



## Telecommuting, income, and out-of-home activities



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### ABSTRACT

Telecommuting is on a rising trend as one of the most important alternative work arrangements. This paper explores whether telecommuters conduct more out-of-home activities than their non-telecommuting counterparts. More importantly, this paper investigates activity differences between low- and high-income telecommuters. This study draws a sample of approximately 7,500 workers from the 2007 Chicago Regional Household Travel Inventory. We use a Poisson model to estimate the number of out-of-home activities, and use an instrumental-variables (IV) approach to address the potential self-selection issue of telecommuting. We also identify workers who worked at home (WAH) during the survey days. Results show that telecommuting status and whether the respondents WAH on survey days affect out-of-home activities. During the survey days, low-income workers were less likely to telecommute than high-income workers, but those who actually telecommuted were similarly likely to conduct a higher number of total trips, pick-up/drop-off trips, and maintenance/discretionary trips, but fewer commute trips than the high-income telecommuters. Even on the days when telecommuters went to workplaces, telecommuting status is still associated with more trips. The behavioral difference between telecommuters and non-telecommuters on commuting days suggests that such disparity stems from unobserved differences between the two groups of workers rather than from the saved commute time through telecommuting.

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### 1. Introduction

Alternative work schedules (AWS) have become increasingly popular in the U.S.A. in the past four decades. The three most important alternative work arrangements are telecommuting, compressed work weeks, and flexible working hours (Combs, 2010). Each arrangement offers different levels of flexibility to workers, by relaxing the time and space constraints of work places and/or working hours. Transportation studies have shown that workers who exercise AWS have different travel behaviors, including departure time choices, route choices, and travel duration (He, 2013a; Pendyala et al., 1991; Zong et al., 2013). The travel behavioral difference suggests increased individual autonomy and flexibility (Harpaz, 2002); workers use these employment-related options to avoid traffic congestion, save commuting time, and optimize trip scheduling to achieve a better work–life balance.

As an important AWS policy, telecommuting can benefit individuals, organizations, and society (Harpaz, 2002; Baruch, 2000; Handy and Mokhtarian, 1996; Lister and Harnish, 2011). This research investigates how telecommuting affects individual's

out-of-home activities, which, combined with physical and social activities, indicate subjective well-being and life quality (Ettema et al., 2010; Mollenkopf et al., 2005; Biddle and Mutrie, 2008; Bergstad et al., 2012). All else being equal, telecommuters are expected to conduct more out-of-home activities. This is because telecommuting relaxes the time and space constraints of individual travel and allows better coordination of intra-household activities and discretionary activities (Perin, 1998; Zhu, 2012). The time saved by not commuting could be spent on other activities at home or outside the home. Meanwhile, WAH may generate “cabin fever” – the desire to get away instead of staying at home all day, and thus workers who WAH would have more non-work-related travel demands. However, in spite of early speculation that telecommuters have more non-work travel, corroboration thereof is not found in early empirical studies (Mokhtarian, 1998).

What also remains unknown is the effect of telecommuting on different income groups. Income levels, telecommuting status, and travel intertwine: job types at different income levels affect telecommuting options and travel patterns, while telecommuting status affects travel as well. Low-income households usually have different patterns of daily routines and time use (Roy et al., 2004; Grieco, 1995) because of individual and household constraints. Firstly, low-income households have limited economic and mobility resources compared to middle- and high-income

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households. Secondly, low-income workers also face great challenges in balancing work and family responsibilities. For example, they may have to use the saved time budget from telecommuting on the second or third shifts to earn more money rather than on non-work-related activities (Roy et al., 2004; Hamer and Marchioro, 2002).

Indeed, disparities exist in the adoption and benefits of telecommuting among workers of different socio-economic and demographic backgrounds (Golden, 2008; Romer, 2011). Telecommuters tend to be male, professional, high-income, and well-educated (Luukinen, 1996; Olszewski and Mokhtarian, 1994; Ellen and Hempstead, 2002), whereas low-income workers are less likely to be entitled to telecommute because of their limited access to information technology and the higher likelihood of their having location-dependent jobs, such as hairdresser, restaurant/retail worker, repair/service worker, administrative support worker (Hjorthol, 2002; Muhammad et al., 2007).

Although low-income workers have fewer options to telecommute than high-income workers, those that exercise telecommuting may similarly benefit from such options. Telecommuting directly affects the time budget of telecommuters, and the saved time can be spent on in-home and out-of-home activities. Thus far, the effect of telecommuting on the travel behavior of low-income households has rarely been documented. To fill this gap, this research investigates whether low- and high-income workers who adopt telecommuting exhibit different behavioral responses in terms of their out-of-home activities, measured by the number of trips of various purposes.

This paper will continue with a review of previous research on telecommuting and travel. In the methodology part, we define telecommuters and specify a Poisson model to estimate the number of trips for different income groups. We will address the self-selection issue of telecommuting by adopting the instrumental-variables (IV) approach that uses a multinomial logit model in the first stage of the estimation. In the same section, the study area of the Chicago region and the data will be described. The following sections will provide descriptive analysis and set out the results. The paper will conclude with the policy implications of the potential consequences of telecommuting on individual travel demand.

## 2. Literature review

### 2.1. Telecommuting, income, and travel

There are different types of motivations for telecommuting at the individual level (Mokhtarian and Salomon, 1994; Bailey and Kurland, 2002). One of them is related to travel: workers want to reduce commuting costs and stress. The rise of telecommuting was closely linked to the 1970s oil crisis, which caused concerns regarding gas consumption and commuting costs. Another motivation is to improve work–family balance, such as having a more flexible residential location (Mokhtarian et al., 2004; Muhammad et al., 2007; Zhu, 2013), taking care of family members, especially children (Mokhtarian et al., 1998; Kossek et al., 2006), and being more productive during working hours (Salomon and Salomon, 1984; Venkatesh and Vitalari, 1992). Workers with work arrangement flexibility have a more favorable work–family balance (Jeffrey et al., 2001). Results from multiple surveys have shown that telecommuters are more positive in their attitudes towards working than non-telecommuters (Potter, 2003).

Because of these individual-level motivations, telecommuters are expected to have different activity scheduling and travel patterns, which reflect how they utilize the saved travel time and budget. Empirical research has revealed that telecommuting reduces the frequency of commute trips but not necessarily the total travel (Zhu, 2012). In other words, telecommuters may travel more for

other purposes. Actually, the increased travel can be viewed as an improved utility because out-of-home activities are related to subjective well-being and life satisfaction (Ettema et al., 2010; Bergstad et al., 2012).

Telecommuters are not homogeneous in terms of their socio-economic status, and workers in different industrial sectors may not be entitled to or adopt telecommuting in the same way. Telecommuting workers can be divided along the lines of occupation/industry, gender, income, and education (Bailey and Kurland, 2002; Handy and Mokhtarian, 1996; Luukinen, 1996; Mokhtarian and Salomon, 1994; Olszewski and Mokhtarian, 1994; Ellen and Hempstead, 2002; Walls et al., 2007). Income is a particularly important divider of telecommuters because low-income workers face different social, financial, and mobility challenges than high-income workers (Giuliano, 2005; Wachs and Taylor, 1998) and they have limited access to telecommuting option (Romer, 2011; Hjorthol, 2002; Muhammad et al., 2007). Another reason of a lower proportion of low-income workers among telecommuters is that many low-income workers are employed in location-dependent industries, such as manufacturing and retail sectors, in which telecommuting is less feasible.

The benefits of telecommuting may vary between different income groups (de Graaff, 2004). For low-income households, the saved time and money from telecommuting may not be translated into other non-work activities. Low-income households have lower car ownership, which limits their transport mobility and access to activities. Also, many of them still face residential segregation (Logan, 2013); they usually live in neighborhoods with fewer out-door amenities, such as shops and open spaces, and thus they may make fewer maintenance/discretionary trips.

### 2.2. What drives telecommuting?

Self-selection is inherent when we estimate the effect of telecommuting on travel (Mokhtarian et al., 2004; Ory and Mokhtarian, 2006). Workers who have the option and choose to telecommute possess different personal and household characteristics than others, and these characteristics also affect their travel and out-of-home activities; hence, telecommuting is endogenous. If the self-selection issue is ignored, the influence of telecommuting on travel behavior may be compounded with the personal and household characteristics, and then the effect of telecommuting may be biased. This issue can be addressed by the IV approach (Greene, 2008), which considers telecommuting as an endogenous regressor. To choose the IVs, we need to first understand the driving factors behind telecommuting.

Empirical studies show that workers who telecommute possess certain attributes and/or certain conditions that drive them to telecommute (Mokhtarian and Salomon, 1994, 1997; Handy and Mokhtarian, 1996; Mokhtarian and Raney, 1997; Walls et al., 2007). Mokhtarian and Salomon (1994) developed a framework to understand the individual's decision-making regarding telecommuting. The drivers and constraints of telecommuting were grouped into five main categories: work; family; leisure; ideology; and travel. While Mokhtarian and Salomon stated that combinations of these five factors influence most people's choice of telecommuting, they also acknowledged that different weighting schemes should be applied to different people. They demonstrated the importance of identifying propensity to telecommute based on individual characteristics.

Handy and Mokhtarian (1996) analyzed California's telecommuters in 2000 based on the growth rate of telecommuters in each occupational category from 1980 to 1990. Occupations were mainly categorized into two groups: telecommuting-conducive occupations, which include executive, administration, managerial, professional specialty, technicians and related, sales, as well as

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