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Travel time use over five decades☆

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ABSTRACT

In this paper, we use five decades of time-use surveys in the U.S. to document trends in travel time uses. We find that total travel time features an inverted-U shape, registering a 20 percent increase from 1975 to 1993, but an 18 percent decline from 1993 to 2013. We find that demographic shifts explain roughly 45 percent of the increase from 1975 to 1993, but play a much smaller role afterwards. From 2003 to 2013 the shift of time allocation from travel-intensive non-market work to travel-non-intensive leisure accounts for around 50 percent of the decline in total travel time.

1. Introduction

In this paper, we use five decades of time-use surveys to examine trends in travel time use within the United States. Our measure of travel time includes all modes of travel related to market work, non-market (household) work and leisure. We find that there have been dramatic changes in travel time over the past five decades. Total travel time increased by around 19 percent from 1965 to 1993 for an average individual between 19 and 65 year old, and by around 20 percent from 1975 to 1993 if we expand the sample to those 18 and up. In 1975, average travel time for an adult was 8.43 h per week, and grew to 10.1 h per week in 1993. Average travel time peaked some time between 1993 and 2003, possibly around the turn of the century. Due to the lack of annual data, we cannot exactly pin down the peak year. By 2003, average travel time per adult had already declined to 9.03 h per week, a decline of around 11 percent since 1993. The decline has then continued throughout the following decade. In 2013 average travel time per adult was 8.29 h per week, registering a decline of 18 percent compared to that in 1993. Despite dramatic changes in all aspects of economy since 1965, people in 2013 spend similar amount of travel time as those five decades ago.

The dramatic change in travel time is not an isolated phenomenon. The growth rate in vehicle miles of travel (VMT) per capita began to plateau around 2000, and per capita level started to slide after 2005 within the U.S.[2] In addition, distance driven per light-duty vehicle, and the number of light-duty vehicles per capita also peaked shortly after the turn of the century (Sivak, 2013). Since vehicle travel remains the primary travel mode of the country, the peak and subsequent decline in distance driven and vehicle ownership corroborate the dramatic turn in the total travel time around the same time. As total travel time is closely related to

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[2] See, for example, Puentes and Tomer (2008) report for the Metropolitan Policy Program at Brookings.

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mobility patterns and gasoline use in this country, explaining forces behind variations in travel time is important for understanding not only gasoline demand, but also demand for goods and services catering to different mobility needs of consumers. The importance of travel time is not limited to transportation aspect per se. Once we exclude relatively non-discretionary time uses such as sleeping and market work, travel time becomes a sizable component of discretionary time use. Understanding travel time use is also an issue of efficient time allocation. Given the close complementarity of travel time with other time uses, it is important to sort out whether changes in travel time come from changes in transportation sectors per se, changes in opportunity cost of time, or are related to shifts of time uses on a broader scale.

The intriguing questions are: What are the forces behind the dramatic variations in total travel time over the five decades? To what extent do demographic shifts, including the aging of baby boomers, the peak of female labor force participation, and changes in education composition and the fraction of population with children, contribute to the evolving patterns of travel time use? What are the causes behind the recent decline in total travel time, especially after 2003? Can the decline in travel time be attributed to an increase in efficiency as a result of telecommuting and e-commerce, or is it caused by less time allocated to activities complementary with travel? Will the forces behind the decline over the past decade carry into the future and cause continuing decline in total travel time?

To address these questions, we link five major time use surveys to characterize patterns of travel time use. These time use surveys are: 1965–1966 America's Use of Time; 1975–1976 Time Use in Economics and Social Accounts; 1985 Americans' Use of Time; 1992–1994 National Human Activity Pattern Survey; and the 2003–2013 Annual American Time Use Survey (ATUS).

We consider travel time use as part of the optimal time allocation by individuals and households who seek to maximize their objectives and satisfy their needs while subject to resources and time constraints. Robinson and Godbey (1999) show that a set of biological, status and role factors, such as gender, age, education, work status, and parenthood, affect time allocation to a large extent. Since travel time is a part of time allocation, potentially complementary to or substitutionary with other time uses, we hypothesize that the above socio-demographic factors may play important roles in the evolution of travel time as well.

We thus seek to explain travel time variations by taking a close look at two driving forces. The first driving force is changes in demographic composition in terms of age, gender, work status, education and whether there are children in the household. We decompose unconditional changes in average travel time to gauge the contribution by shifts in each demographic attribute. The second driving force is changes in travel time allocation that are common across demographic groups. We examine how travel time co-varies with other time use categories.

We have the following main findings: First, demographic shifts explain around 45 percent of the increase in total travel time from 1975 to 1993. Increases in educational attainment alone contribute to around 28 percent of the increases, followed by around 18 percent contributed by changes in age, work and gender composition. However, demographic shifts play a much smaller role in the evolution of total travel time afterwards. Between 2003 and 2013, the negative effect on total travel time due to aging of baby boomers and decreasing labor force participation is mostly offset by the positive effect due to increases in education attainment. As a result, changes in total travel time are not explained by demographic shifts. Second, variations in total travel time from 2003 to 2013 are dominated by time effects that are common to all demographic groups. In particular, the shift of time allocation from travel-intensive non-market work to travel-non-intensive leisure accounts for around 50 percent of the decline in total travel time. There are no strong evidence for economizing on travel during the recent decade. Third, travel time is complementary with time spent on obtaining goods and services, civil activities, and leisure outside, including exercises, sports and social activities. Time spent on travel is substitutionary with time spent on home entertainment on computer and TV, sleeping, and home production. The substitutionary and complementary patterns of travel time use with other time use categories indicate that there has also been a shift of time allocation from leisure outside to leisure at home, in addition to the shift of time from non-market work to leisure.

Our work contributes to the existing literature on measuring changes in time allocation. Robinson and Godbey (1999) use the same time use surveys we use from 1965, 1975, and 1985, as well as some additional information from the early 1990s, to document time uses in all categories. Aguiar and Hurst (2007) (henceforth A&H) document trends in leisure from 1965 to 2003 by using time use surveys in 1965, 1975, 1985, 1993 and 2003. Similar to Ramey and Francis (2009), they find a dramatic increase in leisure time during the sample period. We further extend A&H sample to include annual time use surveys from 2003 to 2013 conducted by the Bureau of Labor Statistics. The availability of annual data and consistency of time use definitions for surveys after 2003 provide more detailed information on time uses compared to previous surveys. While A&H focus on leisure, we focus on total travel time. Our work also differs from A&H in the choice of sample population. Our sample includes population aged 18 and up, while A&H only include those between 21 and 65.

Our work also relates to a broad literature on the impact of infrastructure provisions on travel behavior. Manheim (1979)'s approach advocates the interactions of the activity and transport systems. Activity system considers socio-demographic and economic factors, which is the focus of our paper, while transport systems consider infrastructure provisions and transportation management. Baum-Snow (2010) studies changes in transportation infrastructure and commuting patterns in US metropolitan areas from 1960 to 2000. Duranton and Turner (2011) investigate the effect of lane kilometers of roads on vehicle-kilometers travelled in U.S. cities. Their empirical evidence are consistent with an unitary elasticity of vehicle-kilometers driven with respect to lane kilometers of highways in urban area. The results represent an instance of Jevons Paradox.[3] Our observations that average travel time has increased from the 60s to the 90s and then declined indicate that there are forces other than changes in infrastructure provision at

[3] Jevons paradox in our case means that technological progress in the transportation sector increases the efficiency of travel, but at the same time increases the demand for travel, thus possibly resulting in a "constant travel time budget". Constant travel time budget is a particular example of Jevons Paradox.