also finds that married women workers with children reside and work with greater frequency in suburban locations than other workers, and this finding somewhat supports White's model's predictions. She concludes that demand for residential location due to female labor force participation can vary in either direction, that is, toward centrally located housing or toward suburban housing, because the demographic effects such as number of children and percentage of married females are key factors to urban land use. In her 1981 paper, she also tells us that women select jobs closer to their residences because their lower wage rates and shorter work hours reduce the earnings return in relation to their commuting and because their household responsibilities increase the cost of longer commutes.

The first study to examine the various factors that may explain gender differences in commuting distances at the metropolitan scale is Hanson and Johnston's (1985). Hanson and Johnston, using the 1977 Baltimore Travel Demand Data Set, show why women work closer to home than men at the metropolitan scale. They also consider the link between journey-to-work patterns and the occupational segregation of women. Hanson and Johnston examine the significance of possible reasons for differences in men's and women's commuting by checking F-ratios obtained from analysis of variance tests for the factors such as income, travel mode, household responsibility (presence of children) and occupation. If one of these factors strongly influences commuting distance for male and female workers, then the test shows significant F-ratio. They find that women's lower incomes, their concentration in female-dominated occupations, and their greater reliance on the bus and auto passenger modes contribute to women's shorter work trips. They tell us that part time or full time work status, occupational group, and household responsibility do not explain observed gender differences in journey to

work patterns. They also find that more women than men live and work in the central city, and that female-dominated jobs are more uniformly distributed whereas male-dominated ones are clustered in certain districts. Contrary to Gordon, Kumar and Richardson's (1989) speculation, Hanson and Johnston could not find conclusive evidence that women work closer to home because they must engage in more nonwork travel than men. Some of the factors that Hanson and Johnston examined to ascertain gender difference in commuting were factors such as spatial distributions of residence and employment and travel mode. However, these factors are endogenous and relating these factors to commuting distance pose questions regarding their conclusions. The problem of endogeneity can be also found in Blumen and Kellerma's (1990) gender difference in commuting study.

By examining the geographic distribution of employment and residences, Blumen and Kellerman (1990) examined the changes in commuting distances using airline distance, residence location and employment location between 1972 and 1983 in Haifa, Israel. They find that males commute longer than females and the reason for this is the distribution of employment and occupational segregation. They tell us that the suburbanization of employment and residence not only increases commuting distances for both sexes but also increases the gender differences in commuting distance over time. This result is mainly due to different rates and directions of decentralized employment for each gender[4]. For females, the decentralization of residence was followed by the decentralization of employment; for men the opposite occurred. They also reason that employment in residential areas is more important for females than is employment for them in major employment centers. They tell us that gender differences in commuting in Haifa, however,

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[4] I should note that I failed to see the logic behind this conclusion.

are relatively small to the ones in the cities of other countries; they also say that the possible reasons for these small differences, after reviewing studies done by Villeneuve and Rose (1988), Hanson and Johnston (1985) and Hanson and Pratt (1988), may be that, in Haifa, labor force participation rate is smaller, the car ownership rate is smaller and the rate of occupational segregation is larger for females than for males.

Singell and Lillydahl (1986) empirically investigate residential decisions made with reference to the male head of household's job location using public use microdata from the 1980 U.S. Census for urban areas. A simultaneous location choice model which was estimated using two-stage least squares was adopted. They estimate a location choice model separately for households that did and did not change residences in the previous year. They find that two-worker households choose residential locations closer to the male's work location than to the female's, a conclusion similar to Madden's (1981) finding. They conclude that the husband's advantage in choosing residence location decreases when the ratio of wife's to husband's earnings narrows. They also speculate that the female worker's shorter commuting time relative to the male's may be due to responsibilities for children, low earnings, and the proximity of traditional female jobs.

White (1986) also uses a simultaneous model approach to see gender differences in urban commuting patterns using household head data from the 1980 Annual Housing Survey. She presents the results for New York City in this paper. She constructed a linear model which has commuting time as dependent variable. The independent variables used are presence of a secondary worker, presence of children, family income, household head's race, housing tenure status and length of living at current housing unit. She finds the presence of young children has a

large and significant positive effect on female household heads' commuting times. She also finds that male house owners commute longer than male house renters and that the longer workers live in the same housing unit, the shorter the commuting journey becomes regardless of sex. She concludes that male workers' commuting journey length is significantly shortened by the presence of both a second worker and children, whereas female workers' commuting journeys are increased by the presence of young children. Regarding racial factors, White finds blacks commute longer than non-blacks. Another study that focused on racial factors was done by McLafferty and Preston (1991). McLafferty and Preston find that minorities commute longer than the white majority, confirming White's finding. They also find that there are large differences between white males and white females, though not between minority males and minority females. They show that industry of employment, income, and occupation are the major causes of these commuting time differences and assume that other factors such as number of children and marital status do not have a strong influence on gender differences in commuting. They assert that one possible reason for the longer commute of minorities is spatial mismatch.[5]

Gordon, Kumar and Richardson (1989), using the 1977 and 1983-4 Nationwide Personal Transportation Study (NPTS), confirm that work trips are shorter for women than for men. In their study[6] they, first, tabulate the mean travel distances and times by gender, by marital status, by number of workers, by presence of children, by city size, by occupation, by income and by travel characteristics such as peak worktrips and non-work trips. Second, they test the influence of gender and family status on worktrips by performing a set of regressions. They regress worktrip distances and times on household income, household size, occupations and locations

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5 See Kim (1993) for detail.

6 The scope of their study is whole U.S.

(central city or suburb). They find that the gender variable is significant at the 0.01 level, that married workers have longer worktrips than unmarried workers, but that the presence of children does not have a significant influence on the worktrips. They conclude that American women do not work closer to their homes because of lower incomes, ubiquitous gender-separated occupations (e.g., sales, secretarial and clerical jobs), limited access to automobiles and the need to rely on public transit, or domestic commitments such as housekeeping, husbands and children. Gordon et al's findings contradict the hypothesis of the advocates of household responsibility, but agree with Hanson and Johnston's finding (1985). Gordon et al. could not find firm evidence why males commute longer than females. They only give us a possible explanation for the shorter worktrips by women's with the possible reason being that women trade off worktrips for non-worktrips which means that women choose to spend more time performing non-worktrips. In their study, they mention that there are several limitations to the usefulness of NPTS data. One of the limitations is that they do not know whether they are measuring full time worker or part time worker's behavior.

Johnston-Anumonwo (1992) examines, specifically, the role of household type on sex differences in commuting distance using the 1977 Travel Demand dataset for Baltimore MSA. She uses one-tailed t-tests to assess sex differences in work trip distance based on the generally accepted fact that women's work trips are shorter. She finds that women from single-worker households travel about the same distance as their male counterparts when income, travel mode, occupation type, and child status are the same. She points out that men in two-worker households travel significantly longer distances than women even after residential location and the other four variables mentioned above are controlled. She speculates that the commuting distance

differences between two-worker household female and male workers may be related to the household division of labor as described in Hanson and Pratt's (1990) findings. Based on that, she concludes that traditional gender roles, involving the division of labor by gender, remain operative in contemporary households. Other scholars who separate gender and household type are Assadian and Ondrich (1993). Assadian and Ondrich use 1978 Bogota and Cali, Columbia, data and a simultaneous model to determine housing consumption, residential location and the labor supply decisions of single- worker and two-worker households. They find that female workers' commuting distances and times are relatively greater than those found in other empirical study findings. Assadian and Ondrich's two possible explanations for this finding are that, for one, two-worker households may choose residence based on the husband's income and employment location, and two, the inadequate spatial distribution of infrastructure may prohibit employers from locating closer to the female labor pool. According to their three stage least square estimation results, they find that the log of commuting distances for males in two-worker households can be explained by his log wage significantly. However, this study still leaves us with the question as to why males and females in different types of household have different commutes, in their case rather why males and females in different types of household commute similarly.

In sum, household responsibilities and the occupational differences are the popular explanations why females commute differently from males. However, there are no robust findings on the effects of these factors except the effects of race. Among many factors that previous researchers used to explain gender differences in commuting, I examine three factors (children, household type, and race) in this paper because of the following reasons. First, one of the main household responsibilities is considered looking after the children and findings on this factor are

very controversial. Second, a factor that is not fully explored yet, and can be related to one of the household responsibilities, is household type. Third, even though previous studies show robust findings of the effects of race, race and ethnic group varies over different study regions and the effects of this factor may be quiet different in the Los Angeles Metropolitan Area.

3. Data and Methods

Individual data that I use in my research come from the Transit Panel Study Survey[7] conducted by the Institute of Transportation Studies, University of California, Irvine. I use the first and the fifth-wave data sets which were collected in 1990 and 1991, respectively. These data contain commuting trip information including reported commuting distances and demographic data involving sex, age, race, household income, personal income and occupation. Home and work zip codes for two-worker households are used as location identifiers. Commuting distances[8] are constructed with the road network between "traffic analysis zones (AZ)" using reported individual workplace and residence locations[9]. These AZs and the road network data

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[7] This survey project is funded by University of California Transportation Center. There are six waves of data sets. The first-wave data set was used in Brownstone and Golob's (1992) study.

[8] Commuting distance represents location distribution more accurately than commuting time. Commuting time is a better measure of trip cost than commuting distance. However, commuting time can vary by traffic condition and travel mode. Although there are advantages and disadvantages to using commuting distance and commuting time, previous studies, such as Small and Song (1992), Kim (1992) showed that measuring commuting costs in either way does not affect analyses results. Hanson and Johnston (1985) used commuting distance because distance shows the commuting differences between males and females more clearly than time.

[9] This survey has commuting distance and time information ; however, I used calculated distances because the reported distance varies by the day the survey is answered. I compared these two sets of distance vectors, and I find that they are remarkably similar.

were created by the Southern California Association of Government (SCAG). The road network data are based on 1990 travel data and a 1980 AZ map is used. There are a total of 1555 AZs in Southern California which cover Los Angeles, Orange, San Bernadino, Ventura and Riverside counties and only 1527 AZs are used.[10]

Transit Panel Study Survey data is employer-based sample[11] data. Since there is no race information in the fifth wave data, I merge the first wave data with the fifth wave data. After merging the two data sets, I determined that there are 508 male and 555 female workers who have all the variables required for the analysis. I constructed a linear model to explain commuting distances using person characteristic variables. Those independent variables are age (AGE), sex (SEX), household type (HTYPE), race (RACE), median household income per year (MDHINC), housing tenure (TENURE), and the presence of children under 17 years of age (CHILD). Under AGE, the ages range from 18 years to 70 years. The average age is 41 years. For the SEX variable, I assigned 0 for males and 1 for females. For HTYPE, if workers belong to a single-worker household, then 1 is assigned; if they belong to a two-worker household, then 2 is assigned. For RACE, I assigned 0 for white and 1 for nonwhite. Among the non-whites; identified one-sixth are black, half are Asian, and one-third are nonwhite Hispanics.[12] For TENURE, if workers own their residence, then 0 is assigned; 1 is assigned for renters. If there are children under 17 years of age, I assigned 1, and if there are no children, 0 is assigned for the CHILD variable. The median household income MDHINC is grouped by 12 categories from

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[10] 28 AZs are excluded because they do not have areas. They are the reference points for the transportation modeling purpose of the agency.

[11] Details of sampling procedures are documented in Uhlaner and Kim's (1992) paper "Designing and Implementing a Panel Study of Commuter Behavior: Lessons for Future Research."

[12] See Table 6.

$7,500 to $150,000. I also constructed dummy variables that show gender and household type together. A dummy variable SF is 1 if the sample is a single-worker household female worker and 0 if it is not. A dummy variable TM is 1 if the sample is a two-worker household male worker and 0 if it is not. A dummy variable TF is 1 if the sample is a two-worker household female worker and 0 if it is not. The mean commuting distances and standard deviations by each independent variable are shown in Table1. I estimated linear regression models by gender and household type, gender and race, and gender and the presence of children. When I ran a given regression, I excluded the variables under study from independent variables. For example, SEX and HTYPE are excluded from the list of independent variables to when I examine the effects of gender and household type. Then I use a Chow test to determine the differences between the regression results.

4. Estimation results

Tables 2a and 2b show the regression results by sex, household type, race and the presence of children. Chow tests do not reject the hypotheses that all the coefficients of these comparing regression results shown in Tables 2a and 2b are in fact same. Therefore, in Tables 2a and 2b, I examine the size and significance of individual coefficient because of very low Adjusted R squares.[13] Column 1 in Table 2a is the result of a regression using the total sample. It shows

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[13] Two other person characteristic variables that I do not include here are education and occupation. One reason I do not include those variables is that education is highly correlated with income and the data only allows for the survey respondent's occupation. In the wave 5 data, there is no occupation information for secondary workers. In the wave 8 survey, we asked about the secondary worker's occupation; however, increasing sample attrition has made sample size too small to work with. The other reason I do not use occupation as an independent variable is that most of the time, people have difficulties defining

that the coefficients of SEX and HTYPE are significant at the 5% level and RACE and TENURE are significant at the 10% level. From column 2 and column 3 in Table 2a, we note the distinctive gender differences in the size of the coefficients for household type, race, and housing tenure. From columns 4 and 5 in the same table, we can see that the coefficient of the gender variable is quite different. From columns 1 and 2 in Table 2b, the tenure variable has the most different size of coefficients but the coefficients that are significant and have different sizes are the ones for gender and household type variables; we see similar results in columns 3 and 4 in Table 2b.

Several sub-category regressions show distinctive gender differences in commuting behavior and these are examined using a Chow test.[14] Those regression results which show differences are presented in Tables 3, 4 and 5. The regression pairs identified are as follows: single-worker household females and two-worker household females (Table 3a); and two-worker household males and two-worker household females (Table 3a); white males and white females (Table 4); males and females with children, and males and females without children (Table 5). In most cases, female workers' commuting distances are influenced by race and household type; on the other hand, male workers' commuting distances are strongly influenced by housing tenure.

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which occupation category they belong unless, of course, people are experts in job categorization. Therefore, the possibility of survey respondent error would have limited the possibility of getting reliable results.

Other variables which might greately affect the results and raise R squares are school qualities, and neighborhood amenities such as proximity to beaches and relative rate of crime. However this information is somewhat subjective and analysis using these are beyond this paper's scope. Further, as I mentioned in Footnote 1, even if we did include all the above variables, if commuting were the result of random behavior, R square would not be improved.

[14] F values and p values are on the bottom of the Tables.

From Table 3a, we see that the RACE variable has an effect on commuting distance for all five sub-groups. Here, we see that non-whites commute shorter than whites holding all other explanatory variables constant. The coefficients of other variables show mixed results. From columns 3 and 5 in Table 3a, we see that the difference between two-worker household females and single-worker household females is that the coefficient of TENURE is positive for single-worker household females; that the presence of children shortens the commuting distance of two-worker household females more than that of single-worker household females holding other explanatory variables constant. From columns 4 and 5 in Table 3a, we note that the coefficients of AGE and CHILD are positive for two-worker household males and negative for two-worker household females. There are large differences in the coefficients for race, housing tenure, and the presence of children variables and they all have negative signs. It is interesting to note that AGE differentiates two-worker household males and females.[15] The coefficient signs of two-worker household males and females' housing tenure are the same as those of White's (1986) finding; however, there is no clear explanation why housing tenure has different effects on each gender.[16] Table 3b shows the regression results using the whole sample and more detailed sex and household type dummy variables. The regression results in Table 3b show significant and strong negative influence of two-worker household female workers on commuting distances. In this regression, I also test the hypotheses that the coefficients of SF and TF are the same and the

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[15] Gera and Kuhn (1980) show that age is a significant variable explaining commuting distance. This may be related to lifecycle commuting hypothesis.

[16] I speculate that this may be an indication that females care more about their residential neighborhood environment than males. Therefore, even if they are renters, females may not consider commuting distance as a top priority for their residential location choice.

coefficients of TM and TF are the same. Both hypotheses are rejected at 0.01 percent significant levels.

From column 4 in Table 4, it is again noted that the coefficient of AGE of white females is negative and as significant as that of two-worker household females in Table 3a. From column 3 and 4 in Table 4, the coefficient of CHILD is negative for white females and positive for white males. The finding that white male's commuting behavior is quite different from that of white females' agrees with McLafferty and Preston's (1991) findings; however, my data on racial differences in commuting show the opposite results of McLafferty and Preston's. My results show that nonwhites commute shorter distances than whites holding all other variables constant (see Table 2a and 2b). Contrary to my results, White's (1986) findings also show that blacks and Hispanic commute longer than whites in New York City. This difference may be because of the peculiar characteristics of Los Angeles in that more Hispanics live in the region, they are not as poor as blacks, and they are spread out more uniformly than blacks. Table 6 shows the number of sample and average commuting distances for each race and Hispanic groups in the survey used in this study. In Table 6, Asian and nonwhite Hispanics commute shorter than blacks, and nonwhites commute shorter than whites. It is worth to mention that white Hispanic and nonwhite Hispanic have very different average commuting distances. Therefore, my results on racial differences should be interpreted with caution, because, first, there are white and nonwhite Hispanics; and second, majority of nonwhite are Asian which may have many new immigrants. These nonwhites, therefore, may behave very differently from traditional blacks in old cities that most of the previous racial studies aimed at.

Table 5 shows that males and females are different. However, one should note that there are no differences in commuting behavior between groups who have children and those who do not. This finding agrees with the previous findings of Hanson and Johnston (1985), Gordon et al. (1989), and Johnston-Anumonwo (1992) that the presence of children does not contribute to males and females commuting differences.

5. Conclusion

The results of this empirical study show that gender differences in commuting in the Los Angeles Metropolitan Area are due to household type, race and housing tenure effects. Because of the small sub-group sample sizes and the low adjusted R squares, it is difficult to say why male and female commuting behaviors are significantly different; however, from the results of subgroup regressions, I can explain why some of the subgroups of males and females behave differently.

The most important finding of this paper is that two-worker household female workers have the most distinctive effects on commuting distances as shown in Table 3b. Two-worker household females commute almost four miles shorter than single-worker household females. In fact, this finding is consistent with Johnston-Anumonwo's finding (1992) that household type affects female commuting distances negatively and significantly and that the presence of children affects female commuting distances negatively, though here the presence of children does not appear to be a significant factor.

Contrary to White's (1986) and Mclafferty and Preston's (1991) findings, I find that being nonwhite negatively affects commuting distance for both males and females. However, this differences may be due to different composition of racial and ethnic groups in the Los Angeles

Metropolitan Area, and my results may be more applicable to the fast growing new cities such as Dallas and Phoenix. My other findings about racial issue concur with Mclafferty and Preston's (1991) that there are sharper gender differences among whites than nonwhites. Similarly to White's (1986) finding, I further note that housing tenure significantly affects males but not females. With regard to the income variable effects, contrary to Hecht (1974), Rutherford and Wekerle's (1988) conclusions, but similar to Gordon et al.'s (1989), I find that household income does not influence commuting significantly.

It is surprising that the results using 1977 data (Johnston-Anumonwo) and the results using 1991 data (this study) about the effects of two-worker household female commuting behavior are similar, in spite of rapid changes of family structure[17] and the louder voice of females in the society. This can be interpreted as that there have been no changes in female and male role in a household during this period. In other words, whenever male and female live together, there may be a labor division by gender in a household as Hanson and Pratt's (1990) findings. Another speculation is that male plays traditional "protector's role" which is far away from gender equity indicating that two-worker households choose their residences close to female workers workplaces so that female workers can have less burden of commuting.

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[17] Baby boomers are the majority of two-worker households and have children in 1990s. In 1970s, most of them must have been single and so called "Hippie generation."

Table 1. Summary Statistics

	NUMBER OF OBSERVATION	COMMUTING DISTANCE	
		mean (miles)	standard deviation
TOTAL SAMPLE	1063	14.64	11.60
males	508	16.12	12.04
females	555	13.28	11.03
Single-worker households	431	15.71	11.39
Two-worker households	632	13.91	11.70
whites	919	14.93	11.68
nonwhites	144	12.76	10.93
no children	758	14.83	11.56
children	305	14.16	11.72
MALE			
Single-worker households	209	16.16	11.86
Two-worker households	299	16.09	12.17
whites	436	16.24	12.12
nonwhites	72	15.38	11.57
no children	349	16.13	11.57
children	159	16.09	13.04
FEMALE			
Single-worker households	222	15.28	10.93
Two-worker households	333	11.95	10.91
whites	483	13.75	11.16
nonwhites	72	10.15	9.63
no children	409	13.72	11.45
children	146	12.06	9.69

Table 2a.
OLS Regression Results: Dependent Variable is Commuting Distance

	Total Sample	Male	Female	Single-Worker Household	Two-Worker Household
AGE	-0.03	0.02	-0.08 *	-0.03	-0.03
	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)
SEX	-2.81 **			-0.82	-4.20 **
	(0.71)			(1.13)	(0.92)
HTYPE	-1.96 **	-0.08	-3.59 **		
	(0.73)	(1.10)	(0.98)		
RACE	-1.98 *	-0.89	-3.20 **	-1.01	-2.53 *
	(1.04)	(1.55)	(1.39)	(1.73)	(1.30)
MDHINC	0.01	0.01	0.02	0.01	0.02
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
TENURE	-1.61 *	-2.85 **	-0.70	-1.25	-2.18 *
	(0.88)	(1.39)	(1.12)	(1.33)	(1.18)
CHILD	-0.82	-0.21	-1.40	-0.50	-0.89
	(0.80)	(1.19)	(1.08)	(1.36)	(1.00)
CONSTANT	20.34 **	15.64 **	21.91 **	17.55 **	16.82 **
	(2.20)	(3.22)	(2.82)	(2.89)	(2.51)
observation	1063	508	555	431	632
Adj R-square	0.02	0.0004	0.03	-0.01	0.04
F value		1.66		1.07	

** Significant at $p < 0.05$
* Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 2b.
OLS Regression Results: Dependent Variable is Commuting Distance

	White	Non-white	Have No-Children	Have Children
AGE	-0.06	0.17 *	-0.02	-0.09
	(0.04)	(0.09)	(0.04)	(0.10)
SEX	-2.54 **	-3.82 **	-2.37 **	-3.94 **
	(0.77)	(1.83)	(0.84)	(1.36)
HDTYPE	-1.85 **	-3.20	-1.95 **	-1.82
	(0.79)	(1.96)	(0.87)	(1.42)
RACE			-1.93	-2.05
			(1.33)	(1.68)
MDHINC	0.02	-0.004	0.02	0.01
	(0.01)	(0.03)	(0.01)	(0.02)
TENURE	-1.27	-3.87 *	-1.31	-2.61
	(0.96)	(2.19)	(1.00)	(1.89)
CHILD	-0.91	-0.36		
	(0.89)	(1.81)		
CONSTANT	20.74 **	14.79 **	19.36 **	22.90 **
	(2.39)	(5.43)	(2.51)	(4.65)
observation	919	144	758	305
Adj R-square	0.02	0.08	0.02	0.03
F value	1.13		0.24	

** Significant at $p < 0.05$
* Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 3a. Gender differences in commuting by Household Type

	Male	Female	Single-Worker Household Female	Two-Worker Household Female	Two-Worker Household Male
AGE	0.02	-0.07	-0.03	-0.12 *	0.05
	(0.05)	(0.05)	(0.07)	(0.06)	(0.07)
RACE	-0.90	-3.50 **	-2.44	-3.81 **	-1.30
	(1.55)	(1.40)	(2.50)	(1.68)	(2.02)
MDHINC	0.01	0.01	0.02	0.02	0.03
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
TENURE	-2.85 **	-0.40	0.58	-1.87	-2.31
	(1.39)	(1.13)	(1.72)	(1.51)	(1.84)
CHILD	-0.21	-1.74	-0.48	-1.82	0.12
	(1.19)	(1.08)	(1.94)	(1.30)	(1.54)
CONSTANT	15.52 **	16.36 **	15.36 **	16.51 **	12.41 **
	(2.74)	(2.40)	(3.87)	(3.03)	(3.83)
observation	508	555	222	333	299
Adj R-square	0.002	0.01	-0.01	0.02	0.001
F value	3.75**		2.62**	4.36**	

** Significant at $p < 0.05$
* Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 3b.
OLS Regression Results: Dependent Variable is Commuting Distance
(Category for "single-worker household male workers" is omitted)

	Total Sample	
AGE	-0.03	
	(0.03)	
RACE	-1.93	*
	(1.04)	
MDHINC	0.02	
	(0.01)	
TENURE	-1.72	*
	(0.88)	
CHILD	-0.77	
	(0.80)	
SF	-0.74	
	(1.11)	
TM	-0.19	
	(1.04)	
TF	-4.39	**
	(1.02)	
CONSTANT	17.31	**
	(1.98)	
observation	1063	
Adj R-square	0.03	

** Significant at $p < 0.05$
* Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 4. Gender differences in commuting by Race

	Male	Female	White Male	White Female
AGE	0.02	-0.08	0.001	-0.11 **
	(0.05)	(0.05)	(0.06)	(0.05)
HTYPE	-0.09	-3.72 **	-0.01	-3.45 **
	(1.10)	(0.98)	(1.20)	(1.05)
MDHINC	0.01	0.02	0.01	0.02
	(0.02)	(0.01)	(0.02)	(0.02)
TENURE	-2.80 **	-0.89	-1.83	-0.89
	(1.39)	(1.12)	(1.51)	(1.23)
CHILD	-0.29	-1.61	0.01	-1.72
	(1.19)	(1.08)	(1.33)	(1.20)
CONSTANT	15.43 **	21.47 **	15.49 **	23.02 **
	(3.20)	(2.82)	(3.52)	(3.03)
observation	508	555	436	483
Adj R-square	0.002	0.03	-0.01	0.02
F value	4.22**		3.12**	

** Significant at $p < 0.05$
* Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 5. Gender differences in commuting by the Presence of Children

	Male		Female	
AGE	0.02		-0.07	
	(0.05)		(0.05)	
HTYPE	-0.08		-3.70	**
	(1.10)		(0.98)	
RACE	-0.93		-3.35	**
	(1.54)		(1.38)	
MDHINC	0.01		0.02	
	(0.02)		(0.01)	
TENURE	-2.82	**	-0.61	
	(1.38)		(1.12)	
CONSTANT	15.53	**	21.41	**
	(3.15)		(2.79)	
observation	508		555	
Adj R-square	0.002		0.03	
F value	4.38**			

	Male with No children		Female with No children		Male with Children		Female with Children	
AGE	0.02		-0.07		-0.02		-0.19	
	(0.05)		(0.05)		(0.15)		(0.12)	
HTYPE	-0.26		-3.26	**	0.40		-4.61	**
	(1.28)		(1.18)		(2.18)		(1.78)	
RACE	-0.31		-3.54	*	-1.78		-2.17	
	(1.98)		(1.81)		(2.61)		(2.05)	
MDHINC	0.02		0.02		-0.01		0.02	
	(0.02)		(0.02)		(0.04)		(0.03)	
TENURE	-2.72	*	-0.18		-3.10		-2.80	
	(1.52)		(1.32)		(3.22)		(2.12)	
CONSTANT	15.00	**	20.83	**	17.56	**	26.30	**
	(3.58)		(3.28)		(6.96)		(5.64)	
observation	349		409		159		146	
Adj R-square	0.001		0.02		-0.02		0.05	
F value	2.63**				2.13**			

** Significant at $p < 0.05$ * Significant at $p < 0.1$
(Standard errors are in parenthesis)

Table 6. Race and Hispanic Group Comparison

	Number of observation	
	Total	Hispanic
WHITE	972	37
BLACK	22	
ASIAN	72	
OTHERS	51	42

	Average Commuting Distance (miles)	
	Total	Hispanic
WHITE	14.9	18.7
BLACK	14.0	
ASIAN	12.9	
OTHERS	11.5	10.6

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