An Analysis of Weekend Work Activity Patterns in the San Francisco Bay Area

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ABSTRACT

The purpose of this study is to examine the spatial and temporal characteristics of weekend work episodes. Specifically, we examine whether individuals work over the weekend and, if they work, whether they work at home or outside the home. We also model the time of day of weekend work. The empirical analysis in the paper is based on the 2000 San Francisco Bay Area Travel Survey. The results indicate the important effects of day of week/seasonal effects, individual demographics, work-related variables, household characteristics, and location variables on weekend work participation characteristics. The models estimated in the paper may be embedded within a larger weekend activity-travel pattern forecasting model system.

1. BACKGROUND

Travel demand modeling has traditionally focused on understanding and modeling individual activity-travel patterns during the 5-day work week (Monday-Friday). This focus on the weekday stems from the intense traffic congestion prevalent in most urban areas during the morning and evening commute periods. In contrast to the substantial attention on weekday activity travel patterns, little or no attention is accorded to weekend activity-travel pattern analysis within the context of travel demand modeling. However, in recent years, the overall magnitude of travel and the intensity of traffic congestion during weekend days have increased to the point where these levels are approaching weekday levels.

In the rest of this introduction section, we motivate the importance of examining weekend activity-travel patterns in general (Section 1.1), briefly review earlier studies examining weekend work participation (Section 1.2), and present the specific objective of the current research (Section 1.3).

1.1 Importance of Examining Weekend Activity-Travel Patterns

There are three reasons why an examination of weekend activity-travel patterns is important today. First, weekend days contribute almost as many trips as a weekday. The 2001 National Household Travel Survey reveals that 14.5% of weekly household trips are undertaken on Saturday, and 12.9% of weekly household trips are undertaken on Sunday (U.S. DOT, 2001). These figures are comparable to the 14.5% of weekly household trips undertaken on an average weekday. The comparability of weekday and weekend day trip levels is also corroborated by a Parsons Brinkerhoff Quade and Douglas study on travel patterns of people residing in New York City, which indicates that the average household makes approximately eight trips per weekend

day compared to 8 to 9 trips on an average weekday (PBQD, Inc. 2000). Further, since the length of an average weekend trip is longer than that of an average weekday trip (see Lockwood *et al.*, 2005), the overall person miles of travel is about the same between an average weekday and an average weekend day in the San Francisco Bay Area.

A second reason for examining weekend activity-travel patterns is that the temporal and spatial characteristics of weekday and weekend day trips are quite different. For instance, weekend travel does not follow the same peaking characteristics as weekday travel. Lockwood *et al.* indicate that the weekend travel peak period is during the midday, and find that the length of this peak period is larger than the morning or evening peak periods during the conventional work week. In addition, there could be unique traffic generators (such as sporting events or cultural events) during weekends, resulting in traffic characteristics that are very different from that of the typical weekday. The net result is that the network links that are congested during the weekend days could be very different from those that are congested during the weekdays, and the peak periods generally occur at times that are different from the traditional weekday peak periods.

A third reason for studying weekend activity-travel patterns is that weekend trips have a significant effect on air quality. The peak period for weekend travel occurs during the midday, when temperatures are higher (Lockwood *et al.*, 2005). Since higher temperatures facilitate the formation of ground level ozone, the result is potentially higher ozone formation per vehicle mile traveled on weekend days compared to weekdays. In fact, air quality investigations by Marr (2002) show that ground level ozone levels, and associated health problems, have been more prevalent during the weekends compared to weekdays for the past 20 years in California.

1.2 Work Participation Over the Weekends

The once-dominant traditional Monday-through-Friday, nine-to-five, workweek has given way today to more flexible work arrangements, thanks to the demand for 24-7 services, and the advent of internet and computing technology. For example, according to the U.S. Department of Labor (2005), the percentage of full time wage and salary workers in the U.S. with flexible schedules that allowed variation in the time of work start and work end increased from 12.4% in 1985 to 27.5% in 2004. While there is little quantitative and objective trend data regarding the impact of the increasing non-traditional work arrangements on weekend work, Presser (1995) did find that as many as 34% of full-time workers over 18 years work non-standard (*e.g.*, weekend) days. At the same time, teleworking does provide more opportunity to work from home during the weekends.

Interestingly, there have been several studies in the sociological literature focusing on the benefits and costs of weekend work and in-home work. Tausig and Fenwick (2001) found that the benefits of an alternate work schedule on balancing family and work lives are only likely to be realized when the schedule is voluntary. They also point out that working over the weekend displaces family time, thus potentially increasing work-family conflict. Similarly, while increased family time and reduced childcare costs are often identified as benefits of in-home work, such an arrangement does not necessarily benefit the family or finances. From a family standpoint, research has consistently indicated that the key to successful home-based telework is the maintenance of a firm separation rather than integration of work and family activities (Mirchandani, 2000; Fitzgerald and Winter, 2001). There are three reasons for the importance of this separation: role meshing reduction (see Pleck and Staines, 1985; Kingston and Nock, 1985; Kinnunen and Mauno, 1998; White and Keith, 1990), less workaholism, and the protection of

professionalism (Mirchandani, 2000). In the context of workaholism, Mirchandani observed that the flexibility gained by working at home is "paid" for by working on average 2.5 hours/day more. From a financial standpoint, working from home may entail childcare payment to achieve an undisturbed work environment.

While the above discussion indicates that there has been earlier sociological research studying the benefits and costs of weekend work (and in-home work arrangements as part of weekend work), we are not aware of any earlier research in the transportation literature that examines the propensity to undertake weekend work activity and the spatial/temporal characteristics of such weekend work activity. As discussed in detail in Sall (2004), weekend work activity decisions can be used to generate overall weekend activity-travel patterns.

1.3 Purpose of This Study

The purpose of this study is to examine whether an individual works over the weekend and, if s/he works, whether the individual works at home or outside the home (*i.e.*, the presence and location of work). We also model the time of day of weekend work (*i.e.*, the temporal dimension of any work activity). Our analysis is motivated by the fact that, while there has been extensive study into weekday work-related attributes and weekday activity-travel patterns (see Damm, 1980; Bhat and Singh, 2000; Pendyala *et al.*, 2002; Strathman *et al.*, 1994), there has been little to no examination of weekend work-related attributes and weekend day activity-travel patterns.

The rest of the paper is structured as follows. The next section discusses the methodology and model formulation for our study of weekend work participation. Section 3 identifies the data source and sample used for the analysis. Section 4 presents the empirical results. Section 5 summarizes our findings and implications.

2. METHODOLOGY

2.1 Formulation for Work Presence and Location Choice

We used a nested logit model to analyze work presence and location. The three choices for this nested logit model are as follows:

1. Did not work on weekend day at all
2. Undertook at least one work episode in or around the home on the weekend day, and
3. Undertook at least one work episode outside the home on the weekend day.

Almost none of the individuals worked both in-home and out-of-home on the weekend survey day, so the three alternatives listed above are mutually exclusive in our empirical analysis. Also, very few individuals had more than one work episode on any given weekend day.

In the empirical analysis, we tested all the three nesting structures possible with the three choice alternatives identified above, though the one with in-home and out-of-home work in a nest seemed most behaviorally plausible. However, none of the three nesting structures was supported by our data, either because the log-sum parameter exceeded one or was not significantly less than one. Thus, the final model structure for work presence and location corresponded to a simple multinomial logit (MNL) model.

2.2 Formulation for Work Time-of-Day Choice

The time of day dimension of weekend work was studied in our paper using two models: (1) A log-linear model of work duration (note that the log-linear form ensures the positivity of work duration in prediction mode), and (2), a discrete choice model for work start time of day. The reader will note that we could have also estimated a single discrete choice model for start time of day and end time of day for work, which corresponds to a comprehensive model for all the

temporal dimensions (start time, end time, and duration) of work activity. Unfortunately, the relatively small number of weekend workers in our sample, as well as the concentration of work start and end times within narrow time windows of the day, precluded us from estimating such a joint model. Further, there are no sharp morning and evening peaks in traffic flows on weekend days as there are for weekdays. Thus, unlike in the case of weekdays, where individuals are likely to jointly determine start time and end time based on the relative positioning of these times vis-à-vis the morning and evening peak periods, individuals are less likely to determine the temporal characteristics of their weekend work activity based on external traffic conditions. Thus, it is reasonable to model the desired work duration first, followed by the work start time of day (of course, modeling these two dimensions immediately provides the work end time of day).

In our analysis, we associated the start time of day for weekend work with one of the following five time periods: early morning (3:00 AM to 6:59 AM), regular morning (7:00 AM to 8:59 AM), late morning (9:00 AM to 11:59 AM), afternoon (12:00 PM to 3:59 PM), and evening (4:00 PM to 2:59 AM). These time periods were based on ensuring a reasonable number of sample points within each discrete period and maintaining a morning/afternoon/evening breakdown of the day.[1]

We considered two discrete choice structures for the start time of day model – a simple MNL model and an ordered generalized extreme value (OGEV) model. The MNL structure is appealing because it has a simple formulation. However, it is saddled with the Independence

[1] An alternative model structure for departure time modeling is a continuous-time duration representation (see Bhat, 2000, and Hensher and Mannering, 1994, for reviews of duration modeling methods). Such a continuous-time representation is appealing because it a) does not require the rather *ad hoc* partitioning of the day into time intervals, and b) provides work start times and end times (based on work duration) at a fine temporal resolution rather than in aggregate intervals. However, duration models have yet to find their way into practice. Further, as discussed by Steed and Bhat (2000), the use of duration models for activity start times requires that the model structure be able to incorporate time-varying coefficients, which can present specification and interpretational challenges. For the above reasons, and because of the widespread familiarity and use of discrete choice structures, we retain a discrete choice representation for work start time in this paper.

from Irrelevance alternatives (IIA) property. In the context of departure time modeling, the IIA property implies that there is no increased degree of sensitivity (due to excluded exogenous factors) between adjacent time-of-day alternatives compared to non-adjacent time-of-day alternatives. The OGEV structure generalizes the MNL structure by allowing an increased degree of sensitivity (due to excluded exogenous factors) between adjacent time-of-day alternatives compared to between non-adjacent alternatives (the reader is referred to Small, 1987 or Bhat, 1998 for a mathematical description of the OGEV model).

In our estimations, the empirical results indicated that the MNL structure is adequate in representing start time of day choice in terms of data fit. Also, the dissimilarity parameter in the OGEV model was greater than 1, implying inconsistency with utility-maximizing theory. Specifically, the dissimilarity parameter was 1.495 with a t-statistic of 0.66 for testing the parameter against the null of 1.0. Hence, we retained the MNL structure in the current analysis.

3. DATA SOURCE AND SAMPLE DESCRIPTION

3.1 Data Source

The 2000 Bay Area Transportation Survey (BATS) conducted by MORPACE International, Inc. for the Bay Area Metropolitan Transportation Commission (MTC) was the main data source for this study (MORPACE International, Inc., 2002). The BATS survey asked individuals from surveyed households to record household and personal demographic data as well as information on the activity episodes they undertook both in and out of the home over a two-day period. A total of 33,402 individuals in 14,529 households completed the survey. Only one day of the survey could be a weekend-day for any household. The data had information on 7,941 weekend

person-days. Zonal land use and demographic data compiled by the MTC supplemented the BATS data.

3.2 Sample Formation

The process of generating the sample for analysis involved several steps. First, only individuals 16 years or older and employed were considered. Second, only the individuals who provided weekend activity-travel pattern information were selected from the original survey data. Third, work episodes were selected from the larger file of all weekend episodes for analysis. Fourth, if there were no work episodes for an individual, the individual was classified as a non-worker on the weekend. Fifth, the work episodes were classified as in-home or out-of-home based on the location information provided in the survey. Sixth, we computed the continuous work duration for each worker based on the sum of all work or work-related episodes of the day, and associated the start time of the first work episode in the day with one of the five discrete time periods identified in Section 3 (note that almost all weekend workers had only one work episode during the day). Finally, we conducted several screening and consistency checks on the resulting data set from the previous steps. As part of this screening process, we eliminated observations that had missing data on work episode start/end times and/or work location. Several observations had missing household income information, and we imputed income for such observations based on a relationship between household income and relevant sociodemographic attributes estimated from the sample of households who provided income information.

The final sample for analysis included 4,201 individuals (or weekend person-days), of whom 3,114 (74.1%) were non-workers on weekends, 210 (5.0%) worked in-home on weekends, and 877 (20.9%) worked out-of-home on weekends. The mean work duration for in-home workers was about 318 minutes, while the mean work duration for out-of-home workers was

about 432 minutes. These statistics indicate that, on average, individuals working in-home do so for a shorter duration than those working out-of-home. The distributions of start times-of-day for in-home and out-of-home work are presented in Figure 1. This figure clearly indicates that individuals working in-home are likely to start work later than those who work out-of-home.

4. EMPIRICAL ANALYSIS

4.1 Variable Specification

Several types of variables were considered in the empirical analysis. These included day-of-week/seasonal effects, individual demographics, work-related variables, household characteristics, and location variables. The day-of-week/seasonal variables capture the day of weekend (Saturday or Sunday) and season of year effects (Fall, Winter, Spring, or Summer).The individual demographic variables explored in the specifications included gender, age, ethnicity, student status, license holding to drive, and presence of physical disability. Work-related variables included number of jobs held, type of job (government, private employer, self-employed, *etc.*), and flexibility in work schedule. The household characteristics considered in the specifications included household income, household structure (household size and family type of household), presence and number of children, number of household vehicles, household income, housing tenure (renting or owning), and internet availability at home. Finally, the location variables included area type variables classifying the residence zone of each individual into one of four categories (Central Business District, urban, suburban, and rural), residential density, and employment density variables.[2]

[2] Another useful explanatory variable would be the occurrence of special events on each individual's surveyed weekend day. However, this information was not collected as part of the BATS survey.

The final model specification was developed through a systematic process of adding variables to the base model (*i.e.*, the constants only model for the discrete choice model and the model with only a constant for the work duration log-linear regression) and evaluating the improvement of fit using well-known statistical measures. Another consideration in the specification was to ensure a reasonable number of observations in each independent variable category for each choice alternative in the discrete choice models. Of course, the overall specification process was also guided by intuitive and efficiency considerations.

A final point regarding our specification analysis. We used a relatively liberal significance level (as high as the 0.2 level of significance) in making variable inclusion decisions when the direction of the effect of variables was intuitive. This is especially so for the weekend work presence and location choice model. The reason for this rather liberal significance level is two fold. First, while there are about 4200 observations in the work presence and location choice model, the substantial skew toward the "no work" alternative leads to difficulty in "pinning down" model parameters (*i.e.*, leads to large standard errors and low t-statistics). Second, we chose a rather liberal significance level also because this research effort is one of the first to examine weekend work patterns. Thus, we consciously chose to include independent variables that are suggestive and that may aid researchers in examining these variables in future studies.

4.2 Empirical Results

In this section we present the results for the weekend work presence and location choice model (Section 4.2.1), the work duration log-linear regression model (Section 4.2.2), and the work start time of day model (Section 4.2.3).

4.2.1 Weekend Work Presence and Location Choice Model Results

The log likelihood at convergence of the final work presence and location choice MNL model specification is -2,831.8. The log-likelihood of the constants only model is -2,935.4. The log-likelihood ratio statistic for testing the hypothesis that none of the exogenous variables impact work presence and location choice is 207.2, which is greater than the chi-squared table value with 19 degrees of freedom (equal to the number of parameters in the final specification) at any reasonable level of significance. Thus, we can reject the hypothesis that the exogenous variables do not affect work presence and location choice. However, it should also be noted that the rho-squared value for the model compared to the constants-only model is rather small , indicating that our ability to explain the presence and location of weekend work activity is limited using conventionally-available socio demographic variables (at least in the current empirical context). Future research should explore empirical analyses in other data contexts and using other variables. On the other hand, it is also important not to underplay the value of the model estimated in this research. In particular, low rho-squared values with respect to constants automatically arise in cases where the choice is highly skewed toward one or more alternatives, as is the case in the current empirical context where almost 75% of individuals do not work over the weekends.

We now discuss the effects of variables by variable group in the rest of this section. Table 1 presents the results.

4.2.1.1 Day-of-Week/Seasonal Effects The seasonal effects reveal that individuals are less likely to work out-of-home over the weekends during the spring, summer, and fall seasons compared to the winter season. Further, during the summer season, individuals are less likely to

work over the weekend (either in-home or out-of-home) relative to other seasons. This is intuitive since the summer season presents more conductive weather conditions for non-work activity pursuits (for example, recreational and social pursuits) than other seasons in the Bay Area.

4.2.1.2 Individual Demographic Variables The results of the individual demographic variables show that women are less likely than men to work over the weekend, presumably because women shoulder more familial responsibilities than do men (Frusti *et al.*, 2003). The race effects suggest that African-Americans work more out-of-home than do individuals of other races, and that Hispanic-Americans and Asian-Americans are less likely to work than other races. These race effects might indicate overall cultural differences in how work is perceived or other factors that need careful scrutiny in future studies. Future research needs to explore the reasons for these race effects. Finally, in the class of individual demographics, the results suggest that full-time students are less likely to work at home than not work at all. However, full-time students are more likely to work outside the home rather than not working at all. This might be a reflection of students working jobs over the weekends for pay.

4.2.1.3 Work-Related Variables The effects of the job type variables under the category of work-related variables in Table 1 confirm the rigid workweek schedule of government jobs, with government workers clearly less likely to work over the weekends. However, self-employed individuals have a very high tendency to work at home during the weekends.

The effects of the other work-related variables in Table 1 indicate the high likelihood of multiple jobholders to work on weekends (especially at home). On the other hand, individuals

who work part-time or who have flexible schedules are less likely to work over the weekends. The first result above is intuitive; multiple jobholders are likely to work on weekends due to the lack of time on weekdays or because they work on some jobs only during the weekends. The second result suggests that individuals working part-time or in flexible jobs either are better able to maintain family-work separation on weekends or are the kind of individuals who seek work arrangements that facilitate better family-work separation in the first place.

4.2.1.4 Household Characteristics The impact of household characteristics indicates that high income earners (*i.e.*, those who earn above $60,000) are unlikely to work out-of-home. They are more likely not to work at all or work from home. However, very high-income earners (*i.e.*, those who earn above $100,000) are more likely to work from home rather than not work at all.

4.2.2 Weekend Work Duration Model Results

As discussed earlier in Section 3.2, we use log (work duration) as the dependent variable in the linear regression model for duration of work. This guarantees the positivity of work duration predictions. The results of the linear regression model are provided in Table 2 and discussed by variable category below. The R^2 value for the regression is admittedly low, even though we considered a comprehensive set of variables among those available to explain work duration. This may be an indication that there is a reasonable amount of randomness in weekend work duration decisions or that there are unobserved individual-specific factors that influence weekend work duration. The latter effect can be captured if we have multiple weekend day observations from the same individual.

4.2.2.1 Work Location Choice The results in Table 2 show the strong effect of work location on work duration. Specifically, individuals who work at home are likely to work for a shorter duration than those who work outside home. This is in contrast to the weekday findings of Mirchandani (2000), who observed that the flexibility of working from home is "paid" for by working an average of 2.5 hours more per day. Clearly, working at home on the weekend has different characteristics and different motivations than working at home on weekdays.

4.2.2.2 Work-Related Variables The impact of the work-related variables indicate, as expected, that individuals working for a private, for-profit, firm (such as retail establishments) tend to work longer weekend hours than individuals working for other types of employers. The effects of the job flexibility variables suggest that individuals work less if they are in more flexible work arrangements. This result reinforces the notion that individuals in flexible jobs are better able to maintain work-family separation on weekends.

4.2.2.3 Household Characteristics The effects of household characteristics show that individuals in households with higher number of children aged 11-15 years are likely to work shorter durations than those in households with fewer or no children aged 11-15 years. This is likely to be a reflection of a desire to be with children and family over the weekend. Similarly, individuals in households with an employed spouse are likely to "reserve" the weekend for family time, as reflected by the negative effect of the variable labeled "Spouse Employed."

4.2.3 Work Start Time-of-Day Model

Table 3 presents the start time-of-day model results for weekend work activity. The early morning period (3:00AM-6:59AM) is the base period in the specification. The reader will also note that the log-likelihood value at convergence of our final specification is -1373, compared to the log-likelihood value at constants of -1638.9 and the log-likelihood value at equal shares of -1749.5.

4.2.3.1 Work Location and Duration The impacts of work location and duration in Table 3 are intuitive. Individuals who work at home are more likely to start their work activity during the later parts of the day. In addition, as expected, individuals with longer work duration are likely to start their work activity earlier in the day.

4.2.3.2 Day-of-Week/Seasonal Effects Individuals working on Sundays are more likely to start work late in the day compared to individuals working on Saturdays. This may be attributable to morning religious services on Sundays and/or to the shorter retail shopping hours on Sundays. The seasonal effects were not statistically significant in their effect on start time-of-day.

4.2.3.3 Individual Demographic Variables The impacts of individual demographic variables indicate that women are likely to avoid starting work early in the morning or late in the evening, presumably because of the substantial familial responsibilities during these periods relative to the other middle periods of the day. The influence of the race variables suggests that African Americans are more likely to start weekend work in the late morning periods compared to other races, while Asian Americans are more likely to start weekend work in the regular morning

period compared to other races. Finally, in the group of individual demographic variables, the results indicate that young adults in returning young adult households are most likely to start work in the late evening.

4.2.3.4 Work-Related Variables Individuals working in private, non-profit, firms and individuals who are self-employed are much more likely to begin their weekend work activities in the regular morning period relative to individuals working for other types of employers. In addition, self-employed individuals clearly prefer not to start their work activity during the early morning or evening periods, perhaps a reflection of trying to maintain family-work separation.

4.2.3.5 Location Variables Several variables reflecting residence county and area type are present in the final specification. While many of these are statistically significant, they have no substantive behavioral interpretations.

5. CONCLUSIONS

The current research effort may be viewed as one component of a larger weekend activity-travel pattern forecasting system that first predicts the work activity dimensions modeled in this paper. *If the individual is predicted not to work over the weekend,* the representation and analysis of the complete weekend activity-travel pattern may be achieved using the framework proposed by Bhat and Srinivasan (2005). *If the individual is predicted to work out-of-home* during the weekend, one may use the Bhat and Singh (2000) representation and analysis framework, which is based on using the work schedule as “pegs” in the scheduling of other non-work activities. This structure is reinforced by our finding that weekend out-of-home workers display the same work patterns as weekday workers in terms of work duration and work start/end times. *If the*

individual is predicted to work at home, a combination of the two frameworks above may be needed. In particular, individuals working at home over the weekends work much shorter durations than those who travel outside home to work, and also tend to start their work activity late in the day. This suggests that in-home weekend workers may be "blending in" their work activity with other non-work activities. However, the work activity dimensions may still act as soft pegs in the overall daily activity-travel scheduling of in-home weekend workers, thus drawing upon some elements of the Bhat and Singh framework. Overall, a study of the factors influencing work participation and its spatial-temporal attributes is a critical part of modeling weekend activity-travel patterns.

The paper analyzes two key weekend work dimensions: (1) whether or not the individual works during the weekend and, if s/he works, whether the individual works in-home or out-of-home, and (2) the timing of work activity if the individual works. The first dimension, associated with the presence and location of work, is modeled using a discrete choice model. A nested logit formulation was attempted to model work presence and location, but none of the possible nesting structures were supported by the data. Thus, a multinomial logit model was used. The second dimension, associated with the temporal attributes of work activity, was analyzed using two models: (1) A log-linear model of work duration, and (2), a discrete choice MNL model for work start time of day.

The empirical analysis in the paper is based on the 2000 San Francisco Bay Area Travel Survey. A variety of variables were considered in the model specifications, including day of week/seasonal effects, individual demographics, work-related variables, household characteristics, and location variables. There are several important findings from our study. First, women are less likely to work over the weekend compared to men. Further, if they work, women

are likely to avoid starting work early in the morning or late in the evening, presumably because of the substantial familial responsibilities during these periods relative to the other middle periods of the day. Second, individuals who are self-employed are very highly likely to work at home over the weekends relative to other individuals. With the growing number of individuals who are self-employed (U.S. Census Bureau, 1999), this result suggests increasing family-work conflict and associated family discord except perhaps in cases where family members work together in a business. Third, individuals working part-time and with a flexible work schedule are less likely to work over the weekends and, even if they work, are likely to work short durations. Thus, as the number of flexible and part-time jobs increase in the U.S. (U.S. Census Bureau, 1999), our findings indicate less weekend work. Fourth, individuals who work at home are likely to work shorter durations, and start their work activity later in the day, than those who work outside home. Fifth, our results indicate that the race of the individual has a statistically significant impact on whether or not to work, whether to work in-home or out-of-home, and the start time of weekend work activity. These race-related differences need further exploration to understand the underlying (perhaps cultural) reasons. Sixth, household income levels, and household structure and composition, influence all dimensions of work activity over the weekends. This emphasizes the importance of accurate sociodemographic forecasting for weekend work activity prediction and, therefore, overall weekend activity-travel pattern analysis. This need for sociodemographic forecasting is sometimes inappropriately perceived as a "weakness" of disaggregate activity-travel model systems. The more appropriate conclusion to be drawn from the results is that sociodemographic forecasting must be given substantially more attention today, both because of the changing face of the population, as well as because of the substantial impacts that these changes will have on future activity and travel patterns.

The current research effort constitutes, to our knowledge, the first transportation-related study to examine weekend work activity and its spatial/temporal attributes. Future research efforts should continue to explore the relatively understudied aspects of weekend activity-travel patterns. For example, it would be helpful to analyze weekend work patterns from different cities and different time periods to develop a rich base for generalizing conclusions regarding the determinants of weekend work pattern attributes.

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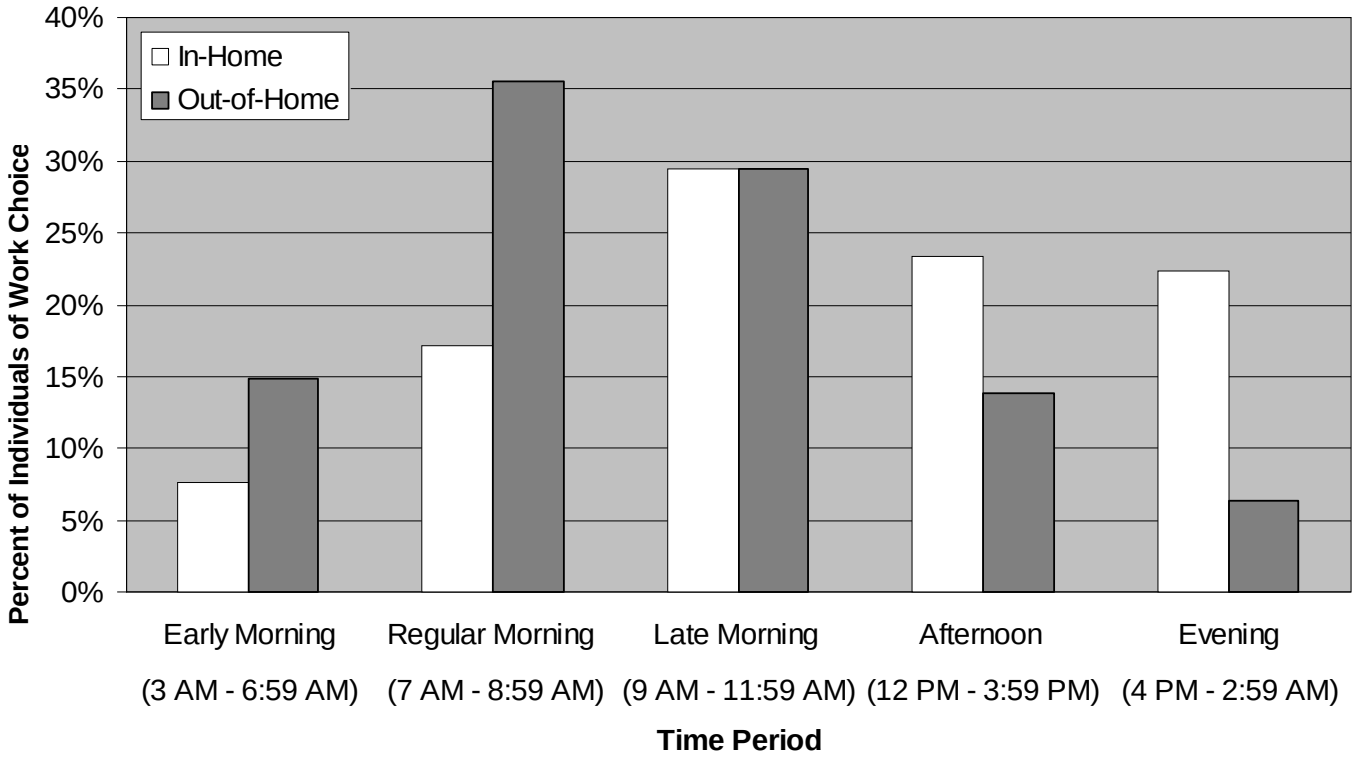

FIGURE 1 Work start time-of-day distribution.

TABLE 1 Weekend Work Presence and Location Choice Model Results[‡]

Log-Likelihood Values: At Convergence: -2,831.8; Constants Only: -2,935.4; Equal Shares: -4,615.3						
Rho-squared with respect to constant model: 0.035						
Rho-squared with respect to equal shares model: 0.386 Number of Observations: 4,201						
Variable	**No Work**		**Work at Home**		**Work out of Home**	
	Coeff.	*T-stat*	*Coeff.*	*T-stat*	*Coeff.*	*T-stat*
Constant	-	-	-3.2623	-14.494	-0.8637	-4.45
Seasonal Effects						
Spring	-	-	-	-	-0.1806	-1.317
Summer	-	-	-0.3764	-2.195	-0.2539	-1.824
Fall	-	-	-	-	-0.209	-1.486
Individual Demographic Variables						
Female	0.2732	3.702	-	-	-	-
Race						
African-American	-	-	-	-	0.6555	3.283
Hispanic- or Asian-American	0.2135	2.193	-	-	-	-
Full-Time Student	-	-	-1.0258	-1.727	0.4393	2.562
Work-Related Variables						
Job-Type						
Government	-	-	-0.3609	-1.455	-0.2718	-2.394
Self-Employed	-	-	1.3384	8.214	-	-
Number of Jobs	-	-	0.6585	4.025	0.3315	2.87
Job is Part Time	0.2605	2.387	-	-	-	-
Job is Flexible	0.3696	4.953	-	-	-	-
Household Characteristics						
Income Category Dummy Variables						
$60,000-$100,000	-	-	-	-	-0.2770	-2.993
Greater than $100,000	-	-	0.2409	1.61	-0.4178	-4.212

[‡] The discrete variable alternatives for weekend work presence and location choice are (1) No work, (2) Work at home, and (3) Work out-of-home.

TABLE 2 Work Duration Model Results
[Dependent Variable is Log (work duration in minutes)]

R-Squared=0.077	Std. Error = 0.803	Number of Observations: 1087
Variable	*Coefficient*	*T-Stat*
Constant	5.998	102.241
Work at Home	-0.409	-6.483
Work-Related Variables		
Private, for-profit firm	0.101	1.963
Job Flexibility		
Partially Flexible	-0.149	-2.422
Fully Flexible	-0.234	-4.032
Household Characteristics		
Number of children 11-15	-0.106	-2.479
Spouse Employed	-0.109	-2.210

TABLE 3 Weekend Work Start Time of Day Results[§]

Log-Likelihood Values: At Convergence: -1,373.0; Constants Only: -1,638.9; Equal Shares: -1749.5
Rho-squared with respect to constant model: 0.162
Rho-squared with respect to equal shares model: 0.215 Number of Observations: 1087

Variable	**Regular Morning (7-8:59 AM)**		**Late Morning (9-11:59 AM)**		**Afternoon (12- 3:59 PM)**		**Evening (4 PM-2:59 AM)**	
	Coeff.	*T-stat*	*Coeff.*	*T-stat*	*Coeff.*	*T-stat*	*Coeff.*	*T-stat*
Constant	2.2911	5.447	3.9599	8.825	3.4795	6.548	3.8549	6.795
Work Location and Duration								
Work at home	-	-	0.5567	2.392	0.9213	3.471	1.5802	4.967
Work Duration	-0.0029	-4.141	-0.0068	-8.966	-0.0091	-10.901	-0.0136	-12.216
Day-of-Week								
Sunday	-	-	-	-	0.3048	1.671	1.2033	4.660
Individual Demographic Variables								
Female	0.4482	2.428	0.4103	2.200	0.4115	1.914	-	-
Race								
African-American	-	-	0.6833	2.140	-	-	-	-
Asian	0.5427	2.492	-	-	-	-	-	-
Son/Daughter of Household Head	-	-	-	-	-	-	2.020	5.183
Work-Related Variables								
Private, Non-Profit, Firm	0.6391	2.685	-	-	-	-	-	-
Self-Employed	0.9155	3.216	0.7648	2.729	0.6369	2.079	-	-
Location Variables								
County of Residence								
San Mateo	-	-	0.9183	3.700	0.7305	1.889	-	-
Santa Clara	-	-	0.5517	2.575	0.8872	2.847	0.620	1.992
Alameda	-0.3089	-1.481	-	-	0.5974	1.970	-	-
Contra Costa	-	-	0.6979	2.806	0.7705	2.150	-	-
Solano	-1.0550	-3.194	-1.0453	-2.471	-	-	0.9671	2.028
Napa	-0.6427	-1.573	-	-	-	-	-	-
Sonoma	-0.6668	-2.362	-	-	0.5826	1.620	-	-
Density-Based Area Type of Residence								
Suburban/Rural	-	-	-0.6776	-3.499	-0.4447	-1.698	-0.6470	-1.914

[§] The discrete variable alternatives for weekend work start time of day: (1) Early morning (3-6:59AM), (2) Regular morning (7-8:49AM), (3) Late morning (9-11:49AM), (4) afternoon (12-3:49PM), and (5) Evening (4PM-2:59AM).