Shopping Time and the Business Cycle

Jan Duras*
Texas Tech University

December 10, 2018

Abstract

I use American Time Use Survey data from 2003 to 2016, and document that (1) on state level, average total shopping time decreases with state level unemployment rate and increases with real per capita GDP, and that (2) on individual level total shopping time increases with family income. This is consistent with procyclical overall shopping time. I also examine the behavior of five time use subcategories and show that similar pattern as for total shopping time arises for travel time related to shopping, other shopping and shopping for food. Only for time spent shopping groceries is the effect of higher family income negative.

JEL Classification: D31, E32, J22
Keywords: Business Cycles, Time Use, American Time Use Survey

*Department of Economics, Texas Tech University, 257 Holden Hall, Lubbock TX 79409 Email: jan.duras@ttu.edu

1 Introduction

This paper investigates the behavior of time spent on activities related to shopping and provides the empirical evidence on its behavior over the business cycle. Whether consumers' time spent on shopping related activities is procyclical or countercyclical has important implications for macroeconomic models developed to study fluctuations of goods and labor market indicators over the business cycle. Crucially, there is no agreement so far on the cyclicality of time spent shopping and consumer search effort in the goods market in the literature: in Bai, Ríos-Rull, and Storesletten (2012) and Petrosky-Nadeau and Wasmer (2015) consumers choose lower effort in recessions, in Haan (2014) the shopping effort in fixed and equal for all consumers, and in Kaplan and Menzio (2013) it is fixed, but unemployed workers exert higher effort than those employed because they have more time to allocate.

The main reason for the disagreement about the cyclical properties of time spent on shopping related activities is a lack of empirical support that could provide guidance for choices that have to be made when developing a model that features search frictions in the goods market. This paper attempts to fill this gap. It examines the behavior of time spent on shopping related activities, with main focus on it behavior over the business cycle. I use American Time Use Survey data from 2003 to 2016, and document that document that (1) on state level, average total shopping time decreases with state level unemployment rate and increases with real per capita GDP, and that (2) on individual level total shopping time increases with family income. This is consistent with procyclical overall shopping time. I also examine the behavior of five time use subcategories: (1) grocery shopping, (2) purchasing gas, (3) purchasing food (not groceries), (4) other shopping related activities (shopping for other consumer goods and services, researching purchases, security procedures related to shopping, waiting associated with shopping), (5) travel time related to shopping for goods and services. Similar pattern as for total shopping time arises for travel time related to shopping, other shopping and shopping for food - shopping time increases with higher family income. Shopping for groceries is the only time subcategory where the effect of higher family income is negative.

The rest of the paper is organized as follows. I discuss the source of data used in this paper in Section 2. Next, in Section 3 I present result from the estimation of the regression models that exploit state level and individual level variation to identify the cyclical properties of the shopping time and its main subcategories. Section 4 presents a simple calibrated model that incorporates search frictions in goods market, which allow it to account for main empirical facts regarding shopping time. Section 5 concludes.

2 Data

I use the data from the American Time Use Survey (ATUS), for the period from 2003 to 2016. This data is collected by the U.S. Census Bureau and Bureau of Labor Statistics and provides detailed information how individuals allocate their time on various activities.

The ATUS sample is drawn from a universe of individuals age 15 or over, living in households that previously participated in the Current Population Survey (CPS). The sample is constructed to be representative of the U.S. civilian, non-institutionalized population. Chosen individuals are interviewed 2 to 5 month after the household's final CPS interview. The main purpose of the interview is to construct a 24-hour time diary, with detailed information on activities the respondents were engaged in during the day before the interview. In addition to detailed data on time use, data on demographic and labor force characteristics are also available in ATUS. In 2003 about 20,000 individuals were interviewed, in the following years the number of interviewed varied approximately between 11,000 and 14,000, with an average of roughly 12,500.

The sample used in this paper is based on ATUS waves from 2003 to 2016, and includes respondents between ages 18 and 65, which yields 129,521 individuals. Activities reported by respondents are categorized in ATUS into a three tier system, with 17 major categories that are further divided in tier 2 and tier 3 into more than 400 subcategories. I use the detailed ATUS classification to construct the following five subcategories of time spent on shopping related activities: (1) grocery shopping, (2) purchasing gas, (3) purchasing food (not groceries), (4) other shopping related activities (shopping for other consumer goods and services, researching purchases, security procedures related to shopping, waiting associated with shopping), (5) travel time related to shopping for goods and services. A detailed list of activities from ATUS lexicon used to construct these subcategories can be found in Appendix A.

3 Shopping Time over the Business Cycle

Several recent papers have analyzed the effects of introducing search frictions in the goods market on macroeconomic variables. But there is so far no agreement on cyclicality of consumer search effort in the models developed in these papers: in Bai et al. (2012) and Petrosky-Nadeau and Wasmer (2015) consumers choose lower effort in recessions, in Haan (2014) the shopping effort in fixed and equal for all consumers, and in Kaplan and Menzio (2013) it is fixed, but unemployed workers exert higher effort than those employed.

Table 1: Average Hours Per Week Spent on Shopping Related Activities

				Unconditional Difference		Conditional Difference	
	Average 2005-2007	Average 2008-2010	Average 2011-2013	2008-2010 vs 2005-2007	2008-2010 vs 2011-2013	2008-2010 vs 2005-2007	2008-2010 vs 2011-2013
groceries	0.687	0.701	0.710	0.014	-0.009	0.018	-0.010
gas	0.046	0.049	0.041	0.003	0.009***	0.003	0.009***
food	0.141	0.144	0.143	0.003	0.001	0.002	0.002
other	2.053	1.840	1.720	-0.213***	0.120**	-0.208***	0.126**
travel	2.124	2.062	1.976	-0.062	0.086*	-0.067	0.097**
total	5.051	4.797	4.590	-0.254**	0.206**	-0.251**	0.224**

*/**/*** denote statistical significance at 10%/5%/1% level

3.1 Time Series Variation

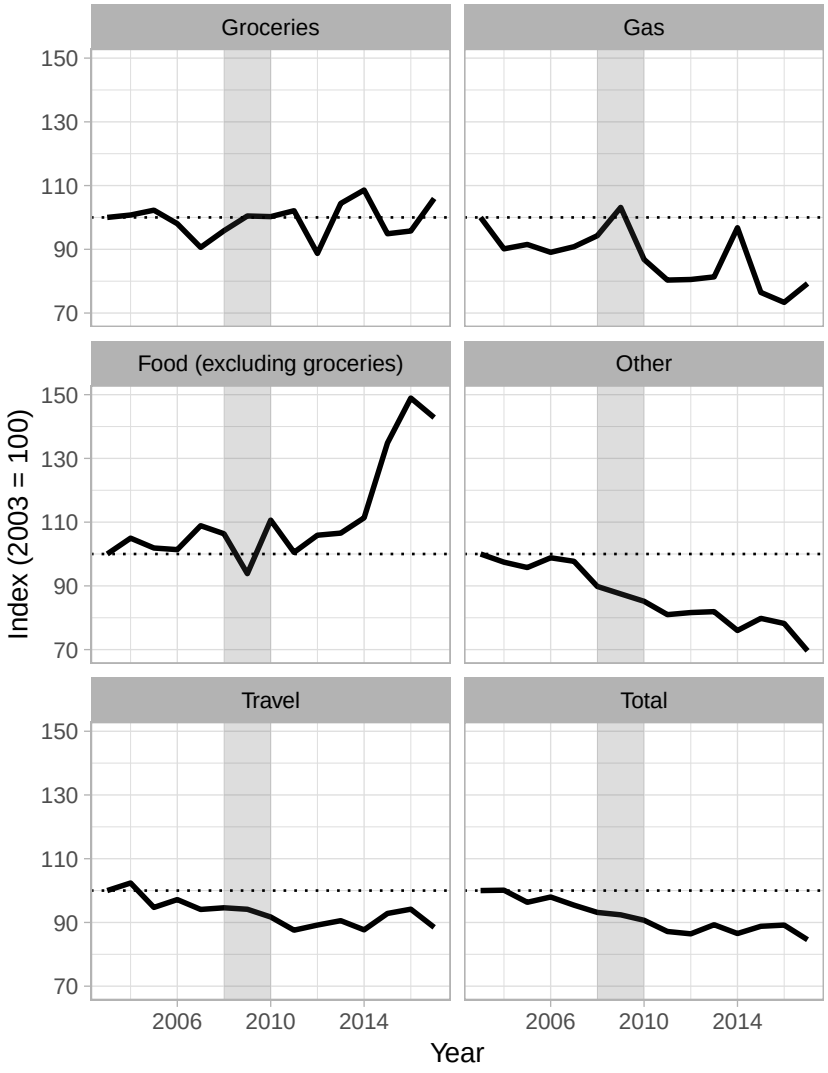
This disagreement about the cyclical properties of time spent on shopping related activities is due to the lack of data and empirical support that could provide guidance for choices that have to be made when developing a model that features search frictions in the goods market. The Bureau of Labor Statistics (BLS) started collecting the data measuring how individuals allocate their time through the American Time Use Survey (ATUS) only in 2003. Consequently, any analysis of time allocation over the business cycle using ATUS as a data source is facing the same challenge - because of the short time span of ATUS, it is not possible to use the common approach to filter out the trend, obtain the cyclical component of a time series and use it examine the changes in the time allocation over the business cycle.

Nevertheless, a promising alternative approach was proposed by Aguiar, Hurst, and Karabarbounis (2013), who use data from 2003 to 2010 ATUS waves to analyze the relocation of time from market work into home production, leisure, and job search, during the 2008-2009 recession. They first document changes in aggregate time series, by comparing the average time spent on those activities during the three year period of 2006-2008, and during the following two years 2009-2010. In the similar spirit and focusing only on "shopping time", Petrosky-Nadeau, Wasmer, and Zeng (2016) compare the average time spent on shopping related activities during the expansion years of 2005-2007, and during the following three years 2008-2010 that include the Great Recession of 2008-2009.

Table 1 presents these averages for periods 2005-2007 and 2008-2010, for the total shopping time and also the five subcategories - (1) time spent grocery shopping, (2) purchasing gas, (3) purchasing food (not groceries), (4) other shopping related activities (shopping for other consumer goods and

services, researching purchases, security procedures related to shopping, waiting associated with shopping), (5) travel time related to shopping for goods and services. Both the unconditional difference in time spent over the two periods and the difference in time spent conditioning on age, education, race, gender, marital status, and the presence of children shows a statistically significant decline for total time spent shopping and other shopping.

Figure 1: Average Hours Per Week Spent on Shopping Related Activities



The biggest issue with this approach - comparing changes in the aggregate data between 2005-2007 and 2008-2010 - is that if the sample is extended to include the 2011-2013 period, there is a further decline in shopping time. The observed 2008-2010 versus 2005-2007 decline can thus to a large extent be due to a long run trend decline rather then cyclical pattern. This can be seen

in Figure 1 which plots the time series for the total shopping time and its five subcategories. The decline is especially noticeable for total time which fell by roughly 10% between 2003 and 2016, and for other shopping time, shich fell by about 20% between 2003 and 2016. This is in line with a broader trend - as argued in Aguiar et al. (2013) changes in leisure and non-market work observed in ATUS data during the 2008-2009 recession include both business cycle fluctuations and the low frequency trends over non-recessionary periods that seem to have continued during the recession.

3.2 State-level Variation

Since aggregate time series provide very limited information on cyclicality of main time use categories in ATUS, Aguiar et al. (2013) next exploit state level variation in time use and severity of the 2008-2009 recession, to estimate the extent of time relocation from market work to other activities during the 2008-2009 recession. To do so, they first consider four two-year periods (2003-2004, 2005-2006, 2007-2008, and 2009-2010), and construct state level aggregates for each of the main time use categories

$$\tau_{st}^{j} = \frac{1}{\sum_{i=1}^{N_{st}} w_{ist}^{j}} \sum_{i=1}^{N_{st}} w_{ist}^{j} \tau_{ist}^{j}$$

where τ_{ist}^{j} denote hours per week during period t that an individual i from state s spent on category j, w_{ist}^{j} are the ATUS sample weights, and N_{st} is the number of individuals in the sample that are from state s, in period t. Then, for each time use category j they estimate a regression

$$\Delta \tau_{st}^{j} = \alpha^{j} - \beta^{j} \Delta \tau_{st}^{market} + \varepsilon_{st}^{j}$$

where the coefficient β^{j} measures the fraction of time that is relocated during recession from market work to time use category j. For their time use categories related to shopping activities, Petrosky-Nadeau et al. (2016) construct the log changes in state level aggregates

$$\Delta \log \tau_{s,2005-2010}^{j} = \log \tau_{s,2008-2010}^{j} - \log \tau_{s,2005-2007}^{j}$$

and examine its correlation with log change in state level real GDP per capita

$$\Delta \log y_{s,2005-2010}^{j} = \log y_{s,2008-2010}^{j} - \log y_{s,2005-2007}^{j}$$

to show that states that experienced the largest drops in the real per capita GDP between 2005-2007 and 2008-2010 also tend to be states with largest drops in the shopping time between 2005-2007 and 2008-2010. The long run trend discussed in the previous section, which limits the inference that can be drawn from the aggregate time series data, is however also present in state level data. Consider the extended sample, which includes the period 2011-2013, and construct additional three year differences are calculated as

$$\Delta \log \tau_{s,2008-2013}^{j} = \log \tau_{s,2008-2010}^{j} - \log \tau_{s,2011-2013}^{j}$$

When shopping time is procyclical and no time trend is present than both $\Delta \log \tau^j_{s,2005-2008}$ and $\Delta \log \tau^j_{s,2008-2013}$ should be negative for most states and shopping time categories. This is not the case, as shown in Table 2 and Figure 2. For total shopping time, only 15 out of 51 states show a negative change both when comparing 2008-2010 to 2005-2007 and also when comparing 2008-2010 to 2011-2013. For the five time use subcategories, only 13 to 17 states show changes in the three year time averages that would be consistent with no time trend and procyclical shopping time.

Figure 2: Changes in Average Hours Per Week Spent on Shopping Related Activities

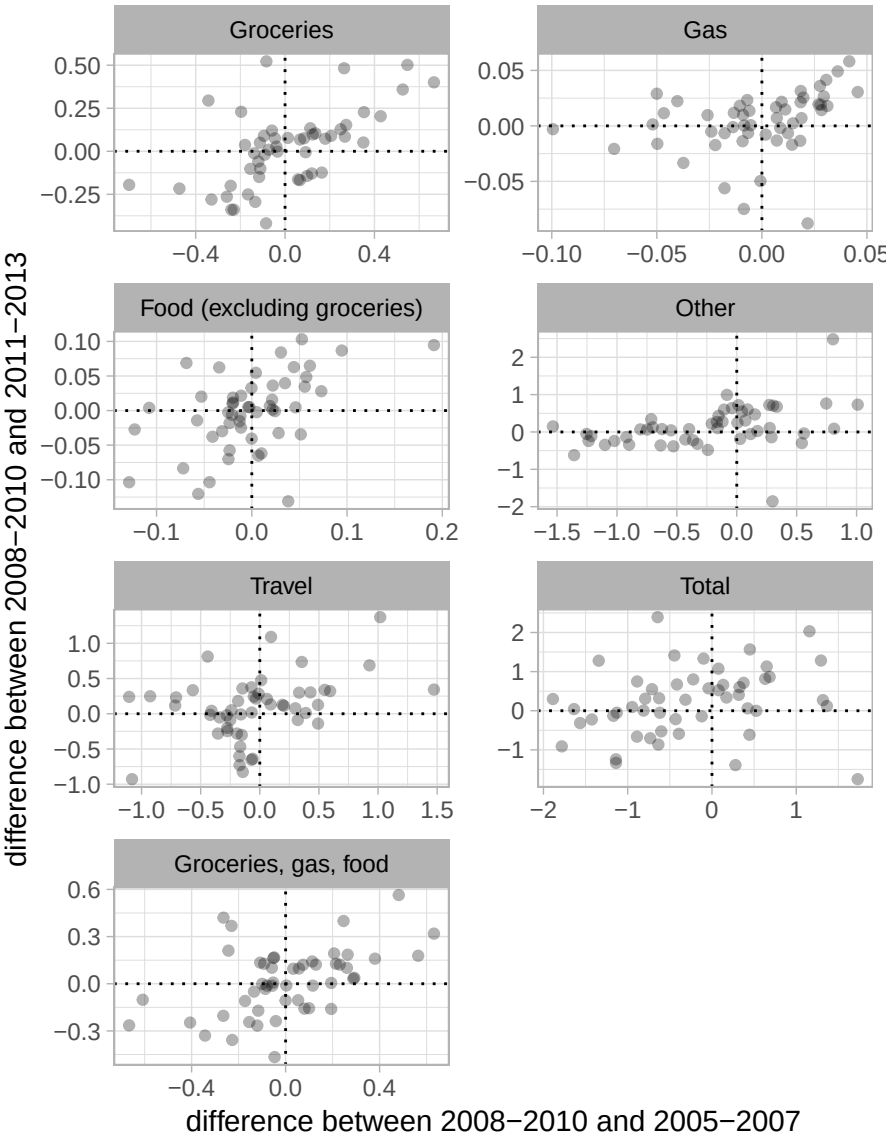


Table 2: Change in Average Hours Per Week Spent on Shopping Related Activities

	Negative, Negative	Negative, Positive	Positive, Negative	Positive, Positive
Groceries	17	10	6	18
Gas	13	12	7	19
Food	17	11	7	16
Other	14	16	6	15
Travel	17	15	2	17
Total	15	16	4	16

Thus, instead of using three year averages and sample from 2005 to 2010, I use the whole sample from 2003 to 2016, and examine the cyclicality of shopping time using state-level variation by estimating variants on the following regression

$$\tau_{st}^{j} = \alpha^{j} + \beta^{j} x_{st} + D_{st}^{j} + D_{s}^{j} + \varepsilon_{st}^{j}$$

where x_{st} is cyclical indicator, D_{st} is a control for time, and D_s are the state fixed effects that control for any state specific time invariant differences in time use. I consider two alternatives for the cyclical indicator x_{st}: state-level log of real GDP per capita y_{st} and state-level unemployment rate u_{st}, and also two alternatives for the time control D_{st}: a simple linear trend common for all states, and state specific linear trends.

Table 3 shows the estimated coefficients β^j for these regressions. Unemployment rate is statistically significant in the OLS models for total shopping time, travel, other shopping and food categories regardless of the specification. Results for real GDP per capita are somewhat mixed; with only common time trend for all states this variable is statistically significant, but when state fixed effects or state specific time trends are included it becomes statistically insignificant (the only exemption is time spent purchasing food). But the results in general, if we exclude purchasing groceries and gas, appear to provide some evidence that shopping time is procyclical rather than countercyclical.

Table 3: State level regressions

	log real GDP per capita				unemployment rate			
groceries	0.156***	0.158***	−0.187	−0.179	0.008*	0.008*	0.003	0.004
gas	−0.032***	−0.031***	0.005	0.006	0.0002	0.0004	0.001	0.0004
food	0.049**	0.039*	0.275***	0.313***	−0.003**	−0.004***	−0.006***	−0.006***
other	0.120	0.248*	0.668	0.968	−0.028**	−0.019*	−0.024**	−0.024*
travel	0.246***	0.298***	0.670	0.453	−0.015**	−0.011	−0.021***	−0.021**
total	0.538***	0.713***	1.431	1.561	−0.038**	−0.025*	−0.047***	−0.047***
common trend	N	Y	Y	N	N	Y	Y	N
state effects	N	N	Y	Y	N	N	Y	Y
state trends	N	N	N	Y	N	N	N	Y

Note: *p<0.1; **p<0.05; ***p<0.01

3.3 Individual-level Regressions

Finally, I estimate individual level regressions to investigate how the shopping time changes with family income. I split ATUS respondents based on their family income into seven groups as follows: $0 to $12,499; $12,500 to $24,999; $25,000 to $49,999; $50,000 to $74,999; $75,000 to $99,999; $100,000 to $149,999, $150,000 or more.

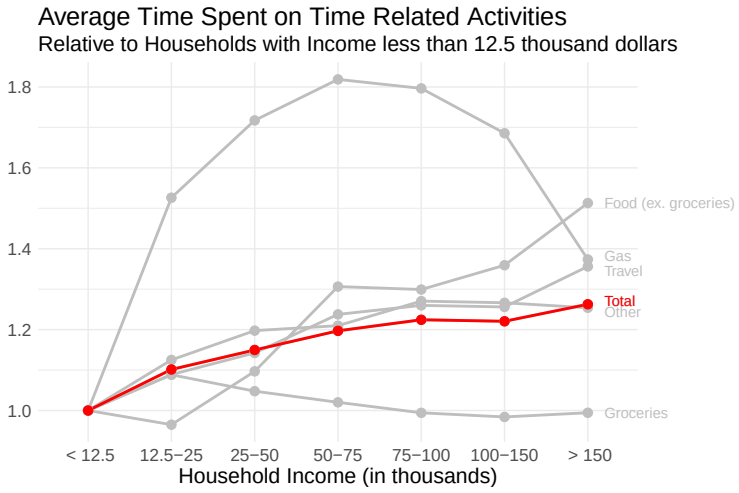
Table 4 shows the descriptive statistics for the sample. There are clearly visible differences in demographics across the income groups. With higher family income we observe increasing shares of individuals who are male, white, and are more likely to have an advanced degree. Individuals from higher income families are also more likely to be married, employed, and have spouse that is employed.

In addition, as shown in Figure 3, higher family income tends to be associated by higher time spent on shopping related activities. This holds for total shopping time, as well as its main subcategories. The only exception appears to be the time spent shopping for gas which has a non-monotone relationships with family income.

Table 4: Summary statistics, by family income (in thousands)

	all	0 to 12.5	12.5 to 25	25 to 50	50 to 75	75 to 100	100 to 150	150+
observations	129,521	12,518	15,260	33,680	25,722	19,202	13,545	9,594
sample share	1.000	0.084	0.111	0.255	0.204	0.148	0.116	0.082
average age	40.800	38.731	39.459	40.318	41.169	41.489	41.679	43.088
fractions within the income group (weighted)								
male	0.491	0.434	0.464	0.488	0.503	0.505	0.507	0.513
black	0.119	0.269	0.182	0.138	0.094	0.074	0.057	0.044
less than HS	0.117	0.282	0.245	0.154	0.070	0.045	0.029	0.028
HS degree	0.296	0.368	0.395	0.371	0.313	0.234	0.169	0.112
(some) college	0.279	0.242	0.255	0.293	0.312	0.302	0.275	0.205
advanced degree	0.308	0.108	0.104	0.183	0.304	0.419	0.526	0.655
married	0.564	0.238	0.386	0.498	0.623	0.694	0.722	0.736
spouse employed	0.745	0.474	0.542	0.669	0.778	0.825	0.853	0.800
employed	0.746	0.448	0.616	0.734	0.801	0.832	0.829	0.832
unemployed	0.057	0.128	0.085	0.062	0.046	0.038	0.040	0.028
student	0.022	0.042	0.026	0.015	0.017	0.017	0.019	0.032
retired	0.037	0.037	0.043	0.045	0.039	0.033	0.027	0.025
homemaker	0.089	0.135	0.118	0.098	0.073	0.067	0.077	0.079
disabled	0.051	0.216	0.116	0.048	0.025	0.014	0.009	0.005

Figure 3: Average Hours Per Week Spent on Shopping Related Activities by Family Income



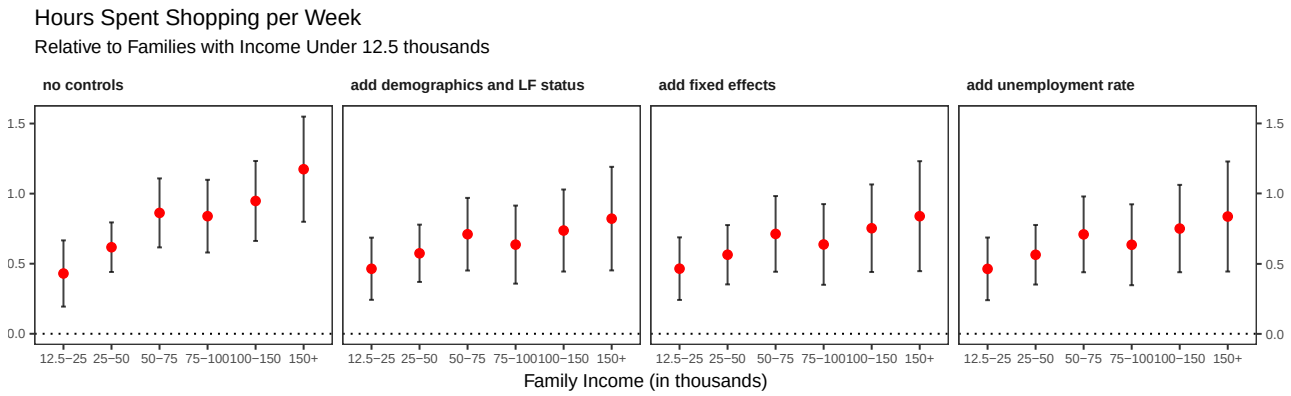
To examine the relationship between family income and time spent on shopping related activities, I estimate variants of the following regression

$$\tau_{ist} = \alpha + \beta I_{ist} + \delta x_{ist} + \gamma UR_{st} + D_d + D_t + D_s + \epsilon_{ist} \tag{3.1}$$

where the dependent variable τ_{ist} is hours per week spent by individual i from state s in year t on shopping related time activities. Set of dummy variables in I_{ist} is used to distinguish seven family income categories: \$0 to \$12,499; \$12,500 to \$24,999; \$25,000 to \$49,999; \$50,000 to \$74,999; \$75,000 to \$99,999; \$100,000 to \$149,999, \$150,000 or more. Controls for demographics and labor force status of the individual x_{ist} include age (from 25 to 65, using five year age dummies), education (using four education dummies for individuals who are high school dropouts, high school graduates, have either some college or college degree, and finally advanced degree), gender, marital status, race, and dummies for labor force status (unemployed, retired, homemaker, student, disabled). Finally UR_{st} is the state level unemployment rate ans D_d, D_t and D_s are the date of week, year, and state dummies respectively. The constant in the regression represents the average time per week for the reference group, which is set to be white, male, single, employed individuals, with high school degree, between 48 and 57 years old living in family with income less than \$12,500.

Table 5 shows the result of estimating (3.1) for total times spent on shopping related activities, and Figure 4 plots the estimated coefficients β together with their 95% confidence interval. While controlling for demographics, and including time and state affect the estimates to some extent, with regard to the main question this paper is trying to address, the results are robust. The results show a strong positive relationship between family income and total time spent on shopping related activities. In the model specification with all controls included, the point estimate is that an individual in a family with income above $150,000 spends each week on average extra 45 minutes on shopping related activities. The results also suggest that controlling for family income, labor force status has implications for time spent shopping, and the estimated coefficients in the regression are consistent with a presence of a time constraint - unemployed and retired individuals and homemakers spend more time shopping than employed individuals and students.

Figure 4: Family Income and Total Time Spent on Shopping Related Activities



In addition to total shopping time, I also estimate regression model (3.1) separately for the five time use subcategories listed above: (1) grocery shopping, (2) purchasing gas, (3) purchasing food (not groceries), (4) other shopping, (5) travel time related to shopping for goods and services. Table 6 shows the coefficients in (3.1) estimated for these time use subcategories. Similar pattern as for total shopping time also arises for travel time related to shopping, other shopping and shopping for food - shopping time increases with higher family income. There does not seem to be a clear pattern when it comes to purchases of gas. For groceries, the effect of higher income is negative. This again appears to be intuitive - individuals in families with higher income are likely to be less price cautious and responsive to sales when shopping for groceries, likely to make fewer shopping trips and visit fewer grocery stores. In addition, they are less likely to prepare meals at home and more likely eating out, which would also lead to lower time spent on shopping groceries.

Table 5: Models for Total Shopping Time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	4.199***	4.829***	3.880***	3.647***	4.138***	4.232***	4.845***
	(0.104)	(0.232)	(0.259)	(0.261)	(0.283)	(0.279)	(0.360)
Family Income							
$12,500 to $25,000	0.426***	0.435***	0.368***	0.448***	0.449***	0.446***	0.444***
	(0.107)	(0.108)	(0.098)	(0.102)	(0.101)	(0.101)	(0.101)
$25,000 to $50,000	0.628***	0.638***	0.459***	0.577***	0.573***	0.566***	0.566***
	(0.093)	(0.099)	(0.093)	(0.104)	(0.104)	(0.106)	(0.106)
$50,000 to $75,000	0.827***	0.841***	0.520***	0.682***	0.688***	0.688***	0.685***
	(0.132)	(0.138)	(0.128)	(0.135)	(0.137)	(0.139)	(0.139)
$75,000 to $100,000	0.942***	0.956***	0.543***	0.722***	0.707***	0.698***	0.695***
	(0.115)	(0.120)	(0.110)	(0.111)	(0.114)	(0.116)	(0.116)
$100,000 to $150,000	0.926***	0.956***	0.513***	0.703***	0.777***	0.766***	0.763***
	(0.141)	(0.149)	(0.134)	(0.143)	(0.148)	(0.151)	(0.151)
$150,000 or more	1.103***	1.099***	0.576***	0.742***	0.837***	0.810***	0.808***
	(0.187)	(0.185)	(0.170)	(0.174)	(0.181)	(0.187)	(0.186)
Labor Force Status							
unemployed				1.317***	1.354***	1.346***	1.355***
				(0.131)	(0.130)	(0.131)	(0.131)
retired				1.838***	1.831***	1.826***	1.825***
				(0.175)	(0.174)	(0.176)	(0.176)
homemaker				1.263***	1.287***	1.263***	1.263***
				(0.124)	(0.123)	(0.123)	(0.123)
student				0.447*	0.469*	0.448*	0.451*
				(0.265)	(0.261)	(0.263)	(0.261)
Unemployment Rate							−0.093***
							(0.032)
day of week dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
demographic controls	No	No	Yes	Yes	Yes	Yes	Yes
year dummies	No	No	No	No	Yes	Yes	Yes
state dummies	No	No	No	No	No	Yes	Yes
Observations	129,521	129,521	129,521	129,521	129,521	129,521	129,521
R^2	0.001	0.023	0.036	0.039	0.040	0.041	0.041
Adjusted R^2	0.001	0.023	0.036	0.039	0.040	0.040	0.040

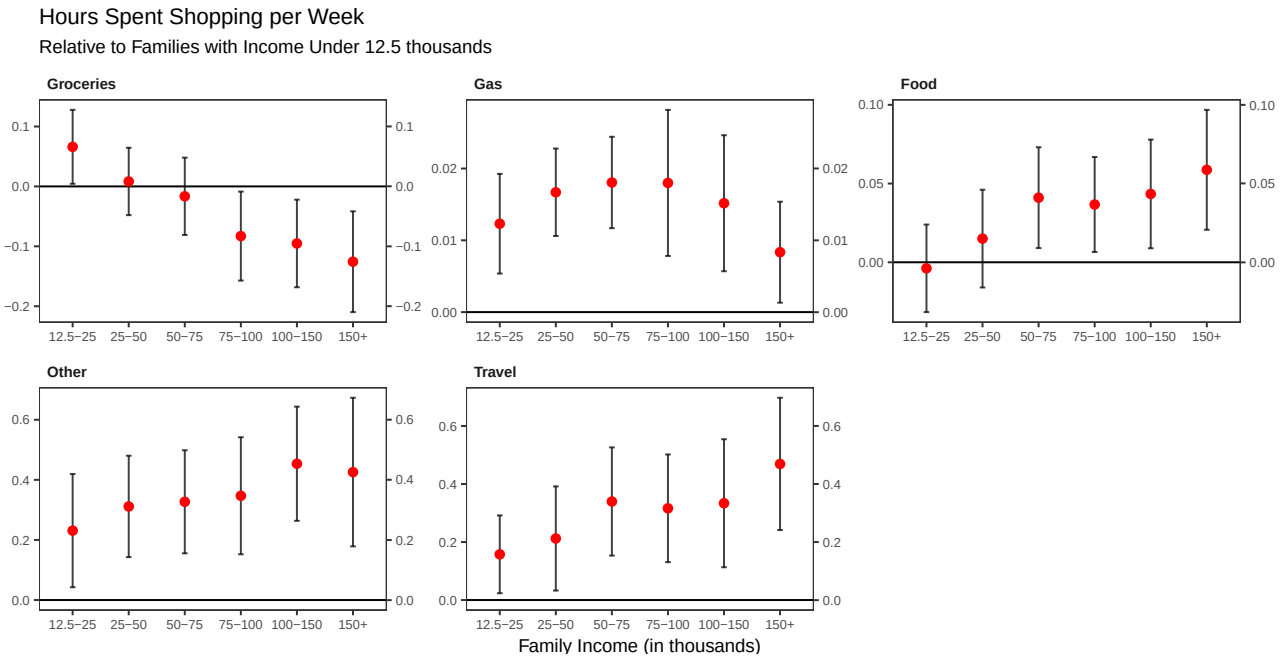
Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Family Income and Time Spent on Shopping Related Activities by Subcategories

	Groceries (1)	Gas (2)	Food (3)	Other (4)	Travel (5)	Total (6)
Constant	0.576***	0.065***	0.151***	1.892***	2.161***	4.845***
	(0.077)	(0.009)	(0.019)	(0.179)	(0.149)	(0.292)
Family Income						
$12,500 to $25,000	0.054*	0.013***	0.0004	0.203***	0.174***	0.444***
	(0.029)	(0.004)	(0.007)	(0.066)	(0.055)	(0.108)
$25,000 to $50,000	0.002	0.017***	0.017***	0.297***	0.233***	0.566***
	(0.025)	(0.003)	(0.006)	(0.059)	(0.049)	(0.096)
$50,000 to $75,000	−0.045*	0.019***	0.043***	0.309***	0.359***	0.685***
	(0.027)	(0.003)	(0.006)	(0.062)	(0.052)	(0.102)
$75,000 to $100,000	−0.094***	0.018***	0.041***	0.376***	0.353***	0.695***
	(0.029)	(0.004)	(0.007)	(0.067)	(0.056)	(0.109)
$100,000 to $150,000	−0.110***	0.016***	0.045***	0.444***	0.368***	0.763***
	(0.031)	(0.004)	(0.007)	(0.071)	(0.059)	(0.115)
$150,000 or more	−0.143***	0.008**	0.062***	0.397***	0.483***	0.808***
	(0.033)	(0.004)	(0.008)	(0.077)	(0.064)	(0.126)
Labor Force Status						
unemployed	0.427***	0.004	−0.018***	0.572***	0.371***	1.355***
	(0.028)	(0.003)	(0.007)	(0.064)	(0.053)	(0.104)
retired	0.254***	−0.001	−0.003	0.970***	0.605***	1.825***
	(0.037)	(0.004)	(0.009)	(0.084)	(0.070)	(0.137)
homemaker	0.392***	−0.007**	−0.036***	0.525***	0.388***	1.263***
	(0.023)	(0.003)	(0.006)	(0.053)	(0.044)	(0.086)
student	−0.005	−0.003	−0.016	0.239**	0.236***	0.451***
	(0.044)	(0.005)	(0.011)	(0.102)	(0.085)	(0.167)
Unemployment Rate	0.004	−0.00005	−0.004***	−0.065***	−0.028**	−0.093***
	(0.007)	(0.001)	(0.002)	(0.015)	(0.013)	(0.025)
day of week dummies	Yes	Yes	Yes	Yes	Yes	Yes
demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
year dummies	Yes	Yes	Yes	Yes	Yes	Yes
state dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	129,521	129,521	129,521	129,521	129,521	129,521
R^2	0.026	0.004	0.010	0.029	0.018	0.041
Adjusted R^2	0.025	0.003	0.009	0.028	0.017	0.040

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 5: Family Income and Time Spent on Main Shopping Related Activities

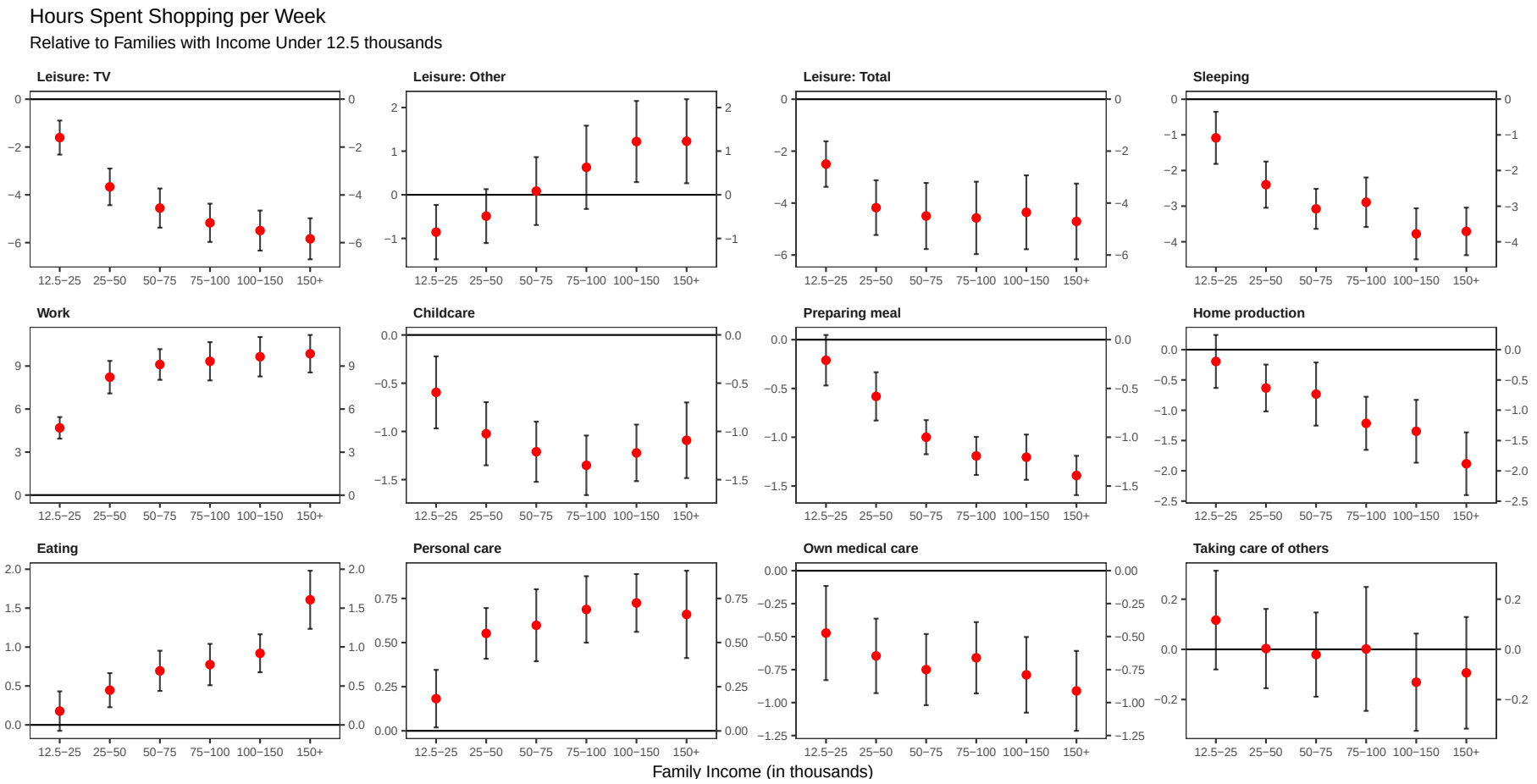


3.4 Discussion

Since income and time spent on shopping related activities are positively related, a natural question arises: Which activities do the individuals in higher income families engage in less? Regression model (3.1) can be estimated for other activities: leisure, non-market work, market work, and their subcategories. Figure 8, Figure 9 and Figure 10 show the results which are again quite intuitive. Controlling for demographic characteristics, labor force status, time and state effects, individuals in families with higher income tend to work up to 10 hours longer per week, but spend up to 3.75 fewer hours sleeping and 4.75 hours less on leisure activities. Interestingly, the last result with respect to leisure is due to as much as 6 hours less TV watching per week, but individuals in families with higher income actually spend about 1.25 hour more on other leisure activities.

In addition, individuals in these families spend about 2 hours less per week on home production. Within this category, they spend almost 1.5 hours less preparing meals. But in the end, they do spend 1.5 hours more eating. This is consistent with results for shopping related activities, in particular time spent shopping for groceries and shopping for food other than groceries. The former decreases with income while the latter increases with income, thus supporting the hypothesis that individuals in higher income families are eating out more often, and spend less time shopping groceries and prepare meals at home. Note that home production here excludes time spent shopping, childcare, and taking care of others.

Figure 6: Family Income and Time Spent on Various Activities



4 Model

In this section I develop a simple static model, which can match the main observed empirical facts documented in Section 3, regarding the shopping time, and how it changes with income, labor force status and unemployment rate in the economy. Firms in the model use labor as the only input to produce goods. Workers in the model search for consumption goods in the goods market, since goods are sold in market that is subject to search frictions. Firms post prices and consumers direct their search effort to acquire goods at a particular price.

4.1 Goods Market

Consumption goods are purchased in markets subject to search friction, thus workers have to spent time to be able to purchase goods. To model these frictions in the goods market I adopt the competitive search - firms post prices and consumers direct their search effort to acquire goods at a particular price. Goods market is divided into submarkets, and firm and household's members can choose in which submarket to trade. The amount of goods sold in any submarket is determined by a matching function $m^G(D, TX)$. Here D is the aggregate search effort of all consumers in the particular submarket, T the measure of firms selling in the particular submarket and X is the quantity of goods sold per firm in the submarket. Goods market matching function $m^G(D, TX)$ is assumed to be constant return to scale, with elasticity of substitution σ.

Submarkets are indexed by (p, Q) where p is the price of the consumption good and $Q = \frac{T}{D}$ is the tightness of the submarket. Since m^G has constant returns to scale, the amount of goods acquired per unit of search effort by household's shopper is

$$\psi^d(Q, X) = m^G(1, QX)$$

and the probability that a particular unit of good is sold is

$$\psi^x(Q, X) = m^G\Big(\frac{1}{QX}, 1\Big)$$

Consequently, the amount of output successfully sold by a firm supplying x in submarket (p, Q), where the total amount of goods supplied by all firms is TX is

$$x\psi^x(Q, X) = \frac{x}{X}\frac{\psi^d(Q, X)}{Q}$$

Thus, ceteris paribus, an increase in the total supply of goods in the submarket affects the probability that a particular unit of consumption good is sold.

4.2 Workers

Workers are either employed or unemployed with preferences are given by $u(c, d, h)$ where c is consumption, d time spent searching for goods in the goods market, and h are hours worked. Each worker has non-labor income a, employed workers receive wage per hour w and unemployed workers receive unemployment benefits b. Workers decide about goods market search effort d, consumption c, and in which submarket (p, Q) to search for consumption goods. I incorporate this last decision through a additional constraint in the problem of a firm which posts price.

Taking prices p and wages w as given, the worker with employment status $e \in \{0, 1\}$ thus faces a budget constraint

$$pc = a + ewh + (1 - e)b$$

In addition, search frictions in goods market impose a constraint

$$c = d\psi^d(Q, X)$$

where $\psi^d(Q, X)$ is the amount of goods acquired per unit of search effort in the goods markets.

Workers's problem is thus

$$\begin{aligned} &\max_{c,d} u(c, d, h) \\ &\text{subject to} \\ &pc = a + ewh + (1 - e)b \\ &c = d\psi^d(Q, X) \end{aligned} \tag{4.1}$$

4.3 Firms

Firm has n employees who each work h hours. The amount of goods x that the firm can potentially sell is given by

$$x = zf(nh)$$

with $f_l > 0$, $f_{ll} \leq 0$. Each firm chooses in which submarket (p, Q) to sell the goods. If the firm decides to sell its output x in the (p, Q) submarket, where the aggregate amount of goods being sold is X, then the actual amount of goods sold is given by

$$x\psi^x(Q, X) = \frac{x}{X}\frac{\psi^d(Q, X)}{Q}$$

As discussed in Section 4.2, the firm needs to take into account a constraint which guarantees shoppers in the (p, Q) submarket equilibrium value of search S^*. Let M be the marginal value of wealth in terms of utility, then

$$S = u_d + (u_c - pM)\psi^d(Q, X)$$

is the value to the consumer of the marginal search effort in the (p, Q) submarket. The problem that a firm solves is then

$$\max_{p,Q} \{p\psi^x(Q, X)x - wnh\} \tag{4.2}$$

subject to

$$x = zf(nh)$$

$$S^* = u_d + (u_c - pM)\psi^d(Q, X)$$

4.4 Characterization of Equilibrium

Suppose that the utility function is given by

$$u(c, d, h) = \frac{c^{1-\eta}}{1-\eta} - \zeta\frac{(h+d)^{1+\chi}}{1+\chi}$$

The following proposition then characterizes the relationship between labor force status and time spent shopping for goods

Proposition 1. *The optimal choice of the worker satisfies $d_u > d_n$ thus unemployed workers spend more but $Q_u < Q_n$ thus $c_n > c_u$.*

In addition, the relationship between income and time spent shopping for goods is characterized as follows.

Proposition 2. *The optimal choice of the worker in employment status e satisfies $\frac{\partial d_e}{\partial M} > 0$ where M is the total income defined as $M = a + ewh + (1-e)b$.*

4.5 Calibration and Model Simulation

To be added.

5 Conclusion

This paper examines the behavior of time spent on shopping related activities, with main focus on it behavior over the business cycle. I use American Time Use Survey data from 2003 to 2016, and document that document that (1) on state level, average total shopping time decreases with state level unemployment rate and increases with real per capita GDP, and that (2) on individual level total shopping time increases with family income. This is consistent with procyclical overall shopping time. I also examine the behavior of five time use subcategories: (1) grocery shopping, (2) purchasing gas, (3) purchasing food (not groceries), (4) other shopping related activities (shopping for other consumer goods and services, researching purchases, security procedures related to shopping, waiting associated with shopping), (5) travel time related to shopping for goods and services. Similar pattern as for total shopping time arises for travel time related to shopping, other shopping and shopping for food - shopping time increases with higher family income. For groceries, the effect of higher income is negative.

References

Aguiar, M., Hurst, E., & Karabarbounis, L. (2013). Time use during the great recession. *American Economic Review*, *103*(5), 1664-96. [3,5].

Bai, Y., Ríos-Rull, J.-V., & Storesletten, K. (2012). *Demand shocks that look like productivity shocks* (Working Papers). Federal Reserve Bank of Minneapolis. [1,2].

Haan, W. D. (2014). *Inventories and the Role of Goods-Market Frictions for Business Cycles* (Discussion Papers No. 1402). Centre for Macroeconomics (CFM). [1,2].

Kaplan, G., & Menzio, G. (2013). *Shopping externalities and self-fulfilling unemployment fluctuations* (Working Paper No. 18777). National Bureau of Economic Research. [1,2].

Petrosky-Nadeau, N., & Wasmer, E. (2015). Macroeconomic dynamics in a model of goods, labor, and credit market frictions. *Journal of Monetary Economics*, *72*, 97 - 113. doi: http://dx.doi.org/10.1016/j.jmoneco.2015.01.006 [1,2].

Petrosky-Nadeau, N., Wasmer, E., & Zeng, S. (2016). Shopping time. *Economics Letters*, *143*(C), 52-60. doi: 10.1016/j.econlet.2016.02 [3,5].

Stewart, J. (2013). Tobit or not Tobit? *Journal of Economic and Social Measurement*(3), 263-290.

Appendix A

Time Use Categories in ATUS

The American Time Use Survey lexicon classifies activities based on a three tiered system. The first tier major categories, the second tier splits the first tier into more detailed sub-categories, and similarly the third tier splits the second tier into more detailed sub-categories.

Table 7: ATUS lexicon codes

	ATUS activity code
Shopping	
Grocery Shopping	07-01-01
Purchasing Gas	07-01-02
Purchasing Food	07-01-03
Other Shopping	07-01-04, 07-01-05, 07-01-99, 07-02, 07-03, 07-99, 08-01-02, 08-02-03, 08-03-02, 08-04-03, 08-05-02, 08-06-02, 08-07-02, 09-01-04, 09-02-02, 09-03-02, 09-04-02, 09-05-02, 12-05-04
Travel related to shopping	year 2003-2004: 17-07, 17-08, 17-09, 17-12-04 year 2005-2016: 18-07, 18-08, 18-09, 18-12-04
Leisure	
TV watching	12-03-03, 12-03-04
Other	02-06, 02-09-03, 02-09-04, 12-01, 12-02, 12-03 excluding 12-03-03 and 12-03-04, 12-04, 12-05, 12-99, 13, 16, 18-02-06, 18-12, 18-13, 18-16
Sleep	01-01
Work and Related Activities	05-01, 05-02, 05-03, 05-04, 05-99, 18-05-01, 18-05-02, 18-05-03, 18-05-04, 18-05-99
Child Care	03-01, 03-02, 03-03, 04-01, 04-02, 04-03, 18-03-01, 18-03-02, 18-03-03, 18-04-01, 18-04-02, 18-04-03
Home Production	02-01, 02-02, 02-03, 02-04, 02-05, 02-07, 02-08, 02-09 excluding 02-09-03 and 02-09-04, 02-99, 18-02 excluding 18-02-06
Eating	11, 18-11
Personal Care	01-02, 01-04, 01-05, 01-99, 18-01, 18-11
Own Medical Care	01-03, 08-04, 18-08-04
Others Care	03-04, 03-05, 03-99, 04-04, 04-05, 04-99, 18-03-04, 18-03-05, 18-03-99, 18-04-04, 18-04-05, 18-04-99

Appendix B

Figure 7: Family Income and Time Spent on Shopping Related Activities

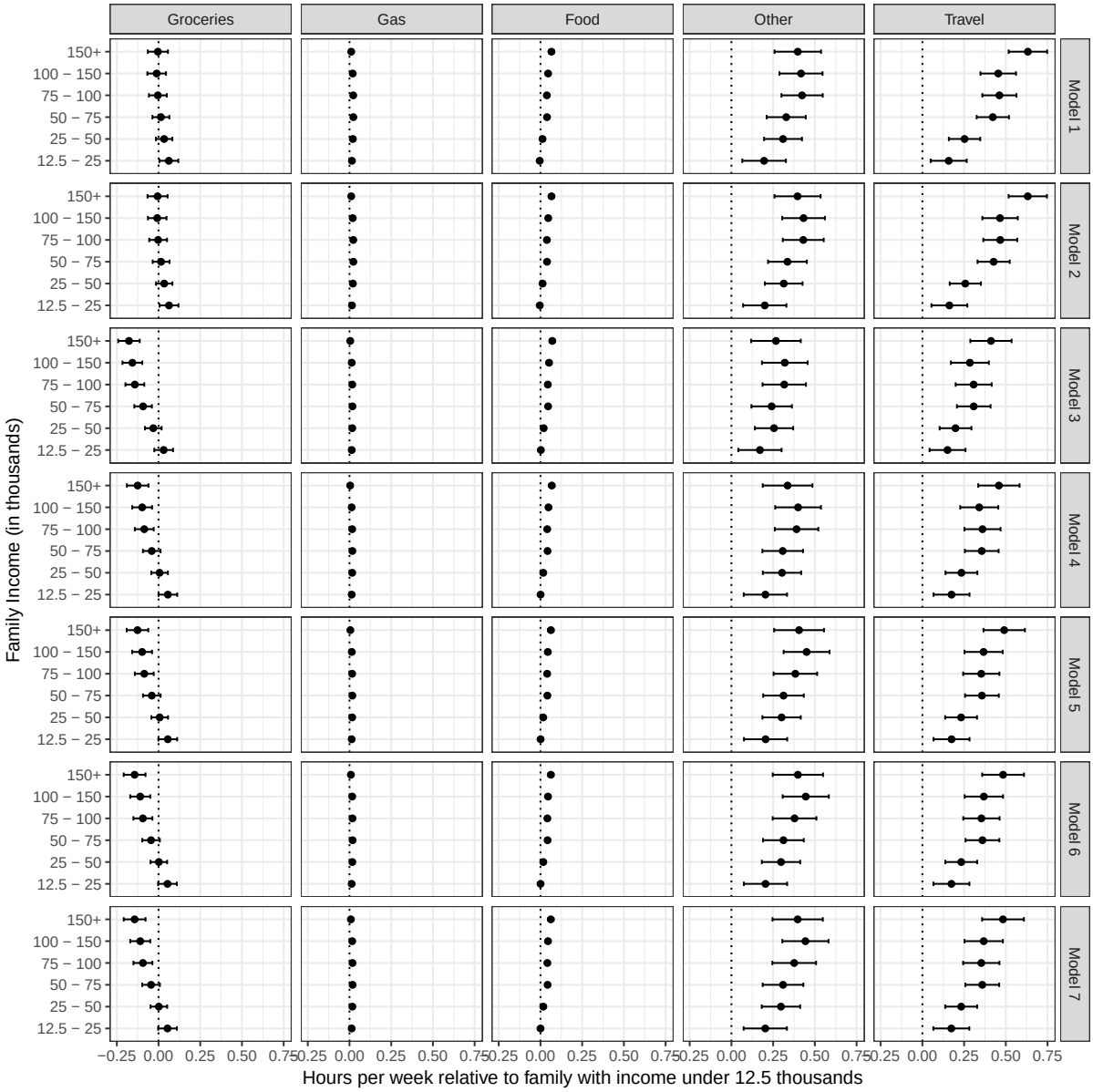


Figure 8: Family Income and Time Spent on Leisure and Sleep

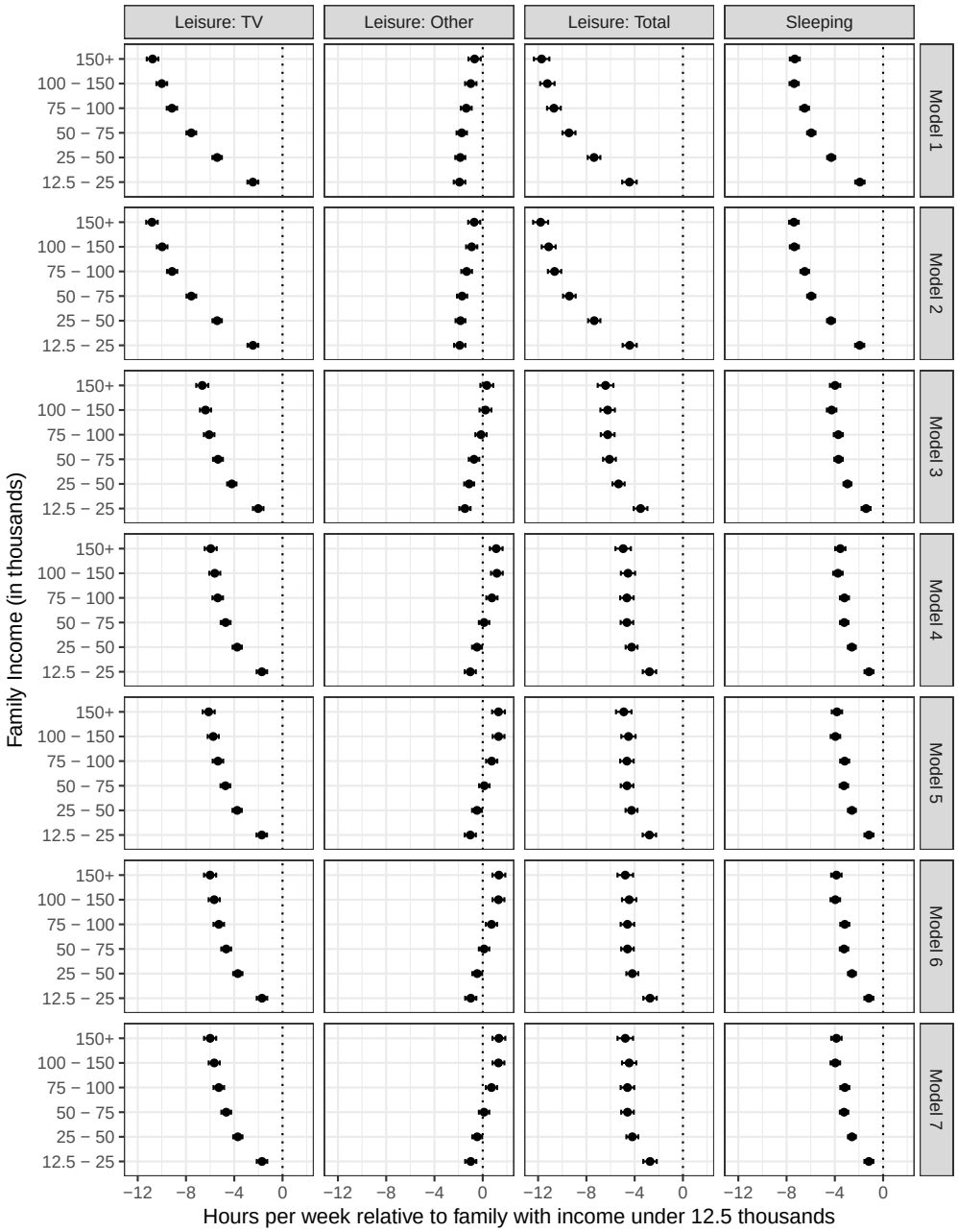


Figure 9: Family Income and Time Spent on Work, Childcare and Home production

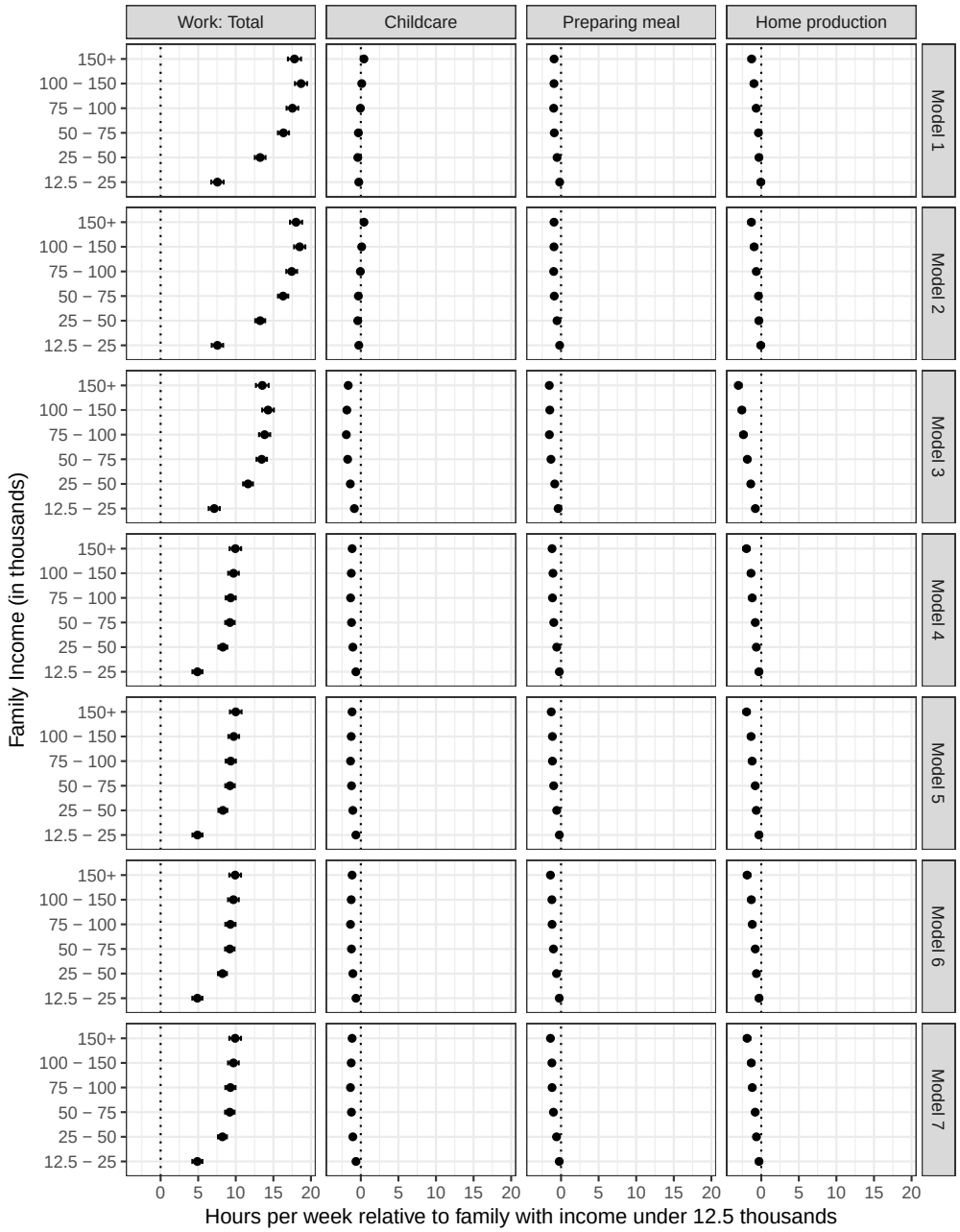


Figure 10: Family Income and Time Spent on Care