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Author(s): Janice F. Madden and Michelle J. White

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# Spatial Implications of Increases in the Female Labor Force: A Theoretical and Empirical Synthesis

Janice F. Madden and Michelle J. White

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## INTRODUCTION

Women live closer to their jobs regardless of whether time or physical distance is used as the measure and regardless of the place or the time period studied (Pratt 1911, London Transport Executive 1950, Taaffe et al. 1963, Wolforth 1965, Wheeler 1967, 1969, Fuchs 1971, Erickson 1977, Madden 1977a). While this empirical fact has been widely noted in diverse studies of local labor markets, of wages and occupations, of urban land use, and of housing demand, there has been little analysis of its behavioral basis. Since roughly one-half of all intraurban trips are work trips (Carroll 1952, p. 271, Domencich and McFadden 1975, p. 186–90), since women currently account for 40% of those work trips, and since women's share of total work trips is increasing dramatically,<sup>1</sup> women's tendency to take shorter trips is of increasing concern to urban, labor market, and transportation analysts.

Women's shorter work trips must be due to sex differences in workplace locations, residential locations, or a combination of both. Women may choose residences closer to their jobs because they have different housing or commuting preferences. Alternately or additionally, they may choose jobs closer to their residences, because they value their commuting time differently or because they have or choose different job opportunities than men.

Commuting preferences, job opportunities/preferences, or housing preferences are all factors that may account for sex differences in workplace-residence separation decisions, and the extent of these differences will affect public policy decisions in the urban, labor, and transportation arenas. If women's housing or commuting preferences are such that they choose residences nearer to their jobs, then an increase in female labor force participation will decrease the rate of suburbanization of residences and may prompt a reurbanization process currently typified by the urban gentrification movement (Alonso 1978). This would suggest a resurgence in older, more densely populated cities in the Northeast corridor while newer, more sprawling cities' growth rates would decline. At the opposite extreme, if employed women choose workplaces closer to their residences because they "dislike" commuting, suburbanization of employment and growth rates in less

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The authors are, respectively, Associate Professor, Department of Regional Science, University of Pennsylvania, and Associate Professor, Graduate School of Business Administration, New York University. The research was funded by National Institute of Mental Health Grant No. 1-R01-MH-31400-01 and Employment and Training Administration, Department of Labor, Grant No. 91-42-78-31. Berhanu Abeyaz and Edgardo Madrilejo provided research assistance.

<sup>1</sup> In 1979, women were over 41% of the labor force and that proportion is expected to grow through the rest of this century. *Employment and Earnings* (January 1980, p. 157).

densely populated cities will accelerate as the female share of the labor force increases. Alternatively, if workplaces are chosen closer to home because women hold different jobs—for example, lower paying and/or less specialized jobs—then equalization of jobs would decrease sex differences in workplace-residence separation and increasing female labor force participation would have no long term effect on aggregate workplace-residence separation patterns.

The delineation of the geographical boundaries of labor markets, which are based on aggregate commuting patterns, determines the allocation of federal funds to depressed areas<sup>2</sup> and the availability of workers for affirmative action goals and timetables (Frank 1978*a*, 1978*b*; Gastwirth and Haber 1976, Haber and Gastwirth 1978). If women commute less due to their inferior job opportunities or to their housing choices, then there are no sex differences in the geographic boundaries of job-specific labor markets; if women commute less due to their distaste for commuting, women's job-specific geographic labor markets would be smaller than men's (Madden 1977*a*, 1977*b*). The latter suggests that labor-market availability statistics for women workers must be defined for smaller geographic units and that aggregate commuting data will show some decrease, *ceteris paribus*, in the geographic size of units (such as SMSAs and BEAs) which are defined by aggregate commuting behavior.

The labor policy implications go yet further. If women select jobs from a smaller geographic labor market, due to either their commuting preferences and/or residential immobility, fewer employers compete for their services. As the number of potential employers declines, the possibility of monopsonistic

or oligopsonistic exploitation (Robinson 1934, Madden 1973) and consequently wage discrimination increases. This implies that there would be less compliance with equal employment opportunity laws in more isolated (i.e., suburban) labor markets. However, if women's job markets are geographically smaller due to their choice of occupation, their shorter work trips would not affect sex-wage differentials within firms.

The impact on transportation policy is also significant. If women commute shorter distances due to their housing choices or their distaste for commuting, increases in the female labor force will change origin-destination distributions of work trips. The shorter average work trip will favor public transit investment in bus rather than rail systems and will also affect the optimal location of highways and public transit systems. On the other hand, if women commute shorter distances due to differential job opportunities, the transportation implication of increasing female labor force participation depends on whether women's job opportunities change. If they do, then the origin-destination work trip distribution will not change; if they do not, the origin-destination work trip distribution will shift as previously described.

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<sup>2</sup> Job Opportunities in the Business Sector (JOBS), which subsidizes training programs in private industry, and Public Employment Program (PEP), which creates jobs in the public sector, implicitly subsidize jobs at particular locations. Concentrated Employment Program (CEP) provides funds for manpower services directly to depressed geographic areas. Efforts by the Small Business Administration and the Office of Economic Opportunity to encourage minority enterprise tend to increase job opportunities in center cities. Efforts by local governments to attract industry through tax abatement or subsidization directly affect the spatial distribution of employment. Community Development Corporations (CDC) for whom federal assistance has been considered, also attempt to directly increase business and, hence, job opportunities in specific geographic areas.

While it may seem obvious that factors affecting both workplace location and residential location outcomes must be considered in the analysis of workplace-residence separation, published research has not typically done so. There have been two distinct approaches to explaining work trips—that of labor economists who have focused on job location choice assuming residential locations to be fixed, and that of urban economists who have focused on residential location choice assuming job locations to be fixed. Labor economists have analyzed the work trip as a cost of *employment* for which workers must be compensated by a higher wage; urban economists have analyzed commuting as a cost of *housing* for which households are compensated by a lower land price.

In this paper we synthesize and evaluate the diverse set of facts, ad hoc theorizing, and empirical results which constitute the current wisdom on sex differences in workplace-residence separation and, more generally, the behavioral bases for workplace-residence separation patterns as presented in the labor, transportation, and urban literature. The first section focuses on the effects of job opportunities and commuting preferences on work trip length, analyzing both employee (spatial labor supply) and employer (spatial labor demand) incentives for wage compensation of the work trip. The relevance of commuting patterns to the analysis of labor market structure is also discussed. Section II considers the effects of the residential land market on work trip length, analyzing the factors that distinguish the housing and residential location preferences of employed men and women and result in sex differences in housing cost compensation for work trips. The effects of increased female labor participation on household

income, housing expenditures, and the location decision process and the consequences of these effects for residential outcomes are discussed. Section III summarizes the major reasons why the research reviewed cannot answer the policy questions outlined above and suggests lines of synthesis of research efforts which could explain and predict the effects of demographic changes in the labor force on workplace-residence separation.

### I. LABOR MARKET EXPLANATIONS

Women's experiences in the labor force are significantly different from men's. Women earn less,<sup>3</sup> work in different occupations and industries<sup>4</sup> and work shorter hours.<sup>5</sup> Since work trips are known to vary by earnings (Oi and Shuldiner 1962, Hamburg et al. 1965), occupation, industry (Wheeler 1967, Horton and Wittick 1969, Mossman and Faria 1975), and hours worked (Hathaway 1975), women's shorter work trips may indeed be related to their workplace activities. Fuchs (1971) has argued that the shorter work trips of women partially account for their lower gross earnings, indicating that the difference between men's

<sup>3</sup> In 1979, women employed full time, full year earned 59% of their male counterparts. Bureau of the Census, *Current Population Reports*, "Consumer Income." Series P-60, No. 116.

<sup>4</sup> Thirty five percent of the female labor force is employed as clerical workers or service workers, compared with six percent of the male labor force. Although men are 69% of the work force for all manufacturing firms, women are 81% of the work force for the manufacture of apparel and other textiles. Women comprise 58% of both the financial industry and the service industry work force. *Employment and Earnings* (January 1980), pp. 84-86, 92-94, 178.

<sup>5</sup> For example, in April 1978, employed men worked an average of 41.7 hours while women worked 34.2 hours. Bureau of Labor Statistics, U.S. Department of Labor, *Employment and Earnings* (May 1978), p. 39.

and women's earnings net of commuting costs is smaller.

The problem with connecting the conditions of female employment with female work trip behavior is the very ad hoc nature of the analysis. Observed wages and commuting patterns are in fact the outcomes of more than individual spatial labor supply decisions. Both the extent of spatial variation in labor demand and the response of land markets to that variation are important, as is the degree of competition within the local labor market. Therefore the basic question that must be addressed is: Are these job and earnings differentials by sex caused by, an effect of, or totally unrelated to the commuting differentials? To answer this question, it is necessary to consider the factors that determine workers' residential location choices, prompt workers to select workplaces closer to their residences, and prompt firms to locate nearer their employees.

Moses (1962) provided the basis for further analytical work by modeling the effects of various hypothetical transportation cost functions on the job location and, therefore, on the work trip behavior of individual workers residing at various distances from the city center. He assumed residences were fixed and did not attempt to spatially aggregate individual labor supply. Madden (1977a) and Ravallion (1979) derive aggregate spatial labor supply functions assuming fixed residential locations and a uniform spatial distribution of population. However, a comprehensive analysis which allows for the simultaneous clearing of spatial labor markets and urban land markets has not yet been developed. As a result, empirical researchers can not disentangle the relationship between housing costs, wages, and the length of the journey to work.

Even if the problem of the impact of the residential land market on commuting patterns is ignored and it is assumed that the full economic impact of commuting occurs in the labor market, the relationship between observed wage differentials and observed commuting differentials is empirically complex. Any observation is the result of both the individual's spatial labor supply decision and the employer's demand for labor. In order to analyze the impact of an individual's job opportunities on his or her commuting behavior, or vice versa, it is necessary to separate the cost of the commute to the workers (spatial labor supply) from the price employers are willing to pay to expand their labor markets (spatial labor demand).

### *Spatial Labor Supply*

Spatial variation in labor supply (the amount of labor supplied by an individual to firms at various locations at a given wage) is determined by spatial variation in the cost of the work trip simply because this cost is the opportunity cost of differing work locations.<sup>6</sup> The cost of the work trip is the sum of the time costs and the out-of-pocket money costs of the journey. In order to sum these costs, the time costs must be converted to money costs; that is, a money value must be assigned to commuting time. Since out-of-pocket costs are explicit, the spatial properties of labor supply depend critically on the value assigned to commuting time.

Assuming that women can choose their work hours or else can choose between jobs with differing work hours,

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<sup>6</sup> This section discusses the spatial labor supply of an individual worker and not the aggregation of these individual labor supplies into a firm's labor supply. Of course the spatial labor supply curve to the firm also varies with the locational distribution of other firms in the area.

and that travel time has no value other than its effects on household income and leisure (that is, travel does not separately enter the utility function as either a good or a "bad"), then travel time is valued at the wage rate net of taxes. The empirical literature has used two methodological approaches to derive the value of travel time. The first alternative (Beesley 1965) imputes the value of travel time from the actual modal choices of individuals who decide between a time-intensive low cost mode or a more expensive, less time-consuming mode. The second alternative interprets the coefficient of length of work trip regressed on wages as the marginal value of travel time. This alternative results in a biased estimate of the marginal value of travel time if individuals with different earnings have different proportions of their travel time compensated in the housing market. While the first alternative yields accurate estimates regardless of the way earnings interact with the housing market to compensate travel time, the data required for this methodology (describing both the money cost and the time cost of travel alternatives) is seldom available.

The value of travel time in studies using both methodologies ranges between 30% and 50% of the gross wage rate, a rate substantially below the wage net of taxes (Becker 1965, Beesley 1965, Lisco 1967, Rees and Shultz 1970). Therefore the initial assumptions used to link travel time to the wage rate must not strictly hold: either workers desire to work more hours or travel time is more enjoyable than work time. Since lower wage workers tend to value their travel time at a lower proportion of their gross wage rate (Beesley 1965), even though their marginal tax rate is lower than higher wage earners, and if low wage jobs are likely to be less enjoyable than high

wage jobs, it is likely that travel time is more enjoyable than work time and, therefore, requires less monetary compensation.

Beesley (1965) found that women were more likely than men to value their travel time either at more than 50% of their wage rate or less than 30% of their wage rate. He argues that women tend to appear at the extremes because, on the one hand, they are more likely to be low earners; on the other hand, employed women are more likely to be part of a multi-earner household, and consequently, have a higher value of time because their family income is higher than that indicated by their own earnings. Furthermore, women's household productivity may alter the relationship between wages and the value of travel time (Madden 1977a).

Because the value of time spent traveling to work has not been successfully measured with any precision for women, it is impossible to measure the cost of their work trips. Without such a cost measure, it is impossible to identify econometrically a spatial labor supply function for women.

### *Spatial Labor Demand*

Spatial variation in labor demand (variance in the wages a firm offers for a given amount of labor at varying locations) arises from spatial variation in labor supply, in revenues, or in nonlabor production costs.<sup>7</sup>

1. LABOR SUPPLY. To the extent that revenue and nonlabor costs are constant

<sup>7</sup> In this section we are referring to the spatial variation in the full wage offered to equally productive workers; that is, to wages adjusted for variation in worker quality, for fringe benefits, and for nonpecuniary returns to the job.

over space for the firm, the profit maximizing employer locates closer to workers to lower costs. Wage costs are minimized if such employers in otherwise competitive markets: (a) reduce their wages by the full amount of commuting costs saved by workers; and (b) hire only workers who live further away from the center of the city than the firm. If these two conditions hold, then households' demand for residential land is unaffected by the existence of suburbanized employment. As a result, wages offered by employers for equivalent jobs at different locations should vary by the amount of commuting costs saved by workers, assuming that no workers out-commute (White 1976, Ravallion 1979). That is, the spatial wage gradient is fully determined by the spatial labor supply function for competitive, ubiquitous firms. This theory predicts that suburbanization is most attractive for firms whose workers already live in the suburbs.<sup>8</sup> This is most likely to be the case for firms having a large percentage of high-income workers (since such workers are more likely to live in the suburbs) and for firms hiring married women (since married women workers are likely to live in the suburbs [White 1977] and may value commuting time at a higher rate [Beesley 1965]). Firms hiring predominately low income, male laborers could even have positive wage gradients, since they may not be able to hire enough workers in the suburbs without hiring out-commuters.

2. REVENUES AND NONLABOR PRODUCTION COSTS. Spatial variation in revenues arises from spatial variation in consumer demand for the final product—the higher the price elasticity of demand, the closer production sites are to consumption sites (Greenhut 1964). Spatial variation in production costs arises from

organizational factors such as scale economies, agglomeration economies, or zoning regulations, or from variation in the price of nonlabor inputs such as natural resources. If land markets are competitive, these phenomena result in higher land and/or labor costs for those firms in the lower production cost or higher revenue locations. The allocation of these returns between the land market (rent gradients) and the labor market (wage gradients) depends on: (a) the spatial distribution of worker residential locations; (b) the spatial elasticity of labor supply; and (c) the spatial distribution of competing employers.

To the extent that a location offering relatively high returns net of labor and land costs (that is, consumer demand, organizational factors or natural resource availability make the location particularly profitable) is distant from workers' residences, firms will pay higher wages than more accessible firms. The spatial wage gradient thus generated would reflect only the additional travel costs (time plus money) of workers. Other things being equal, workers employed by more distant firms will earn higher gross wages but equal net wages to workers employed closer to their homes.

However, if a firm in a location offering relatively high returns net of land costs and labor costs is spatially separated from competing employers,<sup>9</sup> the

<sup>8</sup> See White (1976) for a discussion of the conditions under which job suburbanization does cause a household's bid rent functions to shift and thus suburban employment subcenters to form. In particular this may be caused by firms moving so far out (perhaps to be near a circumferential highway) that they face a shortage of workers available in yet further-out locations and are forced to hire workers who must out-commute.

<sup>9</sup> There are numerous barriers which account for the failure of competing employers to destroy a firm's spatial monopsony in the labor market by locating at the same site. These include zoning regulations and technological and consumer demand restraints which do not permit

firm operates as a monopsonist in the labor market, hiring fewer workers at lower wages than a competitive employer would. Since the differences in the number of workers hired and in the wages paid increase with increases in the spatial inelasticity of labor supply, workers with more elastic spatial supply curves can earn *both* higher gross and net wages than workers with inelastic supply curves (Madden 1977a, 1977b). The higher wages paid to longer distance commuters are due to their higher travel costs *and* their higher wage elasticities. If women's spatial labor supply is more inelastic than men's, this theory predicts that women's lower earnings are partially the result of wage discrimination by spatial monopsonists<sup>10</sup> and could, therefore, be increased (without decreasing employment) by unionization, or by minimum wage and equal pay laws (Robinson 1934, Stigler 1946).

#### *Empirical Evidence of Spatial Wage Gradients*

There has been relatively little empirical study of spatial wage gradients in general, or by occupation or industry. Segal (1960) finds manufacturing wages in the counties surrounding New York City to be generally higher than those in New York City, although wages in the garment industry (a predominately female industry) are higher in the city. However, he finds a converging trend over time, reflecting, perhaps, decreasing costs for longer work trips.

Rees (1968) and Rees and Shultz (1970), in their study of the Chicago labor market, find evidence of systematic spatial wage gradients. For blue collar workers, they find a regional wage gradient which peaks in the southeast and falls off toward the northwest section of the city.

Labor markets for the two primarily female clerical occupations studied—keypunch operators and typists—were found to be of smaller geographic size. In fact, they were immediate neighborhood markets. Employers actually expressed preferences that female employees live nearby and some even had rigid hiring standards related to distance for females.<sup>11</sup> As a result, women experienced very little return from increased commuting. Interestingly, these results are consistent with a spatial monopsony labor market for female workers and a competitive market for male workers.

This empirical literature is far from definitive in identifying the many factors influencing spatial wage gradients. The major reason for the paucity of empirical results is the lack of wage data which controls for worker quality and which identifies the employment location.

#### *Summary*

If the work trip is an employment cost, then the higher wages earned by longer distance commuters compensate them for their higher costs. Women may make shorter trips than men because their employers have been better able to locate near their residences or, alternatively, because women experience greater disutility in travelling and thus experience higher commuting costs. If the wage differentials just compensate for their commuting cost differentials, as would be the

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profitable operation of more firms at a particular point in space. The firm's spatial monopsony position in the labor market will not result in supranormal profits. The profits will be dissipated through either higher land rents or higher prices of natural resources.

<sup>10</sup> Frank (1978a) finds that married women's wages are relatively lower in smaller labor markets.

<sup>11</sup> The data were collected in June 1963, prior to the Civil Rights Act of 1964 which made such procedures illegal.



case in a competitive market, then short distance commuters (women) are not adversely affected in the labor market since wages net of commuting costs are not decreased. On the other hand, if the relative immobility of the short distance commuters gives monopsony power to local employers, then short distance commuters' wages are lowered by the commuting cost differential *plus* a monopsonistic exploitation differential which increases as the spatial labor supply becomes more inelastic.

Because no empirical work has yet been able to sort out these alternatives, it is impossible to quantify the labor market effects or causes of women's shorter work trips. First, as discussed in more detail below, compensation for work trips occurs in housing markets as well as in labor markets and no study (or data) has been able simultaneously to control for both. Second, since both the competitive and the monopsonistic models predict a positive relationship between wages and length of work trips, accurate measurement of the cost of the work trip is critical to deciding between them for any labor market. More precise measurement of the value of travel time, particularly for women, is essential to the econometric identification of the spatial labor supply function that is necessary to determine the spatial wage elasticity of labor supply and the geographic dimensions of the labor market for men and women earners.

## II. RESIDENTIAL LAND MARKET EXPLANATIONS

Just as women are employed in different workplaces than men, they also select different residential locations. The shorter work trips of women indicate that

their residences are more tightly clustered around their workplaces (Kain 1962). Employed women are also more likely than employed men to reside closer to the city center (Kain 1962, Kaniss and Robins 1974). These differences in residential location reflect the differences in household characteristics of employed men and employed women. The most striking difference in the household composition of men and women workers is the greater likelihood of a nonemployed adult (i.e., housewife) in the multiperson households of employed men. Since employed women are more likely to have employed spouses (51.4% of women vs. 40.2% of men) and are also more likely to be unmarried and residing with dependent children (11.3% vs. a negligible percent of men), employed women: (a) are more likely than employed men to select a residential location conditional on another individual's workplace location; and (b) have greater housework responsibilities than employed men. These sex differences in household composition may result in women being more likely to take jobs from nearby employers to reduce time spent travelling, or alternatively, in their choosing smaller, more centrally-located residences. Furthermore, to the extent that women shoulder a disproportionate share of the housework in two earner households and reside at locations selected primarily for proximity to husband's job (as opposed to wife's job), then even when household composition is similar for employed men and women, sex differences in household roles may cause differences in work trips.

In contrast to the labor economics literature, the urban economics literature concentrates on residential location as the main determinant of women's work trip behavior. The basic analysis uses the

urban models of Muth (1969) and Mills (1972) as a starting point. In these simple models where it is assumed that all jobs are in the center, all workers are alike, and all households are alike, no sex differences in work trips are possible. However, the model can be extended to accommodate several of the differences in household status of employed men and women described above. In particular, the residential location effects of employed women earning less than men, having different job locations than men, and living in households with different demographic characteristics are analyzed and the implications for sex differences in work trip behavior are discussed below.

#### *Differentiating Households by Earnings*

Higher earnings have two effects on the household's willingness-to-pay for housing. First, higher income raises demand for housing at any given location, which tends to flatten the slope of the rent gradient. (Higher income households find the low price of land at suburban locations relatively more attractive than low income households do, since they buy more housing.) Second, higher earnings raise travel costs by increasing the value of time spent commuting. This results in a steeper bid rent gradient. For American households it is generally thought that the first effect outweighs the second and therefore that higher earnings lead to a net flattening of the bid rent gradient. This leads to rent gradients which increase in steepness as household earnings decrease, so that low earning households outbid higher earning households for centrally located land (Mills 1972).

Since female-headed households and unmarried women who live alone have lower earnings than similarly situated males, this extension of the urban model

predicts that female-headed households will reside closer to the city center and commute shorter distances than male-headed households. Although these residential location and work trip differences would appear statistically correlated with sex, earnings differentials rather than sex of household head would cause the observed differences in location and travel patterns.

#### *Differences in Household Demographic Structure*

As described above, female commuters come from households with substantially different demographic structures than male commuters. Households with different demographic structures are likely to have different tastes for accessibility to the city center and for housing space, and these taste differences result in residential location and work trip differences.

For example, employed men live in larger families than employed women. Since larger families tend to prefer more spacious housing, at given income levels they are more likely than smaller families to live in the suburbs where housing is cheaper but work trips are longer. Therefore, family size, rather than sex of tripmaker, can explain why employed women make shorter work trips.

Similarly, the needs or tastes of female-headed families may be quite different from those of husband-wife households where only the husband is employed. The theory so far would predict that an employed-husband, wife-and-two-children household would exhibit the same locational behavior as a household headed by an employed female and consisting of herself, her aged mother, and two children, assuming that both had the same income and job loca-

tion. However if the female head-of-household has more childcare responsibilities than the employed husband, then the former may incur greater disutility from commuting and may choose to live closer to her job. Furthermore, families headed by unmarried workers, which are disproportionately female, may prefer central city locations even if they work in the suburbs, since the ancillary services devoted to their interests—day care centers, restaurants and entertainment catering to the interests of unmarried people—are there.

### *Two-Earner Households*

The basic urban model assumes that households each have a single earner. The rapidly rising labor force participation rates of married women make this assumption inaccurate. An urban model of the behavior of two-earner households is clearly needed. However, constructing such a theory raises difficult issues. In the following sections we describe two separate approaches to such a theory.

1. TRADITIONAL DECISION-MAKING. Kain (1962) postulated that for the second earner in a two-earner household, the usual causal relationship between job and residential location might be reversed. Rather than viewing their job location as fixed and deciding on a utility-maximizing residential location, married women workers might view their residential locations as fixed and decide on a utility-maximizing job location. This theory implies a two-stage decision-making process for the two-earner household. First, its residential location is determined with respect to the husband's fixed job location and, second, the wife's job location is determined with respect to the household's fixed residential

location. In making the first stage decision, the household would anticipate the wife's work pattern and her expected earnings, so that the household would choose its residential location by trading off accessibility and demand for space relative to the husband's job location only, but assuming that its income level is the sum of expected earnings by both husband and wife.

This theory leads to the hypothesis that single and two-earner households having the same overall "real" household income level will exhibit the same housing consumption behavior and will choose the same length commuting journey for their male workers if they have the same job locations. However, a comparison of the money incomes of single and two-earner households is misleading. Because nonemployed wives produce household services, a single earner household with the same money income as a two-earner household actually has a higher real income. While no study has dealt adequately with this measurement problem, Duker (1970) and Vickery (1979) find two-earner households consistently consuming less housing than single earner families having the same money income. Duker attributes this difference to two-earner households (and/or banks) viewing wives' income as transitory rather than permanent, while Vickery argues that cuts in housing expenditures are necessary to meet the added expenses of a wife's employment. This difference may also be the result of differences in residential location choices of employed wives and housewives. In a similar vein, Schafer (1978) has found systematic differences across household categories in choice of both residential location and type of housing.

The work trip implications of this hypothesis are less clear. While Kain

(1962) suggested this decision mechanism as an explanation for the shorter work trips of women, such a decision-making process would also be consistent with women making longer work trips. If a wife has specialized skills and does not select her residence with respect to her workplace location, she may well have to commute much longer distances for an appropriate job. Only if it is assumed that wives are unskilled, are low earners, or value their time highly relative to their wage, are shorter work trips to be expected.

2. NONTRADITIONAL HOUSEHOLD DECISION-MAKING. The traditional decision-making theory sketched above is schizophrenic in that it assumes the household acts in one way with respect to the husband's job and in another way with respect to the wife's. An alternative theory would assume that the household acts symmetrically with respect to both husband and wife. Oi (1976) and White (1977) propose theories in which the household maximizes a utility function defined over the leisure time of both the husband and wife, subject to a household budget constraint and time constraints for each. White assumes fixed job locations for both workers and then derives a bid rent function for two-earner households. If married women are assumed to work in the suburbs and all men to work at the city center, then two-earner households are likely to locate in a ring around the job locations of their suburban worker, while single-earner households will locate both closer in and further out. In this case the model predicts that married women workers will have shorter commuting journeys than men workers, single or married, and that married women workers are more likely to have nonradial commuting trips.<sup>12</sup>

Unfortunately these predictions are similar to those of the traditional decision-making theory and do not enable us to differentiate empirically between the two theories. Married women earners may either choose shorter commuting journeys to be near homes that are selected with respect to the husband's job or they may choose shorter commuting journeys because jobs employing women have themselves tended to move to the suburbs.

Alternatively, if all workers—men and women—have jobs at the center, then no clear predictions emerge from the non-traditional theory. Two-earner households would tend to have higher commuting costs—which “pull” them in towards the center, but have higher money incomes—which “push” them out to the suburbs (assuming that their real incomes are also greater). Again no testable hypotheses emerge which would differentiate the two theories.

### *Summary*

If the work trip is a cost which households trade-off against lower housing prices, then households that consume more housing—typically large households and high income households—are more likely to find longer commuting journeys worthwhile. Since over 40% of the female labor force is unmarried with substantially lower earnings than employed men and since employed women reside in smaller households than employed men, employed women are less likely than employed men to find their

<sup>12</sup> Wolforth (1965), for example, finds that women with employed husbands have shorter commuting trips than all workers and that men with employed wives have longer commuting trips than all workers. His results are consistent with a variety of theories of household decision making.

longer work trips adequately compensated by lower housing prices. Women are therefore more likely to select residences closer to their jobs and to make shorter work trips because they earn less and have smaller families.

The effect on work trips of women being more likely than men to reside in two-earner families is less apparent. Depending on the location of male and female employment, on the nature of household decision-making, and on the size of the income effect on housing demand, women in two-earner families may commute more or less than men or unmarried women. It is necessary to simultaneously model the work location and residential location choices of the household to measure the effect of a wife's labor force participation on work trip length for either spouse.

### III. CONCLUSION

The theories synthesized in this review suggest that a more general "urban/labor economic" model is needed to explain workplace-residence separation. In such a model spatial equilibrium in both urban land and labor markets would be simultaneously determined, i.e., in equilibrium households could not be made better off by moving either their residential or their job locations nor could firms be made better off by moving their facilities. In this case workers living the same distance from the center of the city but commuting different distances would be compensated in the labor market for their longer commuting journeys. Workers with more centrally located jobs would get higher wages; workers with jobs at the same locations who commute different distances would be compensated in the land market; workers with more sub-

urban residential locations would pay less for housing. Only within the context of such a complete model is it possible to quantify the causes and effects of different work trip behavior of men and women workers or any workers who differ so drastically in both household and labor force characteristics and to project the spatial effects of compositional changes in the urban labor force.

Furthermore, this review suggests that there are formidable problems for empirical studies of sex differences in work trips. Such studies inevitably involve samples of households having varying job and residential locations who, therefore, receive compensation for commuting in both the labor market and the land market. A way out of this dilemma is to sample workers who either live or work at the same location. Hecht (1974), for example, collected data on income, household structure, and housing location for workers with jobs at centrally located firms in Worcester, Massachusetts. In this case all compensation for commuting is in the land market. Interestingly, he is the only researcher surveyed who finds that, controlling for income, married workers and female workers have longer rather than shorter commuting journeys. Unfortunately, Hecht combined all workers in the same regression, thereby not considering the possibility that workers in single or two-earner households might decide on residential locations according to different models.

However, workplace data does not necessarily solve the simultaneity problem. For example, if workplace data is collected for a suburban employer, then the theory predicts that workers whose residences are *more* suburban than the workplace pay less for housing as they commute further, but workers whose residences are *less* suburban than the

workplace pay more for housing as they commute further. Thus the return to commuting can be positive, negative or zero,<sup>13</sup> depending on the direction of travel. The same problem applies when workers' residential locations are held constant. If all workers in-commute then all compensation for extra commuting is in the labor market; but if some workers out-commute then the wage return to commuting depends on the direction of travel.

In analyzing the extent of men's versus women's workplace-residence separation, two tasks emerge: the land and labor market influences on commuting must be sorted out, and in addition, the extra factors affecting women's decisions must be distinguished from those affecting workers in general. Until the relative contribution of sex differences in commuting preferences, job outcomes, and housing preferences to sex differences in workplace-residence separation is precisely quantified, it is impossible to gauge the spatial impact of increasing female labor force participation. As a result, the researcher cannot advise the policymaker or the urban planner whether this phenomena will increase or decrease urban densities, the size of geographic labor markets, or the demand for public transit. Credible stories and ad hoc statistics can be presented to support trends toward increasing spatial dispersion by citing increases in labor force participation among mothers with young children who reside in the suburbs and attract employers to the suburbs. Alternately, trends toward decreasing spatial dispersion are supported by noting that the increased female labor force participation is correlated with smaller households which will locate more centrally, decreasing workplace-residence separation for both men and women. Note that

these contrary conclusions are due to conflicting notions of who moves: employers or employees. To resolve this conflict, a general equilibrium model which clears land and labor markets for both firms and households is necessary. Additions to the body of ad hoc empirical results cannot resolve the issue.

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<sup>13</sup> It is zero for circumferential commuting.

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