

Measuring Commuting in the American Time Use Survey*

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Abstract

The journey between work and home plays an important role in daily time use, acting as both a fixed time cost of labor force participation and as a constraint on time for other activities. Data from the American Time Use Survey (ATUS) offer the opportunity to examine commuting behavior and its relationship to demographics, labor market characteristics, and the amount of time spent on other activities. Previous analyses have been complicated by the difficulties of obtaining commuting time measures from the ATUS. Travel information can be difficult to interpret in the ATUS, and many commuting trips are likely misclassified using stock measures of work-related travel. To address this shortcoming, I review the strategies of previous researchers to reclassify travel. After surveying possible methodologies, I focus on applying to the ATUS a methodology applied to the National Household Transportation Survey (NHTS). Detailed time information in the NHTS allows me to compare both aggregate commuting measures and the timing of commuting in the two surveys. I further extend the analysis to compare to journey-to-work information in another commonly used dataset,

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the American Community Survey. These comparisons and the methodology provided serve to enable and validate further analysis of commuting behavior using the ATUS, leveraging the advantages of this dataset.

1 Introduction

Commuting plays a major role in the lives of many Americans. The commute acts as a fixed time cost of labor force participation and limits the amount of time available for other activities. Commuting can serve as a cost (in both time and money) to labor market entry. It can affect which jobs are available to job seekers, limiting potential labor markets. Additionally, commuting may play a significant role in happiness and satisfaction. Kahneman *et al.* (2004), for example, provide evidence that commuting ranks as one of the least desirable activities undertaken by workers. Because of its varied impacts on labor supply, location decisions, and general well-being, commuting has been the focus of study by a variety of researchers. Moreover, a range of studies has examined tradeoffs between time spent commuting and time spent on other activities. The scope of this research has been limited by the availability of a nationally representative survey with information on both commuting behavior and an array other characteristics.

The American Time Use Survey (ATUS) collects extensive information on how Americans spend their time, including travel. While it contains no satisfactory direct measure of commuting, it has advantages over other available datasets. The ATUS contains respondent characteristics that commonly used transportation datasets lack, such as wage and salary information. Moreover, unlike both transportation surveys and other large surveys, the ATUS captures other uses of time on the same day. These other uses include the details of time spent on work, which could allow for further classifying commuting behavior. Furthermore, additional ATUS modules are available allowing for the addition of data on other respondent

characteristics such as eating and health information. The survey design also yields linkages to CPS panels with additional data.

Researchers have begun to use the ATUS for analyses of commuting behavior, though the commuting measures they have used have significant flaws. For example, DeLoach and Tiemann (2012) draw conclusions about the characteristics of commuting in the U.S. using an activity code that corresponds only partially to commuting. Christian (2012) exploits the unique advantages of the ATUS to examine tradeoffs between commuting time and time spent on health-related activities, but constructs a commuting measure which appears to overstate travel time.

I address the lack of an appropriate commuting measure in the ATUS data using a methodology previously developed and applied to data from the National Household Transportation Survey (NHTS), a large, nationally representative survey of travel behavior. To do so, I must account for several ways in which the information provided in the ATUS differs from that available in the NHTS. After applying this strategy, I compare measured commuting in the ATUS to that in the NHTS. I also compare the estimates from the ATUS and NHTS to those in a large, nationally representative yearly sample from the American Community Survey (ACS).

I define commutes generally as trips from home to work or from work to home. When such trips are direct, with no stops along the way to perform any other tasks, classifying them as commuting is straightforward. Problems arise when an individual stops along the way between home and work, because it is not evident which of this travel is commuting and which is primarily intended to reach other destinations. McGuckin and Nakamoto (2004) develop and apply to the NHTS a methodology that addresses these chains of consecutive trips. They generate trip tours formed from linked trips that are anchored at home, work, and elsewhere, allowing for stops along the way of up to 30 minutes. Using this strategy, tours between home and work are treated as commutes.

I first describe the available datasets. Next I describe possible methods of classifying travel, detailing the methodology developed in the transportation literature that is applied to the NHTS data to generate measures of commuting from complex chains of trips. I apply this methodology to ATUS data, examining the differences in commuting as measured with this methodology relative to other possible commuting measures. I am then able to compare estimates generated using this methodology from ATUS data to those generated using NHTS data as well as information from the ACS. The goal in the latter sections is to demonstrate the comparability of commuting estimates, providing evidence to support the use of this measure in a range of analyses. This measure will allow researchers to leverage the advantages of ATUS data while not differing markedly in travel classification methodology from analyses using NHTS data, and providing significantly more detail than those using ACS data.

2 Data

2.1 American Time Use Survey (ATUS)

The ATUS is an annual, nationally representative time use survey administered by the Bureau of Labor Statistics (BLS). One respondent per household is chosen from a subset of households which have recently completed the Current Population Survey (CPS). Begun in 2003, data are now available for years 2003 through 2012, with about 14,000 respondents per year. For each respondent, the survey collects time diary information on activities performed in a 24-hour period (from 4 AM the previous day to 4 AM the day of the interview) as well as a range of respondent and household characteristics. The time diaries are collected using “conversational interviewing,” intended to help respondents generate time diaries through open-ended questions (Shelley 2005). Each activity is then assigned an activity code based on the classification of the primary task being carried out. Information on those with whom

the activity took place and the location (or, for travel, mode) is also collected.

ATUS respondents are not asked to provide the purpose of any trips, nor are they asked to identify travel specifically. Instead, a spell is coded as travel if it involves movement from one location to another. Overall, estimates of the total amount of time spent traveling in a day from the ATUS appear to be comparable to those using NHTS data, as demonstrated by Bose and Sharp (2005). However, classification of this travel time by its purpose is inexact.

The purpose of a travel spell is then coded on the basis of the activities taking place immediately before and after (Shelley 2005). In general, travel is categorized as travel related to the next activity; the primary exception is travel to the respondent's home, which is classified as travel for the purpose of the previous activity. For example, if an individual reports that he watched TV, then drove his car, then shopped for groceries, this trip is classified as travel related to grocery shopping. If the next two activities he reports are driving followed by cooking at home, the second travel spell is also coded as travel related to grocery shopping.

The ATUS provides an activity code for "travel related to work."¹ Activities classified under this code meet one of two criteria:

1. Travel occurring immediately before work, or
2. travel occurring immediately after work, provided that the next activity takes place at home.

This activity code does not correspond directly to commuting, differing in two main ways. First, it contains some work-related travel that is not commuting: travel that is directly followed by work is generally coded as work-related travel. For example, the return trip to work from an errand during the middle of the work day would in general be classified as travel related to work. Second, it does not include many commuting spells when stops

¹This corresponds to activity code 170501 in the 2003 ATUS and 180501 in subsequent years.

are made along the way between home and work. Notably, this effect is asymmetrical, impacting the trip to work differently from the trip home. If a worker reports stopping to perform another activity along the way to work, only the last travel spell is generally coded as work-related travel. However, stopping on the way from work to home means that no travel from this commute leg is classified as travel related to work. Because of these shortcomings, this activity code is a poor proxy for commuting. Instead, I propose an alternate commuting measure . . .

2.2 National Household Transportation Survey (NHTS)

The National Household Transportation Survey (NHTS) is a nationally representative survey designed to provide information on the travel of Americans. The survey is performed periodically, most recently in 2001 and 2009. For direct comparison to the ATUS and ACS, I focus here on the 2009 sample, which contains data collected from 150,147 households.

One major difference between the NHTS and the ATUS is that the NHTS seeks to interview every adult member of a surveyed household. While a household is considered “complete” for the purposes of inclusion in the final dataset if 50% of adult household members were interviewed, in practice 93% of eligible household members were interviewed either directly or, in a minority of cases, by proxy. These interviews covered travel days from March 28, 2008 to April 30, 2009. These dates are therefore not directly comparable to samples from the ACS and ATUS, but I limit those samples to the closest relevant year to approximate the travel period in question as closely as possible—the 2008 ATUS and 2009 ACS. As in both the ATUS and the ACS, person-level sampling weights are provided; I use these wherever appropriate.

In addition to a range of characteristics of interest to transportation planners, respondents provide a narrative version of a travel diary, giving information on all trips taken during a specified day. Similar to the ATUS, the NHTS contains information on trip purpose derived

from the tasks performed before and after the trip was taken. As in the ATUS, determination of trip purpose is straightforward in many cases, but frequently complicated when stops are made along the way. The NHTS data therefore have the same main drawback as the ATUS data for the purpose of studying commuting: there is no direct measure of commuting behavior, so a commuting measure must be derived in some way. One such methodology is used to assign trip tours to specific purposes, and this derived information is provided along with other NHTS data.

2.3 American Community Survey (ACS)

A third survey that is often used for its data on commuting behavior is the American Community Survey (ACS). The ACS is performed yearly by the Census Bureau, and samples 1% of households. In addition to the advantages of such a large, frequently repeated sample, it contains a host of demographic and economic information about respondent households and the individuals that comprise them.

However, the ACS contains only limited information on commuting. Respondents report the usual mode of travel to work, as well as information about the timing and duration of the trip to work. Specifically, respondents are asked, “How many minutes did it usually take this person to get from home to work last week?” They are also asked, “What time did this person usually leave home to go to work last week?”

Because respondents are asked to recall information over a relatively long period and average over multiple commuting trips, this would be expected to be both less accurate and to reflect less day-to-day variation than the information for a single, recent commute captured by a travel or time diary. Moreover, this will not capture time spent traveling home from work, and so may give an incomplete picture of commuting patterns. But the ACS information has the advantage that it focuses on travel from home to work to the exclusion of other activities. It is therefore a more direct measure of a portion of commuting behavior

than the measures derived from ATUS and NHTS data, with the major caveat that it relies on respondents recalling information over a longer period of time than other datasets.

3 Candidate Methodologies

Consistent with the broad conceptualization of commuting as travel between home and work, the candidate methodology should provide an estimate of actual time spent in such travel, but not traveling primarily for other reasons. Nonstop trips between home and work are easily classified. However, when a respondent makes stops along the way, properly classifying travel is difficult because of the lack of trip purpose information in the ATUS.

3.1 Methodologies previously applied to the ATUS

Previous researchers have taken divergent approaches to measuring commuting in the ATUS. Some (for example, DeLoach and Tiemann 2012) have used the ATUS measure of travel related to work, interpreting it as commuting. By design, this measure includes some travel that is not commuting and excludes many commuting travel spells. When commutes include stops for other activities along the way, a portion of the trip is not classified as travel related to work. Moreover, the treatment of trips with stops is asymmetric, with different classification results for travels to and from work. Finally, a change in methodology between the 2003 and 2004 waves of the survey impacted which travel was classified as travel related to working. For all of these reasons, travel between home and work is not consistently classified as travel related to work using this activity code.

Alternate approaches have attempted to reclassify travel between home and work to better measure commuting. Brown and Borisova (2007) propose such a methodology, which Christian (2012) adopts in an analysis of commuting and health-related activities. The authors consider all travel between home and work to be commuting, regardless of the number

or length of stops. For individuals starting and ending at home, this can be thought to provide an upper bound of commuting time, but likely substantially overestimates commuting time.

A modified version of the Brown and Borisova methodology is employed by Hamrick and Hopkins (2012) in an examination of travel to grocery stores. The authors calculate total travel between home and shopping, and between shopping and home, then take the minimum of the two travel times. This methodology does address the asymmetric nature of the ATUS travel measures. Applied to travel to and from work, it could be used to generate estimates of commute time. However, when a respondent made long stops in both directions between home and work, this travel would be included. In cases where no stops or only short stops are made, this method does not attempt to explain why one direction might take significantly longer than the other. If for example the time difference is due to normal traffic, this could underestimate commuting time.

3.2 Trip tour methodology

The trip tour methodology outlined by McGuckin and Nakamoto (2004) addresses the fundamental issue of assigning trip purpose to reported travel in trip chains. Classifying travel in this way necessitates the following terminology:

- *trip chains*: sequences of travel with stops;
- *trip tours*: trip chains that, following the McGuckin and Nakamoto methodology, contain stops of no more than 30 minutes; and
- *commuting trip tours*: trip tours that begin at home and end at work or begin at work and end at home.

All trips in a trip chain that contains stops of no more than 30 minutes each are combined to form tours anchored by home, work, or another location. Using this framework,

commuting trip tours are those that either begin at home and end at work, or begin at work and end at home.

Tours are classified as occurring from home to work if the first trip begins at home, the last trip in the sequence ends at work, and the respondent does not report a dwell time of more than 30 minutes at any stop along the way. Tours beginning at home but ending with a 31 minute or longer stop somewhere other than work are classified as home-to-other. The same rules apply to trips from work to home. Therefore, this methodology classifies as commuting tours that contain no stop of more than 30 minutes and either begin at home and end at work or begin at work and end at home.

The Department of Transportation applies this methodology to the NHTS data to produce datasets containing information on trip tours, so that using this methodology allows for direct comparison to this large U.S. transportation behavior dataset. Some travel will likely be misclassified, but the 30 minute cutoff represents a reasonable attempt to balance misclassification in either direction. Other approaches may be more appropriate for classifying travel for other purposes, but focusing on commuting, it is sensible to allow for brief stops along the way but not longer dwell times.

4 Applying the Trip Tour Methodology to the ATUS

To apply the trip tour methodology to ATUS data while maintaining comparability to the NHTS sample, I examine respondents from the 2008 wave of the ATUS.² I limit the sample to respondents between the ages of 25 and 60 who are employed.³ Because work and commuting patterns differ significantly on weekends, I limit the sample to weekdays.

²I use hierarchical extracts of ATUS data obtained from the ATUS-X extract system (Hofferth *et al.* 2013). I use the 2008 ATUS because the majority of diaries from the 2009 wave of the NHTS are for dates in 2008.

³The ATUS contains additional information on whether a respondent worked on a particular day, but I do not use this here because such information is not available in the NHTS.

One limitation of the location data in the ATUS is that respondents are not generally asked to provide a location for “personal care” activities, which include such common activities as sleeping, bathing, and grooming. This is of particular concern since many people, after waking in the morning, are likely to report only engaging in other personal care activities before leaving the house. Indeed, a sizable portion of this sample does not report an activity location before traveling in the morning. To address this I treat all sleep spells occurring at the beginning and end of the ATUS diary day (that is, beginning before 4 A.M. or ending after 4 A.M.) as occurring at the respondent’s home. While this may misclassify the location of some sleep spells, it seems a reasonable assumption for the vast majority of respondents. To link this to the location of the respondent at the beginning or end of travel, I further assume that consecutive personal care spells with no intervening travel take place in the same location.

After supplying a location for these personal care activities, I further limit the sample to those who begin and end the diary day at home. This produces a sample of 2,893 time diaries for individuals who are at home at 4 A.M. and return home by 4 A.M. I use the ATUS sample weights to generate nationally representative statistics for these workers.

The simplest commutes to classify are direct trips from home to work or from work to home. These may contain multiple travel segments by different modes, but do not involve stops along the journey to perform other tasks. As shown in the upper panel of Table 1, the majority of workers have at least one nonstop commute trip during the day: 57% have at least one direct trip from home to work and 47% have a direct trip from work to home. However, only 37% have a commute on the diary day consisting of at least one direct trip from home to work and at least one direct trip from work to home.

[Table 1 about here.]

To apply the trip tour methodology, I combine consecutive travel spells to form trip tours

anchored, as in the NHTS, by home, work, or other locations. I exclude those tours with stops of more than 30 minutes somewhere other than home or work to generate a sample of commute tours, which are either home-to-work or work-to-home tours.

As shown in the lower panel of Table 1, applying the trip tour methodology expands the proportion of the sample with commutes in each direction. The increase is slightly larger for the journey from home to work, with 70% of workers reporting at least one tour from home to work. Workers in the sample are more likely to stop on the way home from work (with fewer nonstop trips in this direction), and those stops are more likely to be greater than 30 minutes than those on the way from home to work, so that only 61% of workers in this sample report trip tours from work to home.

The impact of applying the trip tour methodology to the ATUS on the average measured commute is evident in Table 2. Using the definition of a commuting trip tour as any tour beginning at home and ending at work or beginning at work and ending at home, with stops for no more than 30 minutes, the average daily commuting time in this sample is 38 minutes. For comparison, including only nonstop commute trips between home and work yields an average commute of 27 minutes.

On average, respondents in the sample had 33 minutes of travel classified in the ATUS as “travel related to work.” As mentioned previously, this differs significantly from a measure of commuting trip tours. While it includes some travel that is not classified as commuting, overall this measure includes less travel than the commuting trip tour methodology. Primarily, this activity code does not include all travel when stops are made along the way.

An alternate method of accounting for trip chains is to include all travel between home and work, regardless of the length of stops along the way. This resembles the methodology proposed by Brown and Borisova (2007). As shown in Table 2, this measure generates a significantly larger estimate of commuting time than the trip tour methodology. This is consistent with the increase in number of commute trips in the NHTS when no limits on

stop length are imposed, as shown by McGuckin and Nakamoto (2004).

[Table 2 about here.]

Figure 1 demonstrates how the distribution throughout the day of travel classified as commuting the commute trip tour methodology differs from that of travel classified in the ATUS as travel related to working. In general, commuting trip tours include more travel than the ATUS measure of travel related to work, with one notable exception in the middle of the day. This is expected, since some workers are traveling to or between work-related tasks at this time without going home. Such travel would not generate a trip tour between home and work but could be classified as travel related to work in the ATUS.

[Figure 1 about here.]

5 Comparing Commuting in the ATUS, NHTS, and ACS

Applying the trip tour methodology to ATUS data has allowed me to construct a preferred measure of commuting for the individuals in this sample, which should match the commuting measure available in the NHTS. Next, I construct comparison samples of respondents and compare observed commuting across the surveys. My primary goal in this section is to demonstrate how closely the commuting tour methodology from the NHTS, when applied to the ATUS, reproduces the commuting behavior observed in the NHTS. Since the wealth of information in the ATUS makes possible many analyses that cannot be performed using the NHTS, establishing that the ATUS commuting measure is comparable to the NHTS commuting measure would enhance the credibility of these results. Where the two measures differ it is important to note and explain the differences. Additionally, since the ACS is also

frequently used in analyses of commuting behavior, where possible I compare estimates from ACS data to those constructed from travel and time diaries.

I begin by limiting the 2009 NHTS sample to those between the ages of 25 and 60 who provided a travel diary for travel on a weekday. I then limit to those who begin the day at home, end the day at home, and report traveling to work at some point during the day. This sample should correspond to the sample of ATUS respondents I constructed above.

To compare commuting from the NHTS and ATUS, I begin by comparing aggregate commuting measures in the two samples. Sample average commute times are summarized in Table 3. As shown here, the estimates of commuting time to work from the ATUS sample mirror those from the NHTS sample. Moreover, the estimates of to-work travel time from the ATUS and NHTS are close to those from the ACS when these individuals are excluded. These overall estimates suggest that the of to-work commuting are quite similar, in aggregate.

For total commuting, the ATUS mean time of 37.7 minutes is close to the NHTS mean time of 37.0 minutes. When individuals with zero commuting time are excluded, the means differ more significantly, which could warrant further investigation.

[Table 3 about here.]

One major advantage of diary-based studies such as the ATUS and NHTS is that they make possible detailed analysis of the timing of activities. I am therefore able to construct a figure analogous to Figure 1 displaying the distribution of commuting across the day for ATUS and NHTS respondents. This comparison, shown in Figure 2, shows the similarities in commuting travel captured by the two measures.

[Figure 2 about here.]

ACS respondents do not provide direct information on travel throughout the day. However, because the ACS collects information about the usual departure time in addition to the

usual travel time to work, I am able to compare ACS commuting behavior to work across the day to observed behavior in the ATUS and NHTS. As shown in Figure 3, all three measures of commuting to work follow similar patterns. Additionally, the information on usual departure time in the ACS can be compared to reported departure times in the ATUS and NHTS. As shown in Figure 4, the distributions of departure times appear to be similar in the three surveys.

[Figure 3 about here.]

[Figure 4 about here.]

In summary, when the commuting trip tour measure is applied to the ATUS, observed commuting behavior matches up closely with observed behavior in the NHTS, both in the aggregate (as shown by comparisons of means) and throughout the day (as shown by the above graph). This evidence supports the use of this methodology to produce measures of commuting that mirror those in the NHTS—an established survey used to produce reliable estimates of travel behavior—at the sample level.

6 Multivariate Analysis

Finally, I perform a multivariate analysis to further investigate similarities and differences in the measures of commuting from the ATUS and NHTS. I pool the ATUS and NHTS data⁴ and estimating an OLS regression with commuting time as the dependent variable and a set of respondent characteristics as the independent variables. Specifically, the commuting time measure is calculated using the trip tour methodology, and the individual characteristics include indicators for sex, education level, and age brackets.

⁴Sample weights are used, corrected to give equal total weight to the ATUS and NHTS observations.

I estimate a regression with this suite of indicator variables, plus a set of interaction terms between these indicators and whether the reported time is from the ATUS. By performing an F-test on the estimated coefficients of these interaction terms, I can test whether there is a statistically significant association between a given characteristic and differences in calculated commuting time between the NHTS and ATUS.

The goal of this regression is to provide a detailed picture of the observable factors related to differences in calculated commuting time between the NHTS and ATUS. Effectively, this is an extension of simple t-tests of differences in commuting time by a single factor, such as sex. This t-test would be equivalent to performing the regression described above with only an indicator for women and the interaction of this indicator with an indicator for ATUS, then examining the t-statistic or f-statistic on the interaction term. The regression framework allows for the isolation of the relationship due to each factor by controlling for other observables.

The f-test results from the regression are presented in Table 4 below. The upper panel provides evidence of strong relationships between sex and commuting time, and between age and commuting time. These relationships are expected and consistent with previous literature. Having controlled for these effects and their interactions, there is no significant difference remaining in expected commuting time between the ATUS and NHTS samples, as shown by the p -value of 0.798 on the ATUS indicator.

These results provide little evidence of sex- or age-based differences across the two samples. There is some evidence of differences related to education levels (p -value of .06). However, the overall f-test of the ATUS indicator and all of its interactions does not provide strong evidence of differences in commuting time estimates related to this suite of factors. These commuting time estimates appear to be consistent across the samples not only at the aggregate level and across the day, but also across categories of basic demographics. One possible exception is education, which could warrant further examination.

[Table 4 about here.]

7 Conclusions

Analysis of commuting behavior using the ATUS has been complicated by the difficulties of extracting detailed travel information from the survey data. In this paper, I have provided a summary of these difficulties and surveyed possible strategies for consistently measuring commuting using the available data. I selected a methodology previously applied to the NHTS which addresses many of the shortcomings of other possible measures. Using this preferred methodology, I calculated estimates that are in line with those from the NHTS. I further disaggregated the estimates to find only weak evidence of systematic differences between the measures from the ATUS and NHTS. I therefore propose this methodology as a strategy to produce consistent measures of commuting behavior in the ATUS for analyses where accurate measurement of commuting is a priority.

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Table 1: Commute Characteristics of Workers in ATUS Sample

	Percent of Sample	Number of Diary Days
Nonstop trips between home and work		
At least one nonstop home-to-work trip	57.3%	1,573
At least one nonstop work-to-home trip	46.8%	1,335
At least one nonstop trip in each direction	37.1%	1,015
Trip tours between home and work		
At least one home-to-work tour	70.2%	2,037
At least one work-to-home tour	60.5%	1,788
At least one tour in each direction	54.7%	1,615

Notes: 2008 ATUS with sample limitations in text. Trip tours are, as defined in McGuckin and Nakamoto (2004), chains of travel with no stop of more than thirty minutes. Sample percentages are weighted using ATUS sample weights.

Table 2: Average Commute Times in Minutes, ATUS Sample

Preferred Measure:	
Commuting trip tours	37.7
Other Measures:	
Nonstop commutes only	26.9
ATUS “travel related to work”	33.3
All travel between home and work	49.2

Notes: Trip tours are, as defined in McGuckin and Nakamoto (2004), chains of travel with no stop of more than thirty minutes. All travel between home and work includes all travel between the time a respondent is at home and at work, with no limitation on stop length. ATUS “travel related to work” is all travel with activity code 180501. Sample percentages are weighted using ATUS sample weights.

Table 3: Average Commute Times in Minutes

Sample	To-work travel		Total work travel	
	Full sample	Excluding zeros	Full sample	Excluding zeros
ACS	25.0	26.1		
NHTS	18.5	28.6	37.0	55.2
ATUS	19.6	27.9	37.7	49.6

Table 4: Multivariate Analysis F-test Results

Characteristic	<i>P</i> value
Pooled Characteristics	
Sex	<.001
Education Levels	.218
Age Brackets	<.001
ATUS indicator	.798
Interacted characteristics	
Sex \times ATUS	.389
Education \times ATUS	.060
Age \times ATUS	.591
Total of ATUS indicator and interactions	.102

Notes: 2008 ATUS and 2009 NHTS data with sample limitations in text.

Figure 1: Proportion of individuals commuting at times throughout the day, ATUS sample

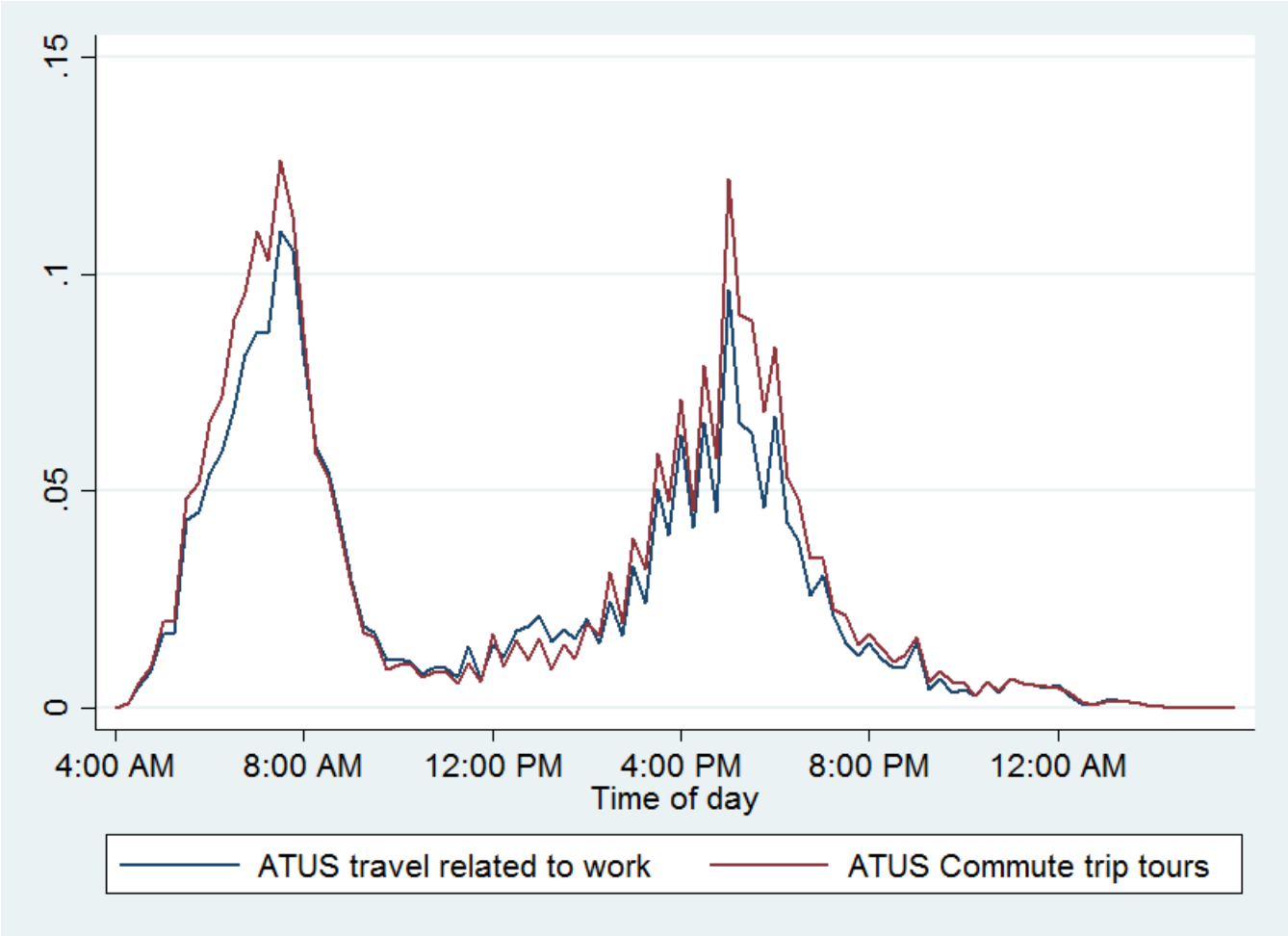


Figure 2: Proportion of individuals commuting at times throughout the day, ATUS and NHTS samples

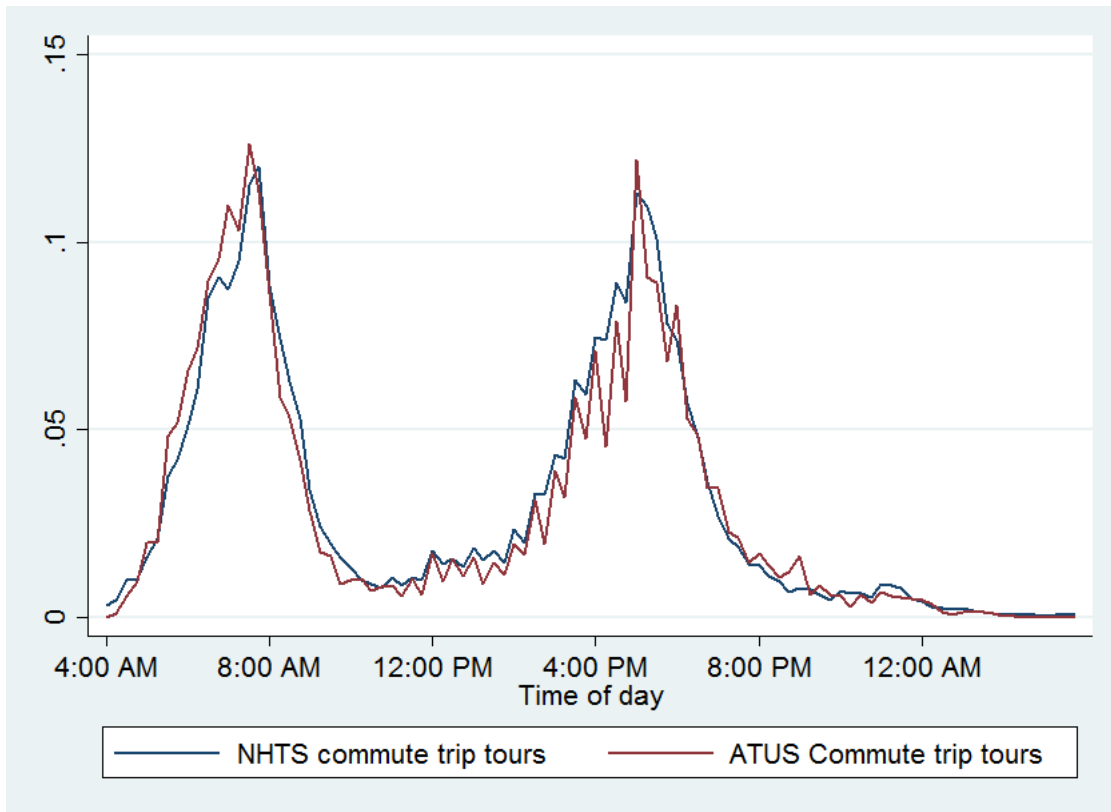


Figure 3: Proportion of individuals commuting to work at times throughout the day

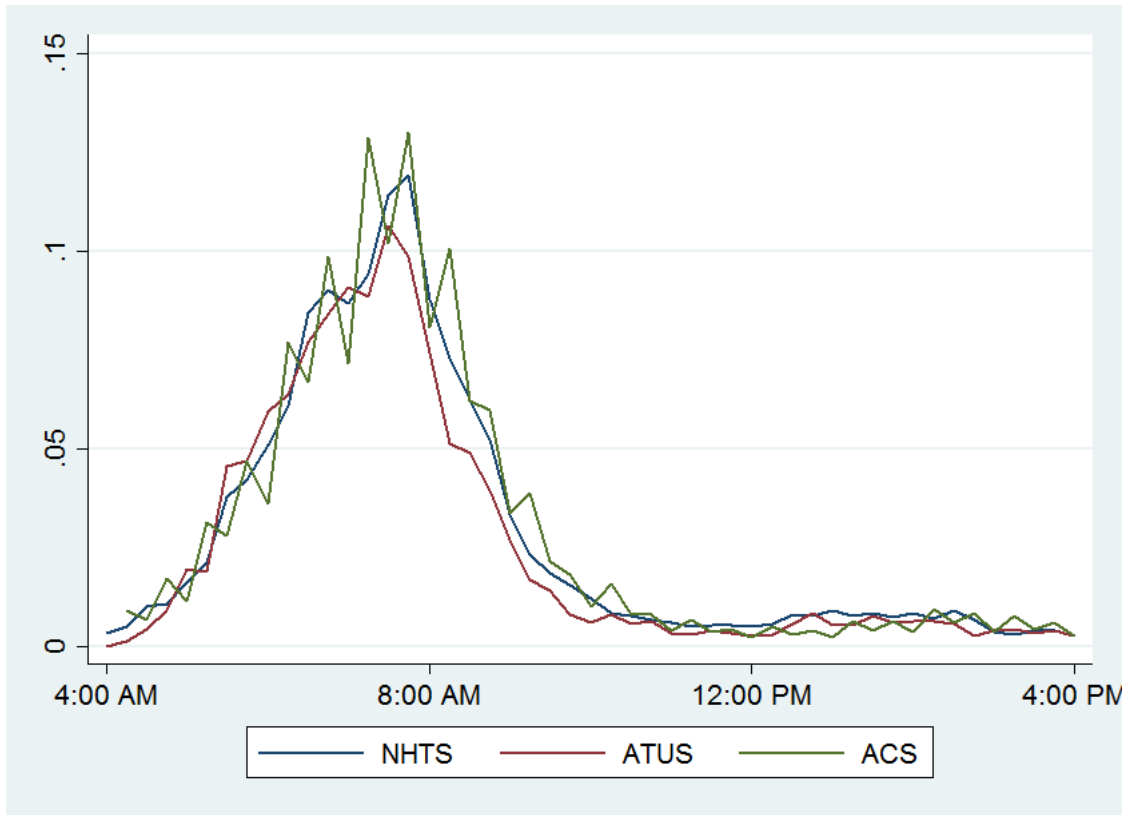


Figure 4: Distribution of departure times to work

