On Modeling the Choice and Frequency of Home-Based Telecommuting

Yasasvi D. Popuri and Chandra R. Bhat

Yasasvi D. Popuri
Cambridge Systematics, Inc.
20 N. Wacker Drive, Suite 1475, Chicago, IL 60606
Tel: (312) 346-9907, E-mail: ydp@camsys.com

Dr. Chandra R. Bhat
The University of Texas at Austin, Department of Civil Engineering,
1 University Station C1761, Austin, Texas 78712-0278
Tel: (512) 471-4535, Fax: (512) 475-8744, E-mail: bhat@mail.utexas.edu

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ABSTRACT
This paper proposes a joint model of home-based telecommuting choice and weekly telecommuting frequency. The model is applied to an empirical analysis using data from a household survey conducted by the New York Metropolitan Transportation Council. The empirical results underscore the importance of socioeconomic and occupational characteristics of employees in explaining telecommuting behavior. Further, the analysis also indicates that failure to accommodate common unobserved factors affecting telecommuting choice and frequency can lead to inconsistent estimation of the effects of exogenous variables and misleading projections of the magnitude of telecommuting.

1. INTRODUCTION

There have been rapid advances in telecommunications and information technologies in the last two decades. These advances, and their applications, have the potential to generate substantial changes in the economic and social fabric of society. One application of interest to planners and policy-makers, due to its potential to mitigate urban traffic congestion and reduce vehicle emissions, is the telecommuting work option. Telecommuting is defined as using technologies to work at home or at a location close to home, instead of commuting to a conventional work place at the conventional time (*1*). Estimates of the number of telecommuters within the United States for 2000 have ranged from seventeen to eighteen million, with an annual growth rate forecast of 18% (*2*). Companies such as AT&T, Pacific Bell, IBM, GE, Walt Disney Co., Blue Cross/Blue Shield and American Express, among others, are strong promoters of the telecommuting concept. These companies specialize in occupations that require high usage of computers and telecommunications, which makes telecommuting a viable option to a large number of their employees. In turn, these companies may realize savings in office space and other office overheads.

An essential element in determining the potential impacts of telecommuting is the extent to which it is adopted by firms and their employees. Early predictions of the amount of telecommuting, and the consequent effect on travel, focused exclusively on the substitution effect of telecommuting. However, it has become clear that telecommuting will not only substitute for work trips, but will also generate new trips due to travel to a satellite office, travel that was previously linked to the work commute, travel generated by increased leisure time, and travel performed by other household members due to the increasing availability of a vehicle [(*3-5*); see Popuri for a recent detailed literature review (*6*)]. In addition, telecommuting increases the flexibility to schedule activities over space and time. This flexibility has critical consequences for future planning of transportation systems.

As should be clear from the above discussion, telecommuting impacts are complex. This has led to several studies aimed at examining telecommuting impacts in the planning, transportation, management, and sociology fields. The early telecommuting research in these fields was qualitative, hypothesizing the factors affecting telecommuting adoption and its consequent impacts on the environment. However, more recent efforts in telecommuting research have been directed toward quantitatively modeling the telecommuting adoption process and related environmental effects. While these quantitative studies have provided useful insights, a problem has been the use of inadequately small samples of frequent telecommuters (*7*). In addition, several of these quantitative studies have used stated preference surveys, which are less useful for directly predicting the rate of adoption of telecommuting than actual observed actions, or revealed preferences. In this regard, Mannering and Mokhtarian point out that the increase in the number of telecommuters makes it feasible and desirable to use revealed preference data to analyze telecommuting (*8*).

The objective of this paper is to contribute to the telecommuting literature by examining revealed preference data to analyze the choice as well as frequency of home-based telecommuting. The data used in empirical analysis is drawn from the Regional Transportation Household Interview Survey (RT-HIS) conducted by the New York Metropolitan Transportation Council (NYMTC) and the North Jersey Transportation Planning Authority (NJTPA). The RT-HIS is well suited to an analysis of telecommuting for several reasons. First, the survey provides information on actual telecommuting behavior rather than stated intentions or preferences (telecommuting is defined in the RT-HIS survey as “working form home using

telecommunications and/or computers to maintain direct linkages to the main office"). Second, the survey reduces the ambiguity in the difference between home-based telecommuting and operation of a home-based business by asking if home was the primary/main work place. Home-based telecommuters are likely to respond negatively, while individuals with a home-based business would respond positively. Third, in addition to whether or not a person is telecommuting, the survey also collected information on telecommuting frequency. This additional information on frequency is valuable in jointly studying telecommuting adoption choice and frequency. Fourth, the RT-HIS collected data from a wide variety of individuals, representing varying demographic and occupational characteristics. This enables the consideration of a multitude of factors affecting the choice to telecommute. Finally, and most importantly, the RT-HIS provides a large sample compared to most other surveys used for telecommuting analysis, offering the opportunity for a rigorous analysis of telecommuting choice and frequency[1].

The rest of this paper is structured as follows. The next section provides an overview of previous research examining telecommuting adoption. Section 3 describes the modeling structure used in this study. Section 4 introduces the data sources used for empirical analysis and discusses some of the sample characteristics. Section 5 presents the empirical results. Section 6 discusses the policy implications of the results obtained in this study. Finally, Section 7 identifies possible extensions of this study.

2. EARLIER STUDIES

A substantial body of research on individual telecommuting choice modeling has been accumulated in the past two decades. Early work on telecommuting adoption was largely qualitative, and focused on examining the motivations and deterrents to telecommuting [see for example, Edwards and Edwards (*9*), Gordon (*10*), Nilles (*11*)]. The qualitative discussion on the adoption process has taken new quantitative directions more recently, through the development of adoption frameworks and subsequent operationalization through probabilistic behavioral models.

The decision to telecommute is complex and is governed by a host of demographic, occupational, and attitudinal factors (*12*). Several researchers have used stated preference surveys to examine the impact of these factors on telecommuting choice. For example, Sullivan *et al*. estimated a multinomial logit model to analyze participation in telecommuting using a stated preference survey of employees of information-oriented firms in Austin, Dallas and Houston (*13*). Their model included travel, work, and socioeconomic variables, and was aimed at understanding the characteristics of individuals and work places that leads to a preference for telecommuting.

Mokhtarian and Salomon presented a conceptual framework for explaining the choice of employee telecommuting by making a distinction between factors or drives motivating telecommuting adoption, and binding constraints to the adoption (*14*). They noted that

[1] An important note is in order here. We use the term telecommuting choice or telecommuting adoption interchangeably with the presence of a telecommuting arrangement. In practice, a particular individual may not be provided the opportunity to telecommute in her/his current job, and so might not have a choice to make. The current study, therefore, confounds the availability of the telecommuting option with the adoption of telecommuting given an opportunity to telecommute. However, it can also be argued that, over a longer run, individuals do decide whether to telecommute or not by switching jobs, changing work arrangements, or specializing in occupations more conducive to telecommuting. Thus, at least over the long run, one can view the presence of a telecommuting arrangement as a manifestation of basic individual desires regarding telecommuting.

individuals have the choice to telecommute only when the constraints are not binding. In another study, Mokhtarian and Salomon tested the role of constraints in telecommuting choice, and distinguished between telecommuting preference models and choice models (*15*). Their work found that although 88% of the respondents preferred to telecommute, only 13% actually telecommuted, indicating the significant presence of constraints. Mokhtarian and Salomon used binary logit models for the choice of telecommuting and demonstrated the important role played by attitudinal measures on telecommuting adoption (*16*).

The studies mentioned above did not distinguish between the many possible forms of telecommuting (for example, home-based telecommuting versus center-based telecommuting). Bagley and Mokhtarian analyzed this dimension of telecommuting by administering surveys that asked respondents to state their preferred frequency of telecommuting from home and from a neighborhood center (*1*). These preferences were then modeled as a function of individual socio-economic and job-related variables as reported by the respondents. Their study found that most respondents either preferred to telecommute from home or were indifferent between home-based and neighborhood center telecommuting. This raises the question of whether there is a place in the market for telecommuting centers, and whether such centers can significantly contribute to transportation demand reduction.

The stated preference-based studies discussed above have provided useful insights into the factors affecting telecommuting choice. However, a better quantification of the rate of telecommuting adoption would be possible by analyzing data from revealed preference surveys (*7*, *17*). One such study was undertaken by Mannering and Mokhtarian, who examined the characteristics of telecommuters using three surveys conducted in 1992 that collected data pertaining to job attributes, family and socio-demographic characteristics, travel behavior, and attitudes toward telecommuting (*8*). A multinomial logit estimation revealed that telecommuting was positively correlated with larger household sizes, the presence of small children in the household, more vehicles in the household, higher degrees of family devotion, familiarity with other telecommuters, preferences for working alone, and being a male. Greater telecommuting frequencies were also associated with personal control over job-task scheduling, supervisory status, and the ability to borrow a computer from work. Distance and travel time to work, the amount of work time spent in face-to-face contacts, and occupation type were unexpectedly insignificant in determining telecommuting frequency. However, the study was limited by a small sample size and by a small percentage of frequent telecommuters within the survey sample. Further, telecommuting frequency was represented as a binary variable (infrequent versus frequent), rather than as the number of telecommuting days per time unit.

Belanger, in another revealed preference study, found that gender and job type influenced the choice to telecommute for Virginia corporate managers, but that age, years of tenure with the current organization, and years of personal computer ownership did not (*18*). Handy and Mokhtarian summarized the results of several California studies, indicating that higher household incomes, longer average commute distances, and supervisory occupation had significant positive influences on rates of working from home (*19*).

In a more recent study using revealed preference data, Drucker and Khattak examined work-at-home and telecommuting arrangements using data from the 1995 Nationwide Personal Transportation Survey (NPTS) (*7*). Their analysis was wider in its geographic scope than earlier studies and provided useful insights into the factors that govern the propensity to work from home using a large sample. In particular, their study indicated that educational attainment and the presence of small children in the household encourage working from home. Further, they found

that males and drivers choose to work from home more often than females and nondrivers, and that the lack of free parking at work promotes homework. The main limitation of their study is that it does not quantify telecommuting frequency precisely. Instead, telecommuters are classified as being frequent or infrequent, similar to the study by Mannering and Mokhtarian (*8*). In addition, due to the lack of data on individual occupational variables, their study could not consider the effect of job-related variables on the decision to telecommute, and could not differentiate between employees and self-employed individuals.

The studies by Mannering and Mokhtarian, Drucker and Khattak, and other revealed preference studies of telecommuting have made important contributions to the telecommuting literature. This study, also based on a revealed preference survey, adds to this existing body of telecommuting literature in several ways. First, it uses a large revealed preference sample from a single urban area (*i.e.*, the New York City metropolitan area) to examine telecommuting choice. The sample includes a sizable number of telecommuters. Second, the study uses an unambiguous definition of telecommuting frequency as the "number of days of telecommuting per week". Third, the current study recognizes that the telecommuting choice decision (*i.e.*, whether to telecommute at all or not) and the frequency of telecommuting may be governed by quite different underlying behavioral processes rather than being governed by a single behavioral process. The latter assumption would tie the telecommuting choice and frequency decisions very tightly, which may not be appropriate. Fourth, our modeling framework recognizes that, while the choice and frequency decision may not be tied very tightly, they may be related to each other. Thus, for example, individuals with children may be more likely to choose to telecommute and may also telecommute frequently. Similarly, unobserved factors (such as being techno-savvy or having a general preference to travel less) may increase the propensity to telecommute and increase the frequency of telecommuting. Our formulation considers the choice and frequency decisions within a joint framework to accommodate such observed and unobserved correlations in the two decisions.

3. MODEL STRUCTURE AND ESTIMATION

The approach adopted in this study uses two equations, one for telecommuting choice and the other for the number of telecommuting days per week. In addition, it accounts for the correlation in error terms between the two equations. That is, it accounts for the potential presence of unobserved individual factors (such as, say, being techno-savvy or having an overall preference for less travel) that influences both the telecommuting participation decision as well as the telecommuting frequency decision. The model system is as follows:

$$t_i^* = \gamma' X_i + \varepsilon_i,\ t_i = 1 \text{ if } t_i^* > 0 \text{ and } t_i = 0 \text{ if } t_i^* \le 0 \qquad (1)$$
$$N_i^* = \alpha' Z_i + \eta_i,\ N_i = j \text{ if } a_{j-1} < N_i^* \le a_j,\ j = 1,2,\ldots,J,\ N_i \text{ observed only if } t_i^* > 0,$$

where i is an index for individuals, t_i is an observed binary variable indicating whether or not a person has chosen to telecommute (t_i =1 if person telecommutes, 0 otherwise), t_i^* is an underlying continuous variable related to the observed binary variable t_i as shown above, N_i is an observed ordinal variable representing the number of days per week that individual i telecommutes, N_i^* is a latent continuous variable representing the propensity underlying the telecommuting frequency decision, the a_j's represent thresholds that relate N_i^* to the observed

variable N_i in the usual ordered-response structure, X_i and Z_i are vectors of explanatory variables, γ and α are vectors of parameters to be estimated, and ε_i and η_i are normal random error terms assumed to be identically distributed across observations with a mean of zero and variance of 1.[2]

The error terms are assumed to follow a bivariate normal distribution. The probability that a person telecommutes and does so for *j* days each week can then be written from Equation (1) as:

$$\text{Prob}\,(t_i = 1, N_i = j) = \Phi_2\left(a_j - \alpha' Z_i; \gamma' X_i; -\rho\right) - \Phi_2\left(a_{j-1} - \alpha' Z_i; \gamma' X_i; -\rho\right) \quad (2)$$

where ρ is the correlation between the error terms ε_i and η_i, and Φ_2 is the cumulative standard bivariate normal function. We now define a set of dummy variables M_{ij} as below:

$$\begin{aligned} &M_{ij} = 1, \quad \text{if } N_i = j \text{ (i.e., } a_{j-1} < N_i^* \le a_j\text{), and} \\ &M_{ij} = 0, \quad \text{otherwise.} \end{aligned} \quad (3)$$

The appropriate maximum likelihood function for estimation of the parameters in the model system is:

$$L_f = \prod_{i=1}^{I} \left[1 - \Phi(\gamma' X_i)\right]^{1-t_i} \times \left\{ \prod_{j=1}^{J} \left[\Phi_2\left(a_j - \alpha' Z_i; \gamma' X_i; -\rho\right) - \Phi_2\left(a_{j-1} - \alpha' Z_i; \gamma' X_i; -\rho\right)\right]^{M_{ij}} \right\}^{t_i} \quad (4)$$

The parameters α, γ, and ρ are estimated by maximizing the likelihood function in Equation (4). If the correlation between the error terms (ρ) is zero, Equation (4) simplifies to two independent models, one for the binary telecommuting participation choice and the other for the number of days of telecommuting. In general, ignoring ρ and estimating independent models for telecommuting choice and number of weekly telecommuting days will lead to biased parameter estimates. The model estimation was pursued using the LIMDEP software package.

4. SAMPLE DESCRIPTION

4.1. Data Source and Assembly

The data source used for analysis in this study is the 1997/98 Regional Transportation Household Interview Survey (RT-HIS) conducted by the New York Metropolitan Transportation Council (NYMTC) and the North Jersey Transportation Planning Authority (NJTPA). The survey recruited households by random digit dialing and administered a "recruitment interview" as soon as a household was reached. This interview informed respondents of the purpose of the survey, and the overall process of data collection. In total, 14,441 households were recruited to participate in the study, of which 11,264 households completed travel diaries and provided sociodemographic and occupation-related data.

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[2] The time unit used to measure frequency of telecommuting is a week in the definition of N_i in Equation (1). In the RT-HIS survey, respondents had the option to indicate that they telecommuted less than once a week, but only 7 of the 1,028 telecommuters indicated doing so and we categorized these 7 individuals as telecommuting once a week.

The data assembly process involved several steps. First, employed individuals were selected from the overall sample. Second, the travel, sociodemographic, and occupational characteristics of employed individuals were assembled into a single file. Third, income values were imputed for households that did not provide income using information from households that responded to the income question. Finally, the resulting sample was subjected to several screening and consistency checks. The final sample for analysis included 6,532 individuals [the reader is referred to Popuri for complete details of the sample development process (*6*)].

4.2. Sample Characteristics

The data sample used for estimation included 1,028 telecommuters (15.7% of the overall sample). Among these telecommuters, 54% telecommute once a week or less, 14.5% telecommute twice a week, 8.3% telecommute thrice a week and 23.2% telecommute four or more days a week. The mean number of telecommuting days among telecommuters is 2 days per week.

Of the 6,532 individuals in the data sample, 5,448 individuals (83.4%) worked on a full-time basis, while 1,084 individuals (16.6%) worked on a part time basis. A slightly larger fraction (16%) of part-time employees chose to telecommute as compared to full-time workers (14.3%). This result may be attributed to the desire for flexibility among part-time workers or for time investment in activities unrelated to work.

The sample comprised 3,159 (48.4%) male workers and 3,373 (51.6%) female workers. The employed female-male ratio in the current sample is slightly higher than the ratio reported by the U.S. Census Data for the New York urban region in the year 2000 [47.2% females, 52.8% males (*20*)]. This overrepresentation of women may be due to a larger response rate among women compared to men. A cross-tabulation analysis between the sex of the individual and the choice to telecommute indicates that 18% of men telecommute compared to 14% of women.

Of the 6,532 individuals considered in the final data sample, 5,193 (79.5%) individuals worked for a private sector firm and 1,339 individuals (20.5%) worked in the public sector. A cross-tabulation between company type and telecommuting adoption indicates that about 18% of employees from privately owned firms telecommute, compared to only about 10.5% of employees from public sector companies.

For many explanatory variables considered in our models, we had strong *a priori* expectations regarding the direction of their impact on telecommuting choice. For example, higher income individuals are more likely to telecommute than lower income individuals. Similarly, we anticipated that the presence of young kids in the household would increase the propensity to telecommute. However, for some of the variables considered in the specifications, we had no *a priori* expectations about the directionality of their effect. These variables were included to explore their effects on telecommuting choice and frequency using empirical data.

The final model specifications were developed by adopting a systematic process of introducing new variables to the most naive model (*i.e.*, the constants only model), eliminating statistically insignificant variables, and combining variables when their effects were not significantly different. This systematic statistical process was informed by intuitive considerations. The model results are presented in the following section.

5. EMPIRICAL RESULTS

Two different model structures are estimated in the current study: (a) an independent model, which does not account for common unobserved factors influencing the choice of telecommuting

and weekly telecommuting frequency, and (b) a sample selection model, which accounts for common unobserved characteristics affecting the choice of telecommuting and weekly telecommuting frequency. Table 1 presents the parameter estimates for both these models. In the next few sections, we discuss the effects of variables without distinguishing between the results of the independent and sample selection models (the general effects of variables are the same between the two models). In Section 5.4, we discuss the differences between the results of the two models.

5.1. Effect of Individual Sociodemographics

Among the individual demographic variables, the effects of the female-related variables suggest that women are less likely to telecommute than men if there are no children in the household. However, if there are children in the household, women and men are about equally likely to telecommute, though women are likely to telecommute more frequently. The influence of age suggests that there is no difference in telecommuting choice between old and young individuals; however, among telecommuters, older individuals are likely to be telecommuting more frequently than younger individuals. This may be a consequence of the greater ability of experienced, older, employees to determine work arrangements compared to relatively new, younger, employees (we also attempted non-linear effects of the age variable, but these non-linear effects were difficult to interpret and also did not improve the log-likelihood value substantially).

Marital status has a positive effect on both the choice to telecommute and the frequency of telecommuting. This supports the results obtained by previous researchers and suggests that married individuals are more committed to household obligations than unmarried individuals, and therefore prefer to telecommute frequently. Further, the work place can be viewed as an environment for social networking, which is more sought by unmarried individuals than married individuals. The influence of college education attainment also shows a marginally positive effect on the propensity to work from home. This result indicates that telecommuting is closely related to employment in occupations that require higher levels of education. The result may also be a reflection of the close association between telecommuting propensity and proficiency with modern technology, which is normally associated with higher education levels.

Finally, within the category of individual sociodemographics, individuals with several vehicles in their household, individuals who drive to work, and individuals with a driver's license, are more likely to work from home. The results also indicate that transit users are less likely to telecommute than transit non-users. This latter result may be a proxy for low income earnings. Specifically, transit users may be low income wage earners, who may not be in telecommuting-friendly occupations or positions.

5.2. Effect of Individual Job-Related Variables

The individual job-related variables indicate that individuals working in private companies are more likely to telecommute, perhaps because of the more flexible work schedules of private companies compared to public companies. Moreover, private sector companies may be associated with technology and information-related jobs, which present a more conducive environment for telecommuting. In addition, workers requiring face-to-face interaction with their colleagues, superiors or clients on a daily basis tend to show lower propensities to telecommute. The face-to-face interaction variable, however, does not indicate any effect on the weekly frequency of telecommuting, showing that the extent of personal contact at the work place

determines the choice of telecommuting but does not affect the decision of weekly telecommuting frequency.

The employment status variable shows that part-time employees are more likely to telecommute than are full-time employees. Further, part-time employees also telecommute more frequently than the full-time employees. It may be argued that employers are in general less willing to allow part-time employees to telecommute and that relatively fewer part-time jobs are in occupations that are telecommuting-friendly. However, the positive sign on the part-time employment variable is perhaps due to the increased flexibility that telecommuting provides to part-time employees who may want to pursue activities unrelated to work. The positive coefficient on the "pay to park at work" variable indicates, as expected, that individuals are more likely to telecommute and telecommute frequently if they are required to pay to park at their workplace. Finally, employees with a long period of service with the current employer tend to be more inclined to telecommute.

5.3. Effect of Household Socio-Demographics

The empirical results associated with household sociodemographics show that individuals in households with higher incomes are more likely to telecommute and telecommute frequently, possibly because high income individuals are in occupations that are telecommuting-friendly.

The presence of fax machines at home and multiple telephone lines increases both telecommuting propensity and frequency of working from home. This finding is intuitive because better access to telecommunication devices at home makes telecommuting more viable.

5.4. Unobserved Correlation and Data Fit

The magnitude and significance of the correlation term ρ in the sample selection model (see third row from bottom in Table 1) indicate that there is a very substantial and significant positive correlation in unobserved factors affecting telecommuting choice and telecommuting frequency. These unobserved factors may reflect individual traits, such as being techno-savvy, a desire for independence and leisure, a desire for enhanced interaction with family, and an aversion to the work-related commute. The independent model ignores the presence of such common unobserved factors affecting choice and frequency. The consequence is that the independent model overestimates the magnitude of effects of independent variables on telecommuting frequency, as can be readily observed by comparing the estimates in the frequency models of the independent and sample selection models. Such a result is to be expected because telecommuting frequency is conditional on a positive telecommuting choice decision. Thus, if the effect of unobserved factors common to telecommuting choice and frequency are ignored, these unobserved effects on frequency are manifested as artificial inflations of the exogenous variable effects in the frequency model in the direction of their effects on choice (note that doing so generates a higher positive correlation between choice and frequency in the independent model to make up, incorrectly, for the positive correlation due to unobserved factors).

The independent model clearly results in the inconsistent estimation of parameters in the telecommuting frequency model. However, the parameter estimates themselves do not provide a measure of data fit. The last two rows of Table 1 focus on measures of data fit. In both the independent and sample selection models, a nested likelihood ratio index test between the log-likelihood values at convergence and with only constants clearly indicates that individual demographic, job related, and, household demographic variables play an important role in determining telecommuting choice and frequency. In addition, a nested likelihood ratio index

comparison of the convergent log-likelihood values of the independent and sample selection models provides a value of 212.5, which is far greater than the chi-squared table value with 1 degree of freedom at any reasonable level of significance. Thus, the sample selection model provides a superior data fit compared to the independent model.

6. USE OF MODEL FOR POLICY ASSESSMENT

The empirical results discussed in the previous section indicate the strong impact of socio-demographic and employment-related characteristics on telecommuting choice and frequency. These results have substantial implications for transportation planning analysis, especially because of the projected changes in demographic and employment-related variables over the next few decades. For instance, according to projections by the Population Research Institute, 24.3% of the population of the United States will be 65 years or older in 2020 as compared to 16.5% today (*21*). Similarly, the structure of the household is changing rapidly, with an increase in households with no children (projections suggest that households with no children below 18 years of age will increase from approximately 53% today to about 60% in the next decade (*22*). The number of employed individuals in the household is also on the rise (*23*) and this trend is likely to continue. All of these demographic and employment changes will have an effect on the choice of telecommuting and subsequently the frequency of telecommuting. The models estimated in this paper can be used to assess these impacts and to provide reliable information regarding the extent of telecommuting.

7. SUMMARY AND CONCLUSIONS

This paper has presented a joint discrete choice model of home-based telecommuting adoption and weekly home-based telecommuting frequency using a revealed preference survey collected in the New York metropolitan region. The results indicate that individual demographics, work-related attributes and household demographics are significant determinants of telecommuting adoption and frequency. Further, the analysis also indicates that failure to accommodate for common unobserved factors affecting telecommuting adoption and frequency can lead to inconsistent parameter estimates and, therefore, misleading projections of the magnitude of telecommuting.

An important limitation of the current study is that it considers only home-based telecommuting. While home-based telecommuting is the dominant form of telecommuting today, insights into other forms of telecommuting, such as regional center telecommuting and neighborhood center telecommuting, are essential to the reliable estimation of overall telecommuting impacts. Unfortunately, the scope of the current study is limited to home-based telecommuting because of data constraints. Future work should consider a comprehensive analysis of all forms of telecommuting jointly to obtain a more reliable quantification of telecommuting patterns and the consequent travel impacts.

The Regional Transportation Household Interview Survey (RT-HIS) used in this study is a cross-sectional survey providing a “snapshot” of telecommuting behavior at one point in time. It does not provide information on the “time path” of telecommuting behavior. A dynamic analysis of telecommuting behavior using revealed preference data collected over a continuous time frame is an important direction for future research.

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TABLE 1 Estimated Model Parameters for Explanatory Variables

Explanatory Variables	Independent Model				Sample Selection Model			
	Telecommuting Choice Model		Weekly Telecommuting Frequency Model		Telecommuting Choice Model		Weekly Telecommuting Frequency Model	
	Parameter	t-stat	Parameter	t-stat	Parameter	t-stat	Parameter	t-stat
Individual Sociodemographic Variables								
Constant	-1.494	-10.782	-1.108	-0.480	-1.524	-11.899	-1.124	-0.671
Female	-0.089	-2.047	--	--	-0.081	-1.940	--	--
Female with children	+0.119	+1.925	+0.420	+3.110	+0.111	+1.915	+0.273	+3.447
Age	--	--	+0.127	+4.321	--	--	+0.059	+2.864
Married?	+0.123	+1.643	+0.281	+2.670	+0.081	+1.114	+0.157	+2.308
College education	+0.128	+1.666	+0.749	+1.224	+0.121	+1.648	+0.656	+1.316
Many vehicles?	+0.161	+1.451	+0.550	+1.987	+0.172	+1.225	+0.271	+1.234
Drive to work?	+0.007	+2.106	+0.118	+1.081	+0.005	+1.891	+0.107	+1.020
Licensed driver?	+0.183	+2.308	--	--	+0.141	+2.088	--	--
Transit to work	-0.411	-5.830	-1.039	-6.496	-0.420	-5.877	-0.205	-1.633
Individual Job-Related Variables								
Work in a private company	+0.284	+5.481	+0.304	+4.454	+0.278	+5.457	+0.188	+1.696
Face-to-face interaction needed at work?	-0.094	-1.593	--	--	-0.151	-3.074	--	--
Part-time employment	+0.183	+1.262	+0.184	+1.693	+0.150	+1.082	+0.180	+2.200
Pay to park at work?	+0.340	+1.654	+0.114	+1.452	+0.298	+1.610	+0.103	+1.232
Length of service	+0.066	+2.373	--	--	+0.059	+2.368	--	--
Household Sociodemographic Variables								
HH income ($10,000)	+0.121	+2.062	+0.373	+3.318	+0.108	+1.871	+0.288	+3.792
Fax at home?	+0.391	+6.096	+0.305	+3.515	+0.383	+5.754	+0.163	+1.786
Multiple phone lines at home?	+0.065	+1.692	+0.133	+1.913	+0.059	+1.484	+0.042	+0.827
Number of Observations (N)	6,532		1,028		6,532		6,532	
Correlation parameter	0.000(-)				0.794(18.994)			
Log-likelihood at sample shares	-4034.45				-4034.45			
Log-likelihood at convergence	-3645.54				-3539.29			