THE UNIVERSITY OF CHICAGO

WHO BRINGS HOME THE BACON? HOW INDIVIDUALS LIVING IN THE SAME HOUSEHOLD SHOP

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Dedicated to my parents and my husband.

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ABSTRACT

This paper examines the shopping labor division and the differences in shopping behaviors between men and women residing in the same household using a novel dataset containing information on the identities of the shoppers. I find both a highly asymmetric division of shopping labor and large differences in the shopping behavior between men and women within married households. Specifically, women undertake a much larger share of shopping tasks in most households. Along with the unequal share of shopping labor, men and women differ significantly in their purchase prices, trip sizes, store visits, and product choices. To uncover reasons behind the asymmetric shopping shares, I present evidence on the impact of the local environment on the shopping labor division via households' moving. The finding suggests that the current state of women as the major shopper may perpetuate the unequal shopping shares and provides one explanation for the asymmetric shopping labor division observed.

CHAPTER 1

INTRODUCTION

Models of consumer behavior are central to the study of both economics and marketing. However, researchers rarely observe individual purchase decisions, but rather must make do with household-level outcomes, driving a wedge between theory and empirics. Consequently, intra-household shopping behaviors has received relatively little attention. Conflating individuals and households can have consequences for firms and policy makers. As an example, if two individuals who reside in the same household are loyal to different brands, treating the household as a single decision unit may lead to overestimation of consumers' preferences for variety and underestimation of consumers' brand loyalty (Bruno et al. 2018; Gupta and Steckel 1993). Such differences will also hinder the success of recommendation systems, leading algorithms to surface items that are irrelevant to the current shopper. Given the limited stock of knowledge on the shopping behavior within households, similar concerns exist in many empirical studies that use household level data where little is known about what happens within a household.

This paper examines how shopping labor is divided and documents the shopping behavior differences between men and women residing in the same household. I leverage a novel dataset that contains information on the identity(ies) of the shopper(s) on each shopping trip; the data I use comprise all shopping trips from January 2018 to December 2021 for 63,173 households in the US composed of a married man and women and their children (if any)[1]. In line with an established literature in labor economics (Aguiar and Hurst 2007; Lise and Yamada 2019; Boerma and Karabarbounis 2021), I find that women undertake many

1. Researcher(s)' own analyses calculated (or derived) based in part on data from Market Track, LLC dba Numerator and marketing databases provided through the Numerator Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business.
The conclusions drawn from the Numerator data are those of the researcher(s) and do not reflect the views of Numerator. Numerator is not responsible for and had no role in analyzing or preparing the results reported herein.

more shopping trips than their husbands: the woman is the primary shopper in more than 75% of households. On average, women undertake more than twice as many solo shopping trips than men in the same household (56.6% of household trips compared to 22.6%). Only 20.8% of trips constitute joint shopping endeavors.

To what extent does this asymmetry matter for household shopping behavior? The data reveal economically and statistically significant differences in the way that men and women who live in the same household shop, ranging from where they shop to what they buy. I show that the shopping behavior differs between married men and women in all aspects I have examined, including purchase prices, trip sizes, product choices, and store visits. The findings reveal that women tend to spend more than their husbands each trip on solo trips even when trips are conducted in the same type of stores. Household members also tend to spend significantly more in joint trips than in solo trips. In instances when a husband and wife are observed purchasing the exact same product from the same retailer on different solo-shopping trips, I find that women tend to get a significantly better deal, paying 1.718% lower prices on average than their husbands. This difference is about twice the size of the women-men price gap among single households, and about the same magnitude as the Black-White racial price gap documented in Butters et al. [2022]. On brand choices, I find that men and women tend to show different brand preferences, where men tends to bring home products that are more similar to the brands purchased by single men. On store visits, I document significant store visit discrepancy especially in large store types such as the food stores. I also discover a non-trivial portion of purchases made by women for their husbands and vice versa. In particular, women shop even more frequently than their husbands do for men's apparel and men's deodorants.

A number of factors may contribute to the highly asymmetric share of shopping trips that we observe. One possible reason is the influence of the local gender norm. My hypothesis is that households may converge to the local gender norm of who undertakes more

shopping trips as shoppers gradually get influenced by the new environment at their moving destination, such as via observing which gender appear more at stores, the type of retail stores located nearby, labor market condition, and other regional policies. In this paper, I focus on investigating how the shopping labor division is affect by the local gender norm using a sample of married households that have relocated to a different county during our sample period. I construct a retail environment score that measures how likely that women conduct shopping trips in a county using the non-focal married households residing in that county. Using this retail environment score as a measure for the local gender norm, I examine the changes in the shopping shares across the moving married households that experienced different size and direction in the retail score changes. As the retail environment score is constructed with a separate sample of households, I use the moving decision to induce a quasi-exogenous change in the shopping labor allocation decision among married households that moved. Thus, the findings aims to inform us the effect of the retail environment on the household shopping labor division. I find that the retail environment has a significant effect on the shopping shares, where men undertakes a larger share of shopping trips post moving among households moving to counties with more gender equal retail environment compared with households moving to counties with the opposite characteristics.

The finding provide insight into the household labor division. Although evidence from time use surveys on the split of household chores suggest a slowly converging trend on equality between partners (Aguiar and Hurst 2007), the findings suggest a barrier to equality in the shopping arena. The impact of gender norm offers one explanation for the persistent unequal share of shopping labor – the current state of women as the major shopper in most US households may reinforce the high shopping shares of women and perpetuate the asymmetry in shopping labor division. Coupled with the substantial differences I found in the shopping behavior between men and women, the study highlights the the importance of understanding the shopping labor division within households. Given the disparity in

the men-women shopping behaviors, a household may appear to behave quite differently in how they shop and what they purchase from trip to trip. While previous knowledge on how household chores are divided between men and women comes almost entirely from household surveys where households self-report the time they spend on various activities (see e.g., Hill 1985; Becker 1985; Aguiar and Hurst 2007; etc.), this study provides a detailed account on intra-household shopping behavior differences ranging from store visits to product choices, where the actual allocation of shopping tasks are observed. To my knowledge, this paper provides the first piece of such evidence with the actual shopping trips conducted by individual household members.

The remainder of this paper is organized as follows. Chapter 2 reviews the relevant literature on household shopping behavior. Chapter 3 describes the Numerator panel that we use in this study. Chapter 4 documents the shopping labor division between men and women residing in the same household. Chapter 5 presents findings on the shopping behavior differences in purchase prices, trip sizes, product choices, and store visits. Chapter 6 examines the effect of the local gender norm on the household shopping labor division. Chapter 7 and 8 discusses the results and concludes the study.

CHAPTER 2

LITERATURE REVIEW

This study contributes to several streams of literature. First, this study contributes to the existing literature on household production and the allocation of time dating back to the pioneering works of Pollak and Wachter [1975], Becker [1985], Becker [1991], Chiappori [1997] and Robinson and Godbey [1999]. In a series of works on home production, Pollak and Wachter [1975], Becker [1985], Becker [1991], and etc. highlighted the role of specialization in shaping the household chores allocation and labor market participation. In the authors view, households are treated as a unitary decision maker and various home production tasks are allocated to household members with lower opportunity cost of time, which offers insight into the gender inequality we observe both in workplaces and in households. Chiappori [1992], Browning et al. [2013], Couprie [2007], and Dunbar et al. 2013 discussed improvement to the modeling of resource allocation among household members in similar fashion. In Robinson and Godbey [1999] and more recent works by Bianchi et al. [2000], Egerton et al. [2005], Aguiar and Hurst [2007], Gimenez-Nadal and Sevilla [2012], Lise and Yamada [2019], and Borra et al. [2021], using the time use surveys, time-diary data, and similar data that surveys the time use of individual household members, the authors have consistently documented a persistent discrepancy in the time used in doing housework between men and women in surveys from 1965 to 2013. Zooming in to the time on shopping, we find fewer studies focusing on the time allocated to shopping specifically. Aguiar and Hurst [2007] and Browning et al. [2011] documented a men-women gaps in the time allocated to shopping similar to the time allocation in general housework. In particular, Aguiar and Hurst [2007] presented a slowly converging trend in men and women's time spent on shopping across five waves of surveys from 1965 to 2003. This study contributes to this literature in several ways. First, it offers a detailed description in one specific form of housework – shopping. The data allows me to examine the shopping labor division in depth, which is a first in the literature. The paper thus

contributes to the understanding of the shopping labor division, which is important both for researchers to understand the intra-household home production decisions, and for marketers to understand consumer behaviors. Second, studies on the time allocation within households typically rely on survey data with self-reported time allocation. While household survey data are especially valuable for insights on such topics, concerns over the survey quality are often raised. For example, Press and Townsley [1998] presented significant over-reporting in husbands' and wives' self-reported time contribution on housework, while Meyer et al. [2015] raised concerns on declining response rate and lower accuracy in household survey answers in recent years. This study, on the other hand, derive insights from the actual household shopping records with known shopper identities and is thus unconstrained by such concerns. As a result, the findings provide support on the existing findings from a new perspective.

Second, this study is closely related to the literature exploring factors that motivate shopping behaviors. While classic studies in economics typically focus on the utilitarian aspect of shopping, such as searching (Stigler 1961, etc.), researches on shopping have pointed out other motivations behind consumer shopping and factors that influence consumer store choices (Stone 1954; Bell and Lattin 1998; Noble et al. 2006; Hasan and Mishra 2015; Atkins and Hyun 2016). Dating back to Stone [1954], the study classified shoppers into four segments where their shopping are motivated by different reasons ranging from economic, social, and moral needs, to convenience. More closely to this study, a number of papers examined gender differences in shopping (Otnes and McGrath 2001; Kuruvilla et al. 2009; Granzin and Painter 2014; Kotzé et al. 2012; Dennis et al. 2018; Brakus et al. 2022; etc.,). Literature on this topic suggested different shopping styles between men and women. In particular, women are found to value the social and hedonic aspect of shopping (Dennis et al. 2018), and engage in more systematic information search before purchasing compared with men (Laroche et al. 2000). These past findings highlight the individual level preference differences that may exist within households. Gender differences in preferences over shopping offers another explanation for

the asymmetry in shopping labor division besides specialization. This paper contributes to this literature by providing a detailed description of the shopping behavior differences between men and women. The data also allows me to focus on comparing individuals residing in the same households and provide insights on the intra-household shopping behaviors. Further, this paper proposes an additional reason for the unequal shopping labor share – the impact of the retail environment. While past literature has discussed the influence of the store environment on consumer store choices (Stone 1954; Kuruvilla et al. 2009; Kotzé et al. 2012; etc.), to my knowledge, how local retail environment affects the shopping labor division has not been systematically studied. This paper contributes to fill in the gap in this literature.

This study also relates to the broad literature on gender inequality. Gender inequality has been extensively studied in the labor market (Blau and Kahn 2017; etc.). In marketing context, studies have documented gender price gaps in advertising and product markets (Lambrecht and Tucker 2019; Moshary et al. 2023). Meyers-Levy and Loken [2015] and Peñaloza et al. [2023] systematically reviewed studies on the gender differences and gender research in marketing and psychology. This paper contributes to the literature by providing evidence on the gender inequality in the shopping arena, where I present both descriptive findings on the unequal shopping shares across men and women, and discusses possible reasons that give rise to the asymmetry in shopping labor division. In addition, this paper relates to the studies examining intra-household heterogeneity in purchases and consumption. Compared with the extensive discussion on inter-household heterogeneity (Kamakura and Russell 1989; Chintagunta et al. 1991; Gonul and Srinivasan 1993; Gupta and Chintagunta 1994; Horsky et al. 2006; etc.), relatively fewer studies in marketing have discussed the existence and implications of intra-household heterogeneity. Studies that empirically examine the presence of intra-household heterogeneity include Yang et al. [2006]; Bruno et al. [2018], Pahwa et al. [2021], and Yang et al. [2021]. This study contributes to the literature as the

first study that examines household shopping labor division and where the shopper's identity on each shopping trip is known.

CHAPTER 3

DATA

The data I use in the analysis comes from Numerator's omni-channel consumer panel, which is provided by the James M. Kilts Center for Marketing at the University of Chicago Booth School of Business.

3.1 Numerator's omni-channel consumer panel data

The Numerator's omni-channel consumer panel data contains information on the shopping trips of over 1,200,000 households in the US from 2018 to 2021. The trip characteristics, including the time and location of the trip, and information on the products purchased are obtained from the receipts uploaded by the panelists to a designated app. Incentive to upload receipts is provided through a rewards-based scheme, where panelists receive higher rewards when they upload more receipts through either a coin-based approach or points/cash-based approach that varies based on their behaviors. The Numerator panelists are recruited through a non-targeted approach. Among these panelists, around 45,000 households are selected each year to construct projection weights that is intended to mimic the overall US population (the static panel). Households are chosen among those who have submitted paper receipts from brick-n-mortar stores in 12 consecutive months and who have reported all the demographic data. In this study, I focus only on the households that entered this static panel for two reasons. First, we observe relatively complete purchase history of these households; second, we are able to construct metrics that helps us compare the sample demographics with the overall US population.

The Numerator data covers omni-channel purchases across a large number of categories. Trip-wise information I observe include the date of each shopping trip; the zip code, type and name of the store visited; purchased items' characteristics (sector, department, category,

brand, item ID) as well as the prices and quantities purchased. A unique feature of the purchase data is that I also observe the gender of household members that are present on the trip. Namely, I have information on whether the trip is taken solely by men, women, or jointly by men and women together. Information on household characteristics that is observed include the household size, living region, education, income, ethnic group, age group of the head of the household and the children, and the marital status of the household.

3.2 Sample selection

The main sample used for the analysis contains all the shopping trips taken during year 2018 - 2021 by 63,173 married households and 20,284 single households. The sample contains 37,622,113 shopping trips conducted by married households and 10,250,214 shopping trips conducted by single households in total, which is approximately 143 shopping trips per household per year.

The sample is selected based on the following criteria. For married households, I restrict to the households that (1) reported to be married or living with their partner; (2) whose reported household size matches the total number of children under 18 plus two adults; (3) either a shopping trip took by adult men and women together, or at least one shopping trip by men alone and one by women alone is conducted during the entire period that I have data on (year 2018 - 2021); and (4) entered the static panel at least once during the sample period. For single households, I restrict to the households that (1) reported to be never married, divorced, separated, or widowed; (2) whose reported household size matches the total number of children under 18 plus one adult; (3) the reported gender of the shopper matches the reported gender of the app user in at least 90 percent of all the shopping trips; and (4) entered the static panel at least once during the sample period. Given these criteria, married households in the sample have similar family structure that consists of one adult men and one adult women with varying number of children, ranging from zero to three. While

single households in the sample consists of one adult with known gender with the number of children ranging from zero to three. The sample selection condition is tailored to the purpose of the analysis, which is to understand the shopping behavior differences between individual household members. This requires the sample to contain households where the identity of each individual member is known to us. Since the Numerator data only provides the gender of the shoppers on each shopping trip (adult men alone, adult women alone, or adult men and women together), the information will be insufficient to distinguish which exact individual took a shopping trip if a household has more than one adult of the same gender. Thus, I focus on the sample of households satisfying the above criteria where the shopper's gender directly informs us the identity of the shopper. As a result, for the sample of married households, I only focus on heterosexual married households due to the data limitation. I further exclude shopping trips where the shopper information is not reported as I cannot determine who made these purchases. Consumers in the Numerator data typically do not provide information on who is the shopper if purchases are made on e-commerce platforms. As a result, almost all trips included in the sample are made in brick-n-mortar stores.

3.3 Sample demographics description

Table 3.1 presents the demographics of the households in the sample and compare the demographics with the demographic information from the 2022 American Community Survey 1-Year Estimates (ACS). The comparison is intended to help us understand how the Numerator sample compares with the general US population. I compare the composition of the households in the sample with ACS in terms of the marital status, age group, ethnicity, income, and education. For each demographic variable, I compute the fraction of households belonging to different groups in both the Numerator sample and ACS to understand how closely the Numerator sample of household mimics the US population. I presents both the unweighted sample breakdown and the weighted version using the average of the mini Amer-

ican statics across years provided in the Numerator panel, where in column (2), I weigh each household in the sample using the weights, and in column (3), I presents the raw breakdown without weighting. I further supplement the comparison with the gender ratio breakdown within each marital status in the appendix (Table A.1) to present additional information on the gender composition of the Numerator households.

By Table 3.1 panel A, compared with ACS, the Numerator sample has significantly higher percentage of single women. Using the weights provided in the Numerator data, the gender ratio becomes much closer to the actual gender ratio. Table A.1 in the appendix further shows that this pattern holds across different marital status, where the weights corrects the gender bias especially well for the never married and separated groups, while the fraction of women still remains somewhat higher for the divorced and widowed groups. In the remaining panels of Table 3.1, I find that compared with the ACS, the Numerator sample of households tends to skew towards married, white, older, lower income, and more educated population. After weighing the households, the breakdown of the Numerator household demographics becomes more similar to the demographics in the ACS data and roughly matches the breakdown of the US population in many groups. To summarize, I observe some gaps between the sample of the Numerator households and the actual composition of the US households. The weights bridge the gaps even though some differences still persist. Nonetheless, this sample of households is valuable in helping us understand the shopping behavior within households. Since the weighted sample is closer to the demographic composition of the general US population, I use the weighted version in the analysis throughout this paper.

The sample covers a wide range of retail stores and products, which records purchases made in more than one million different stores across the US and on over 40 million different products. Table 3.2 provides the descriptive statistics for the household shopping behavior in the sample. For both married and single households, I summarize the sample by the trips, stores, and products purchased across household-year. In each of the three panels,

Table 3.1: Comparison of the household sample demographics breakdown with the ACS statistics (total number of households = 83,457)

	(1) ACS	(2) Numerator (Weighted)	(3) Numerator (Unweighted)
Panel A: Gender - Fraction of Women App User			
Single	0.5168	0.6129	0.7655
Married	0.4818	0.8138	0.8336
Panel B: Marital Status			
Married	0.4800	0.6366	0.7556
Never married	0.3430	0.1965	0.1352
Divorced	0.1050	0.1038	0.0747
Separated	0.0170	0.0107	0.0077
Widower	0.0550	0.0524	0.0268
Panel C: Age			
18-20	0.0506	0.0007	0.0003
21-24	0.0688	0.0227	0.0101
25-34	0.1734	0.1634	0.1701
35-44	0.1689	0.1636	0.2386
45-54	0.1552	0.1534	0.1928
55-64	0.1615	0.2186	0.2257
65+	0.2217	0.2777	0.1624
Panel D: Ethnicity			
White	0.5679	0.7552	0.7732
African American	0.1143	0.0978	0.0692
Hispanic	0.1726	0.0868	0.0717
Asian	0.0553	0.0461	0.0618
Other	0.0899	0.0141	0.0241
Panel E: Income			
Less than $50,000	0.3390	0.3785	0.3381
$50,000-$99,999	0.2906	0.3337	0.3839
$100,000-$149,999	0.1690	0.1615	0.1703
$150,000-$199,999	0.0868	0.0665	0.0583
$200,000 +	0.1146	0.0599	0.0495
Panel F: Education			
Less than high school	0.1052	0.0218	0.0195
High School	0.2719	0.1824	0.1762
Some college, no degree	0.2154	0.2207	0.2067
College	0.2838	0.3886	0.4094
Advanced	0.1236	0.1864	0.1882

column (2) to (5) summarizes the total number of shopping trips, the number of unique stores visited, and the number of unique products purchased each year by each households in the samples respectively.

3.4 Reporting rate of the shopper's gender

A key information that allows us to study the intra-household shopping behavior differences between men and women is the identity of the shoppers. I identify the shoppers by the shopper's gender that is reported for each shopping trip. The Numerator data contains missing values in this field as this information is disclosed voluntarily by the panelists instead of obtained directly from the receipts. The presence of missing values is not a major concern for the analysis if the information is missing at random so that men and women have similar reporting rates. The existence of missing values becomes relevant when men and women disclose this information at systematically different rates. If women(men) report the shopper's gender at a higher rate than men(women), we are likely to over-estimate the shopping effort of women(men) even when both family members share the shopping effort equally.

I perform a quality check against such bias by using the single household sample. I compute the fraction of trips where the shopper's gender is reported for each single household and perform a t-test that compares the reporting rates of single men and women. A summary of the reporting rates and test results are present in Table 3.3 Panel A. On average, single women report this information for 67.2% of the shopping trips while single men report the information for 69.7% of the trips. The t-test on the difference shows a small and significant difference between the report rate of single men and women. I consider this difference to be reasonably small. Panel B presents the share of shopping trips by each type of shopper among the shopping trips conducted by heterosexual married households that have the shopper's gender. I find a much larger share of shopping trips conducted by women compared to men, while shopping trips that consist of joint endeavor account for only approximately 20.8% of

Table 3.2: Sample descriptive statistics

Year	(1) Mean	(2) Std.Dev.	(3) Min	(4) Percentiles					(5) Max
				10	25	50	75	90	
Married Households (N = 63,173)									
Panel A: Num. Shopping trips									
2018	174.73	121.25	1	41	86	152	238	336	1254
2019	173.07	121.60	1	40	84	150	236	335	938
2020	152.82	111.91	1	34	71	129	208	302	915
2021	157.75	117.13	1	32	72	134	216	312	1100
Panel B: Num. Unique Stores Visited									
2018	18.85	10.10	1	7	11	18	25	33	95
2019	17.88	9.36	1	7	11	17	24	31	79
2020	16.48	8.15	1	7	11	16	21	27	88
2021	17.87	9.08	1	7	11	17	23	30	101
Panel C: Num. Unique Products Purchased									
2018	761.18	482.89	1	196	416	700	1,019	1,378	7,201
2019	734.30	456.74	1	207	405	670	981	1,324	4,413
2020	729.04	460.99	1	212	405	661	965	1,311	6,173
2021	759.85	493.70	1	205	418	690	1,009	1,372	8,170
Single Households (N = 20,284)									
Panel D: Num. Shopping trips									
2018	150.35	118.68	1	30	66	121.5	202	308	925
2019	150.23	120.89	1	29	64.5	120	201	310	1,170
2020	134.14	113.58	1	24	54	105	180	279	925
2021	133.43	115.34	1	21	52	105	180	280	1,217
Panel E: Num. Unique Stores Visited									
2018	17.47	9.89	1	6	10	16	23	31	84
2019	16.38	9.14	1	6	10	15	22	29	77
2020	15.06	8.22	1	5	9	14	20	26	62
2021	15.84	8.98	1	5	9	15	21	28	70
Panel F: Num. Unique Products Purchased									
2018	572.19	440.71	1	117	267	486	766	1,111	7,260
2019	556.50	420.74	1	124	261	466	746	1,076	4,318
2020	566.44	462.35	1	120	256	464	751	1,115	7,490
2021	575.69	479.77	1	110	257	472	761	1,144	8,373

the total shopping trips. The shopping shares appear to be highly asymmetric between men and women. In the following sections, I will examine the shopping labor division in more details.

Table 3.3: The fraction of trips where the single households reported the shopper's gender

	(1) Obs	(2) Mean	(3) Std. Dev.	(4) Min	(5) Max	(6) 95% C.I.
Panel A: Single households' report rates						
Women	15,527	0.672	0.186	0.00244	0.970	[0.669, 0.675]
Men	4,757	0.697	0.181	0.00203	0.977	[0.692, 0.703]
Panel B: Married households' shopping shares						
Women	63,173	0.566	0.311	0.000	1.000	[0.564, 0.568]
Men	63,173	0.226	0.253	0.000	1.000	[0.224, 0.228]
Joint	63,173	0.208	0.220	0.000	1.000	[0.206, 0.209]

CHAPTER 4

SHOPPING LABOR DIVISION IN MARRIED HOUSEHOLDS

4.1 Basic facts on the shopping shares of men and women

I begin the analysis by documenting the share of shopping trips taken by men and women living in the same household. I define three types of shoppers: (1) *Men*, for trips taken by men alone; (2) *Women*, for trips taken by women alone; and (3) *Joint*, for trips taken by men and women together. Figure 4.1(a) illustrates the share of men's shopping trips against the share of women's trips, where the shares are computed as the fraction of shopping trips taken by men/women over the total number of shopping trips taken by that household. In Figure 4.1, each blue dot represents a married household in the Numerator sample. The shares form a triangular region bounded by three lines, Women alone = 0, Men alone = 0, and Women alone + Men alone = 1. The location of a point reveals how shopping labor is divided within that household. Households that fall on the boundaries only allocate their shopping tasks among two of the three types of shoppers. For example, men and women never shop together during the sample period in households that fall on the -45 degree line boundary. Households moving further away from this boundary have higher shares of joint shopping trips.

Two observations stand out in Figure 4.1(a). First, on average, women shop more frequently than men living in the same household. Figure 4.1 shows that there is a higher density of households at the lower right corner where women are the main shopper in the household. The average shopping share of men, women, and joint are 0.226, 0.566, and 0.208 respectively, where the mean fraction of trips taken by women alone is more than doubled the fraction for men alone. In 48,125, or approximately 76% of the households, women shop at a higher frequency than men. Second, there exists substantial heterogeneity in how shopping tasks are allocated across households. According to Figure 4.1, there appears to

be non-trivial mass of households across the entire space of feasible shopping shares. I also observe a small cluster of households at the top left and bottom left corner, suggesting that despite women shop more in an average household, men shopping/joint trips remains the main shopping pattern in some households.

In Figure 4.1(b), I further benchmark the shopping shares against the employment information provided in the 2022 Consumer Expenditure Surveys (CES) conducted by the U.S. Bureau of Labor Statistics. CES provides quarterly information on the employment and income information of individual household members for each surveyed household. I am able to identify 6,154 heterosexual married households from the 2022 CES data where for each household member, I observe the employment status, the weekly working hours and the annual income of the wife and the husband during year 2022. Using this information, I construct two benchmarks with the predicted shares of shopping labor for each household by making simple assumptions on their time availability and the shopping task allocation. First, using the reported employment status and the weekly working hours, I assume that when the husband(wife) is the only unemployed individual, he(she) undertakes all the shopping trips; when both individuals are unemployed, they always shop together; and when both individuals are employed, they split the shopping according to the inverse of their reported working hours. Second, using the reported annual income, I assume that the shopping trips are allocated as a function of the inverse income ratio. Formally, I assume that the household allocate the shopping labor according to:

$$\frac{s_f}{s_m} = (\frac{I_m}{I_f})^\alpha$$

where s_f and s_m are the shopping shares of women and men respectively, and I_f and I_m are the annual income of women and men. I estimate α using the reported income to best approximate the observed average shopping shares in the Numerator data, and use the predicted function as the second benchmark to compare the shopping share against. The

estimated $\hat{\alpha}$ is 0.933 with a standard error of 0.0435.

The CES employment benchmarks provide a rough measure of the likely shopping labor division based purely on the time constraints of individual household members. Using the benchmarks, I am able to compare the discrepancy between the actual shopping labor division I observe in the Numerator data and the predicted allocation if shopping labor is allocated based solely on the time availability of household members. In the CES sample, 27.5% of men and 40.0% of women are unemployed or out of the labor force. Given the higher employment rate among men, I predict a higher share of shopping trips among women, which is consistent with the observed data pattern from the Numerator data. Table 4.1 presents the comparison between the observed shares in the Numerator data with the predicted shares using the CES employment information, where column (2) benchmarks the Numerator shares against the prediction based on the reported weekly working hours, and column (3) benchmarks against the prediction from the estimated function on the inverse income ratio. In both CES benchmarks, I generate a higher shopping shares for women than for men, however, the predicted differences between the women-men shares are not as large as what is observed in the data. The comparison offers suggestive evidence that the time availability explains the women-men shopping share discrepancy to some extend, but not fully. Figure 4.1(b) illustrates the comparison between the actual shopping labor division in our data and the predicted shopping shares from the CES working hours. For plotting purpose, I add a normally distributed random noise with mean zero to the shopping shares for each CES household to better illustrate the share distribution. From the figure, the working hour benchmark suggests a higher share of women's shopping trips than men's trips, however, the predicted ratio is less extreme than what is observed in the Numerator households. I observe similar pattern using the CES income benchmark, Figure B.1 in the appendix documents the comparison.

Another benchmark we use to compare the observed shopping labor division pattern with

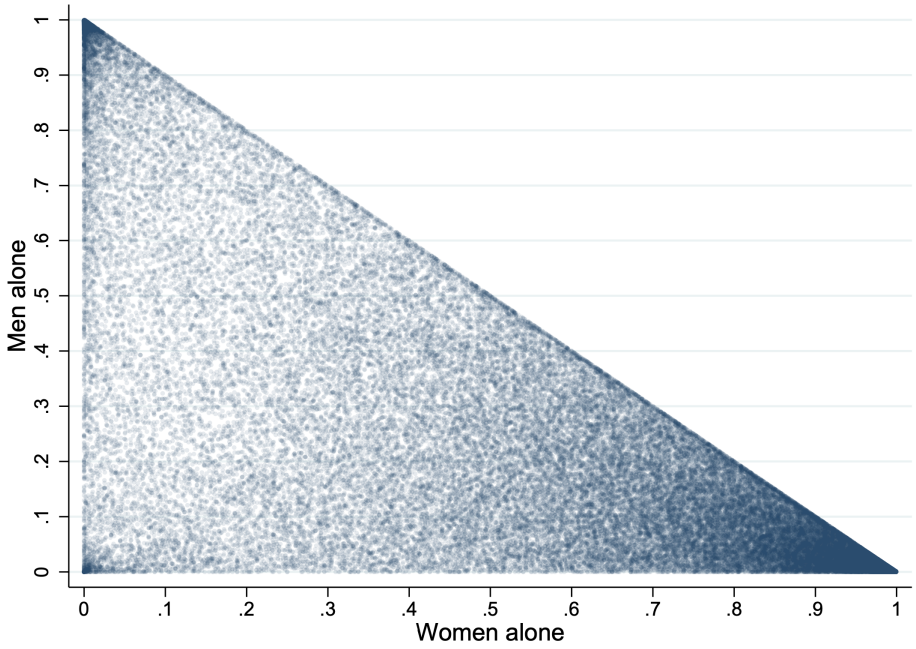
Table 4.1: Mean share of shopping trips by each shopper compared with the predicted shopping shares using the CES benchmarks

	(1) Numerator	(2) CES working hours	(3) CES income function
Women	0.566	0.487	0.508
Men	0.226	0.321	0.290
Joint	0.208	0.193	0.202

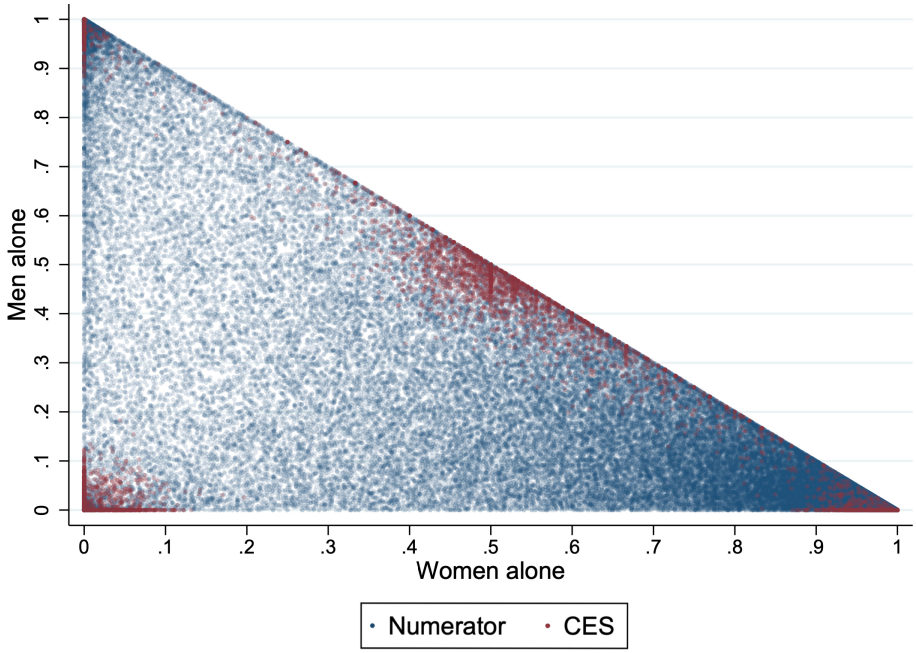
is the self-reported time spend on shopping documented in Aguiar and Hurst [2007]. The authors documented that men reported 4.34 hours spent on shopping, while women reported 5.93 hours spent on shopping per week in the 2003 time use survey. While the reported time does not reflect the within household women-men difference in the time spent on shopping, it offers us another benchmark to compare the observed shopping shares with. The time difference suggests that women tend to shop more than men on average, however, our data suggests that the actual shopping labor share difference between women and men may be more extreme than what would be inferred based on the documented facts from previous studies.

4.2 Shopping labor division across geographic regions

Next, I examine how shopping labor division differs across different US counties. I use the first three digits of the household's reported postal code as an approximation for the county that the household reside in. I first compute the difference in the share of shopping trips conducted by women and men for each household, and then compute the average difference across all married households living in the same county. Figure 4.2 presents the geographic distribution of the shopping share difference. Among all the 886 counties that I have data for, 12 counties have higher average shopping shares of men over women. At the county level, women on average conducts 34.9% more shopping trips than men, with a standard deviation of 0.133. While there exists substantial heterogeneity in the shopping labor division across



(a) Shopping shares in married households



(b) Shopping shares overlay with CES weekly working hour benchmark

Figure 4.1: Shopping shares of men alone against women alone (N=63,173)

geographic regions, women appear to consistently shop more than their partners in the majority of the US counties. I normalized the shopping share differences and binned the

counties into deciles for plotting in Figure 4.2, which illustrate the relative gender difference across US counties.

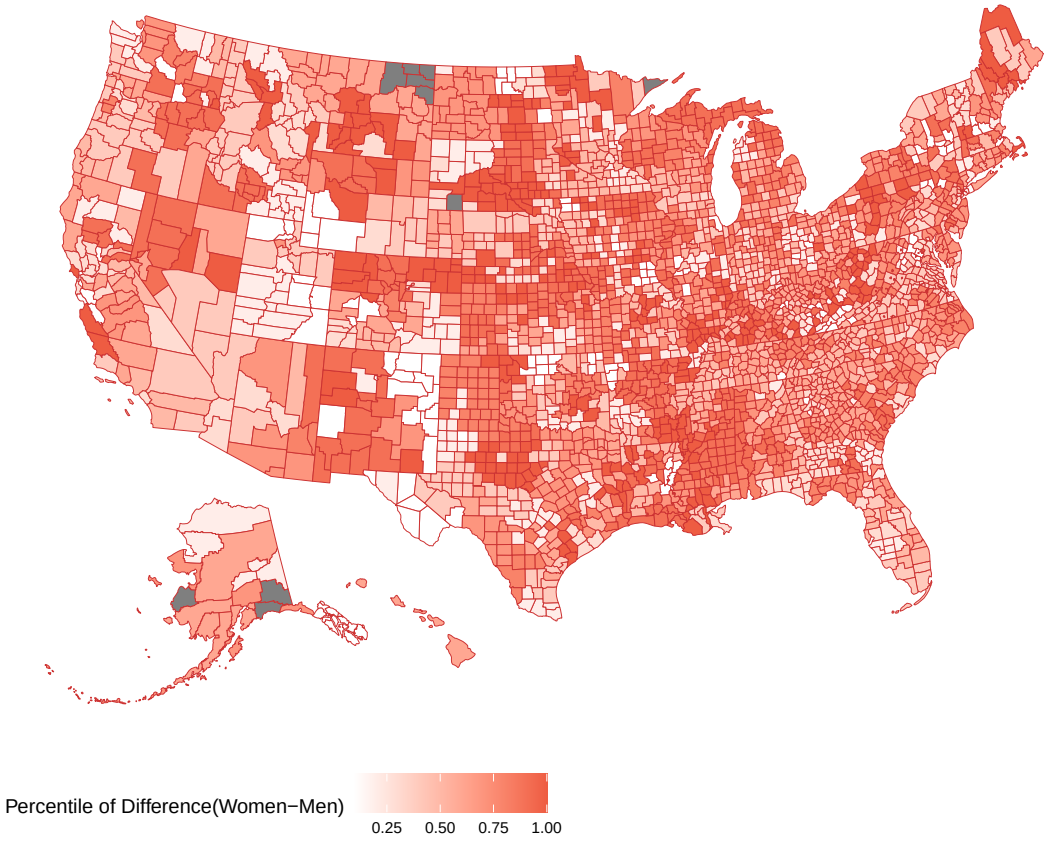


Figure 4.2: Difference between women and men's shopping shares across counties

4.3 Shopping labor division across households with different demographics

In this section, I compare how shopping tasks are divided across households with different demographics. Table 4.2 summarizes the breakdown of shopping shares for each shopper

across households with different demographics, where households are segmented by the number of children, age groups, ethnicity, income, and education level respectively. I find that women as the main shopper appears to be a pattern that holds across different household types. Women consistently conduct more than half of the shopping trips across different demographic groups. Column (1) and (2) compares the fraction of shopping trips taken by women and men alone. I find that the share of women's trips is more than twice the share conducted by men in almost all the demographic groups.

To further measure how much of the variation in shoppers' shopping shares can be explained by the household demographics, I perform a multivariate regression of shopping shares on the observed household characteristics:

$$
\begin{aligned}
frac_f &= \beta_{0f} + \beta_{1f} n\_kids + \beta_{2f} age + \beta_{3f} income + \Lambda + \epsilon_f \\
frac_m &= \beta_{0m} + \beta_{1m} n\_kids + \beta_{2m} age + \beta_{3m} income + \Lambda + \epsilon_m \\
frac_b &= \beta_{0b} + \beta_{1b} n\_kids + \beta_{2b} age + \beta_{3b} income + \Lambda + \epsilon_b
\end{aligned}
$$

where $frac_i$, $i = \{f, m, b\}$ are the shopping shares for women, men, and together respectively; Λ includes the education level, and ethnicity fixed effects; the error terms $\epsilon' = (\epsilon_f \ \epsilon_m \ \epsilon_b)$ are multivariate normal distributed.

In column (1) to (3) of Table 4.3, I present the estimates from the regression. Column (4) presents the estimates of regressing the shopping share difference between women and men on the same set of household characteristics. The omitted groups in Λ are less than high school, and other ethnic groups for education level, and ethnicity respectively. I find relatively large and significant differences in the share of shopping trips across households with different number of children, where women tend to conduct even more higher share of shopping trips in households with more children. I find that one more kid is associated with a 4.20% increase in the shopping share of women, a 0.742% increase in the shopping share

Table 4.2: Average shopping shares across households with different demographics

	Num.Households	(1) Women	(2) Men	(3) Together
Panel A: Number of Kids				
0	43,607	0.5518	0.2250	0.2232
1	11,597	0.5816	0.2289	0.1895
2	7,337	0.6198	0.2324	0.1478
3	632	0.6315	0.2160	0.1525
Panel B: Age				
18-20	16	0.5991	0.1399	0.2610
21-24	567	0.5362	0.1455	0.3183
25-34	10,538	0.5332	0.2005	0.2663
35-44	15,017	0.5590	0.2406	0.2003
45-54	12,209	0.5812	0.2320	0.1868
55-64	14,531	0.5944	0.2175	0.1881
65+	10,295	0.5530	0.2431	0.2038
Panel C: Ethnicity				
White	49,714	0.5725	0.2235	0.2041
African American	3,559	0.6028	0.2377	0.1595
Hispanic	4,579	0.5590	0.2147	0.2263
Asian	3,891	0.4656	0.2608	0.2737
Other	1,430	0.5434	0.2472	0.2094
Panel D: Income				
Less than $50,000	15,857	0.5554	0.2193	0.2253
$50,000-$99,999	25,973	0.5684	0.2237	0.2080
$100,000-$149,999	13,089	0.5699	0.2310	0.1990
$150,000-$199,999	4,588	0.5695	0.2395	0.1911
$200,000 +	3,666	0.5764	0.2445	0.1791
Panel E: Education				
Less than high school	943	0.5301	0.2618	0.2081
High School	11,218	0.5767	0.2115	0.2118
Some college, no degree	12,945	0.5733	0.2197	0.2070
College	26,270	0.5671	0.2249	0.2079
Advanced	11,797	0.5480	0.2487	0.2033

of men, and a 5.04% decrease in joint trip shares. While on the other hand, the differences appear to be smaller across other household demographics including age and income levels. For education, I find that women tend to shop less in general in households with higher education level. There also appear to be significant heterogeneity between men and women's shopping shares across different ethnic groups.

To summarize, I find an asymmetric distribution in men and women's share of shopping labor in married household, where women on average conduct significantly more shopping trips than men. Although there appears to be some heterogeneity in the shopping shares across households with different demographics, the asymmetric shopping labor division holds consistently across all household types I have examined. The finding shed light on the widely existence of gender inequality in the household labor division, which is broadly consistent with the self-reported share of household activities in time-use surveys documented by Aguiar and Hurst [2007], where the authors found higher reported hours in nonmarket work by women than men in three waves of surveys from 1965-2003. My results suggest that larger time devotion in shopping of women compared with men persists in recent years and the asymmetry in the shopping labor division may be more extreme than one would infer based on the women-men difference documented in the literature.

Table 4.3: Relationship between shopping shares (percentage) and household characteristics

VARIABLES	(1) Women	(2) Men	(3) Joint	(4) Diff(Women-Men)
Num Kids	0.0420***	0.00842***	-0.0504***	0.0370***
	(0.00270)	(0.00242)	(0.00165)	(0.00317)
Age	0.00102***	0.00148***	-0.00250***	0.000592***
	(0.000163)	(0.000136)	(0.000121)	(0.000185)
Log(Income)	0.00976***	0.00684***	-0.0166***	0.00597*
	(0.00297)	(0.00253)	(0.00212)	(0.00332)
Education==Advanced	-0.0284***	0.0285***	-9.91e-05	-0.0516***
	(0.00625)	(0.00545)	(0.00444)	(0.00697)
Education==College	-0.00379	0.00519	-0.00140	-0.0104*
	(0.00502)	(0.00430)	(0.00359)	(0.00564)
Education==High School	0.0153**	-0.0141***	-0.00120	0.0119*
	(0.00595)	(0.00487)	(0.00446)	(0.00664)
Education==Less than high school	-0.0162	0.0331**	-0.0169	-0.0726***
	(0.0186)	(0.0155)	(0.0122)	(0.0198)
Ethnicity==Asian	-0.0822***	0.0148	0.0674***	-0.0874***
	(0.0161)	(0.0124)	(0.0114)	(0.0176)
Ethnicity==African American	0.0486***	-0.00125	-0.0473***	0.0670***
	(0.0160)	(0.0125)	(0.0107)	(0.0177)
Ethnicity==Hispanic	0.00187	-0.0226*	0.0207*	0.0391**
	(0.0158)	(0.0122)	(0.0110)	(0.0170)
Ethnicity==White	0.0143	-0.0191*	0.00478	0.0503***
	(0.0142)	(0.0107)	(0.00970)	(0.0151)
Observations	63,173	63,173	63,173	63,173
R-squared				0.009

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 5

SHOPPING BEHAVIOR DIFFERENCES ACROSS SHOPPERS

Accompanying the asymmetry in the shopping labor division between men and women, I find that men and women also tend to behave differently when they undertake a shopping trip. In this chapter, I document these differences across shoppers. In particular, I focus on the product and store choices of shoppers and present the difference in men and women's purchase price, trip size, brand choices, and store visits.

5.1 Price and trip size differences

To compare the differences in purchase prices and trip sizes between men and women, I run the regression specified in Equation (5.1).

$$\log(y_{ijt}) = \beta_0 + \beta_f \mathbb{1}(Woman_{it}) + \beta_m \mathbb{1}(Man_{it}) + \Lambda + \epsilon_{ijt} \tag{5.1}$$

where $\log(y_{ijt})$ represents either the log price of item j purchased, or the log total expenditure spent by household i on trip t; $\mathbb{1}(Woman_{it})$ and $\mathbb{1}(Man_{it})$ are indicator functions for whether a trip is taken by women/men; Λ controls for different sets of fixed effects; and ϵ_{ijt} is the error term clustered at the household level. In regression (5.1), the omitted shopper type is the joint trips.

Table 5.1 presents the estimates for regression (5.1). The coefficients represents the relative percentage differences in prices and trip level expenditure compared with the prices paid when men and women shop together. I find a small but significant price difference paid across different shoppers, where women tend to pay slightly lower prices than men even when they purchase the exact same item from the same store. By column (4), compared with the prices paid in joint trips, I find that women pay 0.966% less for the same item on solo trips while men pay 0.752% higher compared with joint trips. Together, the estimates

suggest a 1.718% price gap between men and women residing in the same household when purchasing identical product from the same retail store. Column (5) to (7) presents the trip level spending differences across shoppers. Households tend to spend significantly more in joint trips than in solo trips. Comparing the solo trips by men and women, I find that women tend to spend more than men in solo trips, even if the shopping trips are conducted in the same type of stores. I show that these pattern are robust against the control for different fixed effects.

I perform similar analysis with the sample of single households to understand how married individuals shop differently from single households. Table 5.2 presents the differences in the purchase prices and trip sizes between single men and women. Since I cannot examine the within-household price gap for single households as I did for married households, I control for the household demographics instead, including age, ethnicity, education, and income level. Errors are clustered at the county level. Similarly, I find that single women tend to purchase the same item at a small but significantly lower price than single men. The price difference between single men and women is about half the size of the price gap between married men and women. Given that women tend to shop more than men, experience in shopping may contribute to the price gap I observe. In the appendix Table C.1, I provide additional findings on how experience in shopping affects the gender price gap. For trip level spending, I find that single women spend more than men per shopping trip. The trip spending differences between single men and women are larger than the differences between married men and women, but smaller than the differences between joint and solo trips conducted by married households.

Apart from comparing the women-men price gap with the single households, I find that the price gap is of similar magnitude to the Black-White price gap documented in Butters et al. [2022], where the authors found that African American households tend to pay 2% higher price than White households. My findings suggest that the within-household women-

men price gap, which is approximately 1.718%, is economically significant. Further, Barnes and Brounstein [2022] documented a 0.89% women-men price gap across women and men households using the NielsenIQ data. This price gap is almost identical to the price gap I find among single men and women in our study, which is also about half the size of the within-household gender price gap. The findings suggest that if we use the single household gender price gap as an approximation for the within-household gender price gap, we are likely to underestimate the price difference paid by women and men. In fact, the within-household gender price gap appears much larger than the existing gender price gap benchmark based on across-household price data.

Table 5.1: Price of items purchased and trip level expenditure by married men and women residing in the same household

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Expenditure)	Log(Expenditure)	Log(Expenditure)
Women	-0.0947***	-0.00934***	-0.00957***	-0.00966***	-0.421***	-0.324***	-0.316***
	(0.00118)	(0.000281)	(0.000277)	(0.000263)	(0.00329)	(0.00287)	(0.00281)
Men	-0.0230***	0.00873***	0.00860***	0.00752***	-0.560***	-0.471***	-0.464***
	(0.00160)	(0.000407)	(0.000403)	(0.000383)	(0.00469)	(0.00435)	(0.00431)
Constant	1.038***	0.985***	0.985***	0.985***	3.414***	3.338***	3.332***
	(0.000792)	(0.000186)	(0.000183)	(0.000174)	(0.00251)	(0.00222)	(0.00218)
Observations	243,393,023	243,321,568	243,321,568	243,319,776	37,441,032	37,441,032	37,438,307
R-squared	0.349	0.875	0.875	0.877	0.151	0.254	0.271
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	No	No	No			
Item ID FE	No	Yes	Yes	Yes			
Store Type FE	No	No	Yes	No	No	Yes	No
Retailer FE	No	No	No	Yes	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2 Store visit differences across shoppers

To understand the store visit differences between men and women, for each store type s, I run the following regression specified in Equation (5.2):

$$\log(N(trip)_{sit}) = \beta_0 + \beta_f Frac(Woman)_{sit} + \beta_m Frac(Man)_{sit} + \Lambda + \epsilon_{sit} \tag{5.2}$$

Table 5.2: Price of items purchased and trip level expenditure differences by single men and women

VARIABLES	(1) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Expenditure)	(6) Log(Expenditure)	(7) Log(Expenditure)
Single Women	-0.00648	-0.00626***	-0.00890***	-0.00894***	0.206***	0.185***	0.182***
	(0.00639)	(0.00153)	(0.00161)	(0.00153)	(0.0139)	(0.0136)	(0.0136)
Constant	0.908***	0.900***	0.901***	0.901***	2.628***	2.641***	2.642***
	(0.00420)	(0.00101)	(0.00152)	(0.00140)	(0.00842)	(0.00825)	(0.00820)
Observations	54,802,938	53,320,184	53,320,184	53,318,204	10,187,586	10,187,586	10,184,484
R-squared	0.332	0.875	0.875	0.877	0.046	0.138	0.159
Household Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	No	No	No			
Item ID FE	No	Yes	Yes	Yes			
Store Type FE	No	No	Yes	No	No	Yes	No
Retailer FE	No	No	No	Yes	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

where $\log(N(trip)_{sit}$ represents the total number of shopping trips conducted in store type s by household i in week t; $Frac(Woman)_{sit}$ and $Frac(Man)_{sit}$ represent the fraction of these shopping trips that are conducted by women/men respectively; and Λ controls for the household fixed effect.

Figure 5.1 plots the estimated coefficients $\hat{\beta}_m$ for men against $\hat{\beta}_f$ for women, where the size of the point represents the popularity of that store type in the sample. Since joint trip is the omitted shopper type in the regression, the size of each coefficient represents the estimated percentage change in the number of shopping trips should all shopping trips conducted in that particular store type are switched from joint trips to men/women's solo trips. A positive coefficient indicates that the household is more likely to visit that store type in men/women solo-shopping trips than in joint trips. The red solid line represents the 45 degree line. Points fall above the line suggest that the store types are more likely to be visited by men than by women, and points fall below the line represents store types that are more likely to be visited by women. Points that are further away from the 45 degree line suggest larger differences in the store visits between men and women. Figure 5.1 reveals substantial intra-household heterogeneity across shoppers in their store visits, where

I observe the largest men-women differences in beauty, gas and convenience, drug, and food stores. The most frequently visited store types including food stores and mass merchandisers are furthest away from the origin, suggesting that households are more likely to visit these stores in solo trips than in joint trips.

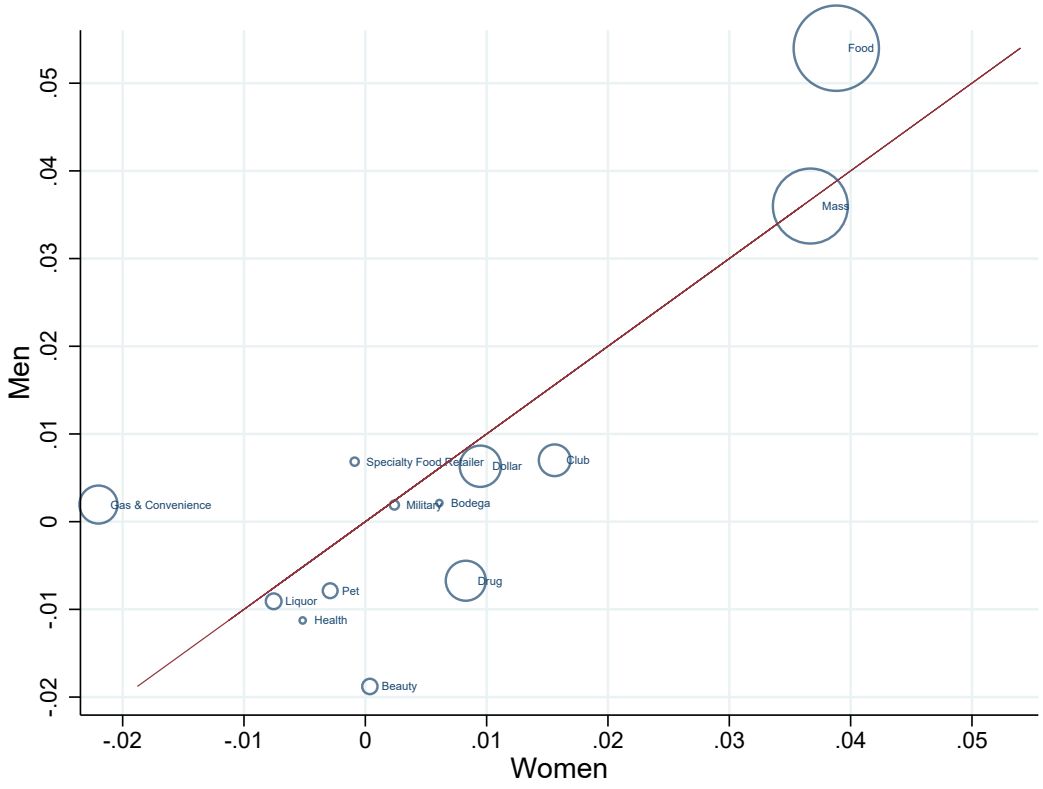


Figure 5.1: Differences in the likelihood of visiting each store type across shoppers

5.3 Gender scores of purchase bundles

One of the challenge of understanding the brand choice differences between men and women is to find a method to quantify the brand choice differences. In this section, I construct a gender score for the purchase bundles that evaluates the similarity of brand choices across shoppers. The purpose of the score is to inform us the intra-household differences in product choices. I choose a set of items from frequently purchased product departments and assess

the genderness of each brand via the purchase ratio by single men against women. Then, I construct the gender score for each purchase bundle as the weighted average of the genderness of the brands in the bundle.

Formally, for each brand $b \in B$, I first construct a "propensity to purchase by single men", ppm_{bt}, as described in Equation (5.3):

$$ppm_{bt} = \frac{\sum_{i=1}^{N} E_{mt}}{\sum_{i=1}^{N} \sum_{g \in \{m,f,b\}} E_{gt}} \tag{5.3}$$

where for each brand $b \in B$, I compute the ratio between the spending by single men on brand b in week t and the total spending on brand b by all single households in week t. The propensity score measures the likelihood that a brand b is purchased by single men versus by single women in week t.

The propensity score, ppm_{bt}, is matched to the purchases of single and married households by the $(brand, week)$ pair. I construct a gender score for the purchased bundle of household i in week t, G_{it} as described in Equation (5.4):

$$G_{it} = \frac{\sum_{b=1}^{B} ppm_{bt} E_{bt}}{\sum_{b=1}^{B} E_{bt}} \tag{5.4}$$

where I take the weighted average of the propensity scores across all purchases in that week, weighted by the weekly expenditure of the brand. In the construction of the gender score, I focus on product departments that are frequently purchased by consumers, and tend to be available nation-wide so that the score can be used to compare purchases across the US[1]. Gendered products, such as makeups, men/women deodorant, and men/women apparel

1. I use brands from the top 100 product departments, excluding the gendered products such as clothing and footwear, feminine products, makeups, and etc., in the construction of the gender scores. The product departments used in the construction are: beverages, produce, meat, dairy, snack, frozen foods, beer wine and spirits, pet food, paper and plastic, baking and cooking, candy, personal health care, condiments, packaged bakery, deli n prepared foods, combustible nicotine products, pet supplies, computers and accessories, gift cards, laundry, vitamins and supplements, canned food, skin care, breakfast, shelf stable meals, hair care, kitchen and dining, oral hygiene, medical products, TV and video, sweet goods, home decor, home appliances

are also excluded from the construction of the gender score. These product departments are excluded so that the differences in gender scores across households and shoppers are not driven by the differences in demand of gendered products.

Similarly, I construct the gender scores for each shopper using the weighted average of the propensity scores across all purchases by shopper $g \in \{f, m, b\}$ in household i in week t (Equation 5.5).

$$G_{igt} = \frac{\sum_{b=1}^{B} ppm_{bt} E_{bgt}}{\sum_{b=1}^{B} E_{bgt}} \tag{5.5}$$

As a result, the gender score $G \in [0, 1]$ measures how similar a purchased bundle is to the average purchase bundle of single men in the same week. It allows us to compare the similarity among brand choices and measure whether men and women bring different products home when they shop.

Table 5.3 summarizes the gender scores of the purchase bundles across different types of households and shoppers. According to the definition, a larger gender score represents a purchased bundle that is more similar to that of a single man. The first three rows of Table 5.3 summarize the distribution of the gender scores in all married, single women, and single men households. The next two rows summarize the gender scores for married households where women/men is the more experienced shopper respectively. The last three rows summarize the gender scores for shopping trips that are taken by men alone, women alone, and by men and women together in married households.

Table 5.3 shows that the constructed gender score successfully distinguishes the differ-

small, stationery, home patio, seafood and fish, household cleaners, storage and organization, bath and body care, video games, bedding, air fresheners and deodorizers, gardening and lawn care, shaving and hair removal, vacuums floor care n accessories, home appliances large, herbs and spices, sports nutrition, dishwashing, batteries, toy arts and crafts, health tools, mobile accessories, heating cooling and air quality, hardware tools, cleaning tools, audio, smart home, cell phones, car care and maintenance, tablets and ereaders, bathroom accessories, eye care and vision, furniture, hand care, dolls n accessories, pasta and noodles, tools, wearable technology, lighting and ceiling fans, refrigerated foods, diet, party invitations and cards, outdoor sports, toy building, toy action figures, baby equipment, electrical tools, in-store bakery, games, home audio and theater, outdoor power equipment, auto replacement parts, painting supplies and wall treatments, beans and grains, pest control, sports and outdoor play, toy vehicles, office furniture, home appliance parts and accessories.

Table 5.3: Summary of the gender scores across household types and shopper types

Household/Shopper Type	(1) Mean	(2) SD
Married	0.278	0.401
Single Women	0.124	0.212
Single Men	0.777	0.688
Married - Women shop more	0.276	0.396
Married - Men shop more	0.285	0.411
Married - Men trips	0.291	0.463
Married - Women trips	0.273	0.415
Married - Joint trips	0.282	0.429

Table 5.4: Within-household differences in the gender scores of purchase bundles between men and women

VARIABLES	(1) Gender Score	(2) Gender Score
Women	-0.000877***	-0.000690***
	(0.000246)	(0.000247)
Constant	0.276***	0.276***
	(0.000106)	(0.000106)
Observations	13,571,434	13,571,434
R-squared	0.078	0.079
Household FE	Yes	Yes
Week FE	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

ences in brand choices across different shoppers and household types. The second and third rows show that the sizes of the average gender scores, $\bar{G}_{\text{single men}} > \bar{G}_{\text{single women}}$, which suggests that the purchased bundle of a single man appear more similar to the average purchase bundles of single men than that of a single woman. The average gender scores of different samples of married households and their shoppers all fall between $\bar{G}_{\text{single men}}$ and $\bar{G}_{\text{single women}}$. A t-test on the gender scores differences between the married households

where men/women have more experience in shopping returns a zero p-value, suggesting that the difference in gender score is significant. Within married households, we find that $\bar{G}_{\text{married men}} > \bar{G}_{\text{joint}} > \bar{G}_{\text{married women}}$, suggesting that compared with married women, married men's purchases are more similar to the purchases of single men. I further compare the within-household brand choice differences between men and women by taking the solo trips and regressing the gender score on the indicator for whether the trip is taken by women. Table 5.4 presents the estimates on the within-household differences in the gender scores of the purchased bundles. Compared to the purchases of men, the purchase bundles of married women receive significantly lower gender scores, suggesting that the women's brand choices appear more similar to the purchases of single women than their partners. The estimation suggests that men and women tend to bring home different brands when they shop.

CHAPTER 6

INFLUENCE OF THE LOCAL GENDER NORM ON HOUSEHOLD SHOPPING LABOR DIVISION

In this chapter, I examine how the local gender norm affects the shopping labor division in married households. In previous sections, I have documented a highly asymmetric labor division in shopping within married households, accompanied by substantial intra-household heterogeneity in product choices and store visits across shoppers. I find that women consistently shop more than their partners across households with different demographics and living in different regions. Along with the large differences in men and women's shopping behavior, understanding the factors that influence the household shopping labor division offers a meaningful topic to explore for researchers to better understand consumer shopping behavior. Many factors may contribute to this highly asymmetric labor division that is observed, such as differences in individual preferences over shopping, and specialization in different household tasks. Among them, one important factor that may affect the shopping labor division is the local gender norm on how households allocate their shopping tasks. I construct a retail environment score using the average women's shopping shares in each county to measure the local gender norm. Then, I exploit a sample of married households that moved to a different county during our sample period to generate quasi-exogenous variation in the local gender norm. In the analysis, I identify a set of married households that moved from and to counties with different environment scores. Using these moving married households, I examine the effect of the changes between the gender norm at the origin and the destination of their moving path on the how they divide their shopping labor. The analysis helps us understand the influence of the local gender norm on the households' shopping labor division. In the following sections, I describe how I construct the sample of moving households, define the gender norm measurement using the a retail environment score, and presents the effect of the change in the gender norm on household shopping labor division.

6.1 Sample of married households that moved

I determine if a household has permanently moved to a new location and the time of the movement based on the postal codes of the stores they visit on each shopping trip. The assumption is that households tend to visit stores within a certain radius from where they live. If the set of store postal codes visited by a household shifts permanently after a shopping trip t, I will say that the household moved between shopping trip t and $t+1$. Identifying the households that moved is critical for finding the relevant sample to study the effect of the local environment on shopping.

To identify whether a household has moved and when is the moving time, for each household i, I take all the shopping trip time $t_i \in \{2, 3, \cdots, T_i - 1\}$ and search over t_i to find the most likely moving time. I take each trip t_i as a break point and divide the shopping trips in two blocks. For each block, I exclude stores whose postal codes are beyond one deviation from the mean postal codes of that trip block, and compute the distance of the two blocks using the difference of the mean postal codes that are kept. The shopping trip t_i that results in the largest difference is considered the most likely moving time for household i.

Formally, for each household i, we search for

$$t_i^* = \underset{t_i}{\text{argmax}} \left| \frac{1}{K_1} \sum_{k=1}^{t_i-1} zip_k * \mathbb{1}\{zip_k \in [m_k - sd_k, m_k + sd_k]\} \right.$$
$$\left. - \frac{1}{K_2} \sum_{k'=t_i}^{T_i} zip_{k'} * \mathbb{1}\{zip_{k'} \in [m_{k'} - sd_{k'}, m_{k'} + sd_{k'}]\} \right|$$

where

$$m_k = \frac{1}{t_i - 1} \sum_{k=1}^{t_i - 1} zip_k$$
$$m'_k = \frac{1}{T_i - t_i + 1} \sum_{k'=t_i}^{T_i} zip_{k'}$$

are the mean postal code visited by household i before shopping trip t_i and on or after shopping trip t_i. sd_k and $sd_{k'}$ are the standard deviation of the visited postal codes respectively. I define K_1 and K_2 as

$$K_1 = \sum_{k=1}^{t_i - 1} \mathbb{1}\{zip_k \in [m_k - sd_k, m_k + sd_k]\}$$
$$K_2 = \sum_{k'=t_i}^{T_i} \mathbb{1}\{zip_{k'} \in [m_{k'} - sd_{k'}, m_{k'} + sd_{k'}]\}$$

which are the number of shopping trips within one deviation of the mean postal codes before and after t_i respectively.

I identify a household i as one that has permanently moved to a new location if the difference between the most visited postal code before and after t_i^* is larger than 100, which roughly correspond to moving to a different county. Households whose moving time falls before the first ten shopping trips or after the last ten shopping trips are excluded from the sample so that I have enough trips to study both before and after moving. Households whose total number of shopping trips fall into the lowest percentile are also excluded for similar reason. I then manually adjust the time of moving based on the identified moving time wherever I notice a discrepancy in the actual and the identified break point in the postal code.

6.2 Measure the local gender norm

Many place-based factors plausibly affect how shopping trips are allocated within households. For example, factors including the social norm, the types of retail stores located nearby, public transportation options, and labor market conditions, etc., can shape the shopping labor division among household members. To understand the effect of the local environment on the household's shopping labor division, I construct a retail environment score using the share of shopping trips conducted by women among the non-focal married households in each county to measure the local gender norm. I adopt this environment score as a measure of the local gender norm since the shopping shares of men and women among married households living in a particular county reflects the above environment factors that may potential influence the shopping labor division of the households moving into that county. To be more precise, for each county, I define the retail environment score to be the weighted average share of women's shopping trips among the non-focal married households that are not included in the moving household sample. Formally, the retail score RS_c of county c is described by Equation 6.1:

$$RS_c = \frac{\sum_{i=1}^{N_c} w_i frac_{fi}}{\sum_{i=1}^{N_c} w_i} \tag{6.1}$$

where $frac_{fi}$ represents the share of women's shopping trips for household i residing in county c, and w_i represents the weight on household i. The constructed retail environment score is thus a score within the range of $[0, 1]$, where a higher score suggests that women are more likely to undertake the shopping labor in that county. Using the environment score, I am thus able to compare the changes in the retail environment between the origin and the destination of the household's moving path, and study the effect of the changes in the environment score on the shopping labor division.

In the analysis, I further exclude the counties with too few households to form an accurate retail environment score, where I restrict to the counties above the bottom ten percentile in

terms of the number of married households that factored into the construction of the retail environment score. This corresponds to counties with at least ten married households in the environment score construction. Figure 6.1 presents the distribution of the constructed retail environment score across the included US counties, where the mean of the score is 0.691 with a standard deviation of 0.0787. Most counties received a retail environment score above 0.5, suggesting that women shop more than men in the majority of the US counties. I provide the summary of the environment score with alternative cutoff thresholds and the corresponding estimation in the appendix as a test of the score sensitivity. The analysis suggests that the estimation is robust to different cutoffs.

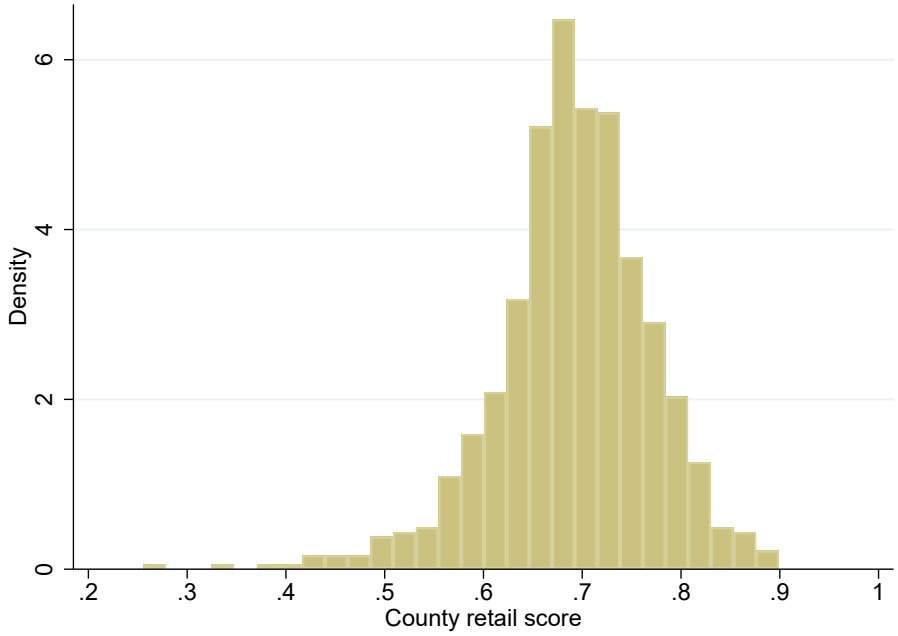


Figure 6.1: Distribution of the county level retail environment score

I further show that there exists considerable heterogeneity in the retail environment across the US counties via the geographic distribution of the retail environment score. Figure 6.2 presents the geographic distribution of the retail scores across US counties, where a darker color suggests women are more likely to shop in that county. I standardized the retail environment score and binned them by deciles for better visibility. By Figure 6.2, I observe

substantial heterogeneity in the retail environment across US counties. The non-uniform distribution of the retail environment offers support for the possibility that moving may lead to significant changes in the local retail environment.

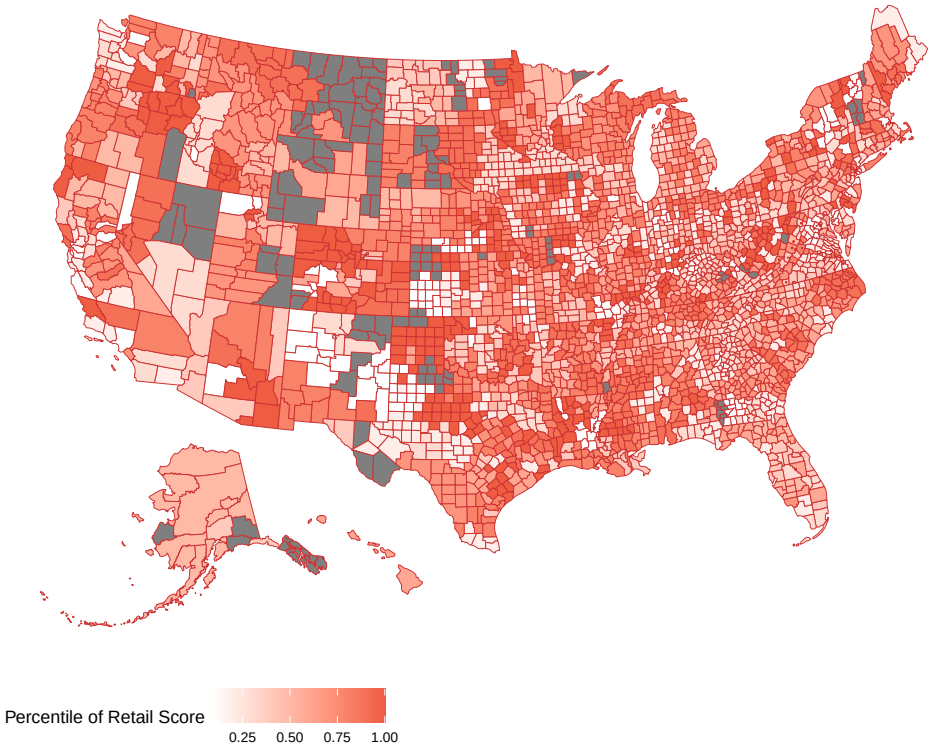


Figure 6.2: Geographic distribution of the retail environment scores across US counties

6.3 The effect of local retail environment on shopping labor division

In this section, I present evidence on how the local retail environment affects the household shopping labor division. I hypothesize that the shopping labor division of married households can be influenced by the local retail environment. If true, when a household moves to a county with higher environment score, the women is likely to shop more compared to a household moving in the opposite direction. I test this hypothesis using the sample of moving married

households described in the previous sections. In the sample, I identified 4,242 married households that moved during our sample period. For each household, I compute the changes in the environment score from the household's moving origin to the destination, and regress whether a trip is conducted by the woman on whether the trip is conducted post moving and on the interaction with the change in the score. Formally, I run the following regression:

$$\mathbb{1}(Women)_{it} = \beta_0 + \beta_1 After_t * \Delta RS_i + \beta_2 After_t + \Lambda_i + \epsilon_{it} \tag{6.2}$$

where ΔRS_i represents the change in the retail environment score for household i, and Λ_i controls the household fixed effects.

I first present the distribution of the changes in the retail environment score among the married households that moved in Figure 6.3. I find that the mean changes in the retail environment score is 0.00224, with a standard deviation of 0.0855. The histogram illustrates that there exist considerable heterogeneity in the direction and sizes of the changes in the environment score, which offers support to study the effect of the changes in the retail score on how shopping labor is allocated among household members.

Table 6.1 presents the estimated results on regression (6.2). The coefficient on the interaction term is significant and positive, which suggests that women tend to shop significantly less when moving to a county with lower retail environment score, i.e., to counties where the environment is relatively more gender equal, compared with the households moving in the opposite direction. The size of the estimated coefficient on the interaction term is 0.103. The estimate suggests that in the extreme case where a household moves from a county where men always undertakes all the shopping trips to a county where women always undertakes all the shopping trips, the women's shopping share in that household is likely to increase by 10.3 percentage point. According to Table D.1 in the appendix, the mean changes in the retail score in our data is 0.00224, this corresponds to a 0.0231 percentage point increase in the women's shopping shares. I then examine how much closer the women's shopping shares

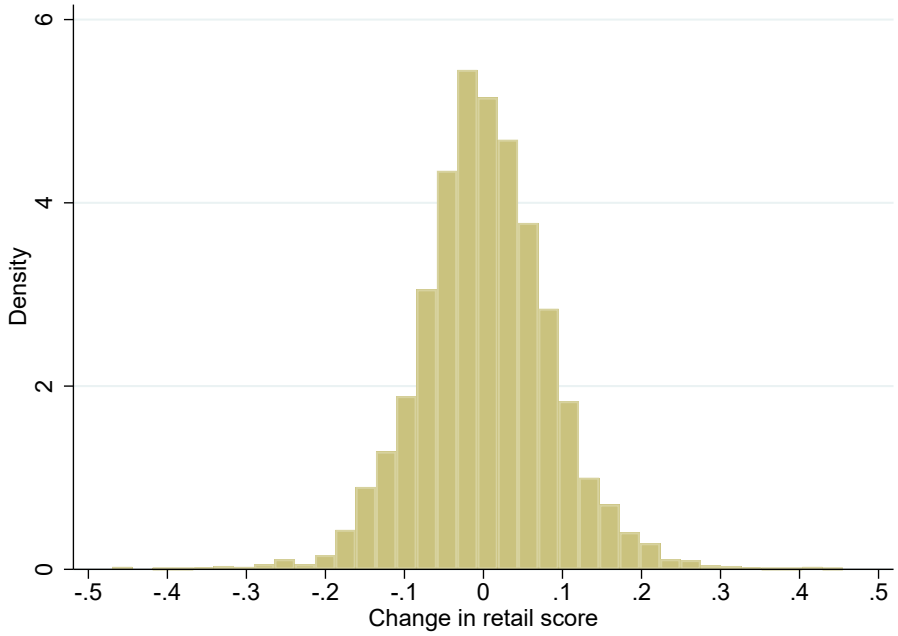


Figure 6.3: Distribution of the changes in the retail environment score among married households that moved

become to the average women's shopping shares at their moving destination post moving. I measure the distance between the household's shopping labor division and the retail environment at the moving destination as the absolute difference between whether a trip is taken by women and the moving destination's retail score, i.e., the mean share of women's trips at the destination county. I find that the mean distance to the destination average before moving is 0.430, while the distance post moving is 0.426. The distance decreases by 0.004, or 0.93% post moving. The change in the distance suggests that on average, the household's shopping shares become closer to the average shopping shares in the destination county post moving. The convergence to the destination mean appears small in the short term post moving that I have data on, but I observe that the household's shopping shares are getting closer to the destination mean.

I further present the dynamic treatment effect on the changes in the household's shopping labor division via a event study around the time of moving, where I examine a three-year

window around moving. Formally, I run the following regression:

$$\mathbb{1}(Women)_{it} = \beta_0 + \sum_{\tau=1}^{T} \beta_{1\tau} \mathbb{1}(t \in \tau) * \Delta RS_i + \sum_{\tau=1}^{T} \beta_{2\tau} \mathbb{1}(t \in \tau) + \Lambda_i + \epsilon_{it} \tag{6.3}$$

where $\mathbb{1}(t \in \tau)$ indicates whether trip t by household i is conducted during the three-month window τ. Figure 6.4 presents the estimates on $\beta_{1\tau}$, which represents the effect of the change in the environment score on the change in the women's shopping shares around the time of moving. I present the dynamic effect at a three-month interval. Figure 6.4 shows that prior to moving, the share of women's trips stays quite stable, while post moving, households moving to counties with higher(lower) retail environment scores show an increase(decrease) in the women's shopping shares from six months onward. The event study provides further evidence that the changes in the local retail environment affects how shopping labor is divided within the households, where households moving to a different county tend to converge to the gender norm at their new neighborhood.

Table 6.1: Women from households moving to counties with relatively gender-equal environment shop significantly less post moving than households moving in the opposite direction

	(1)
VARIABLES	Women
Post moving	-0.00934**
	(0.00457)
Post moving * Change in retail score	0.103**
	(0.0464)
Constant	0.692***
	(0.00226)
Observations	1,409,403
R-squared	0.470
Household FE	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

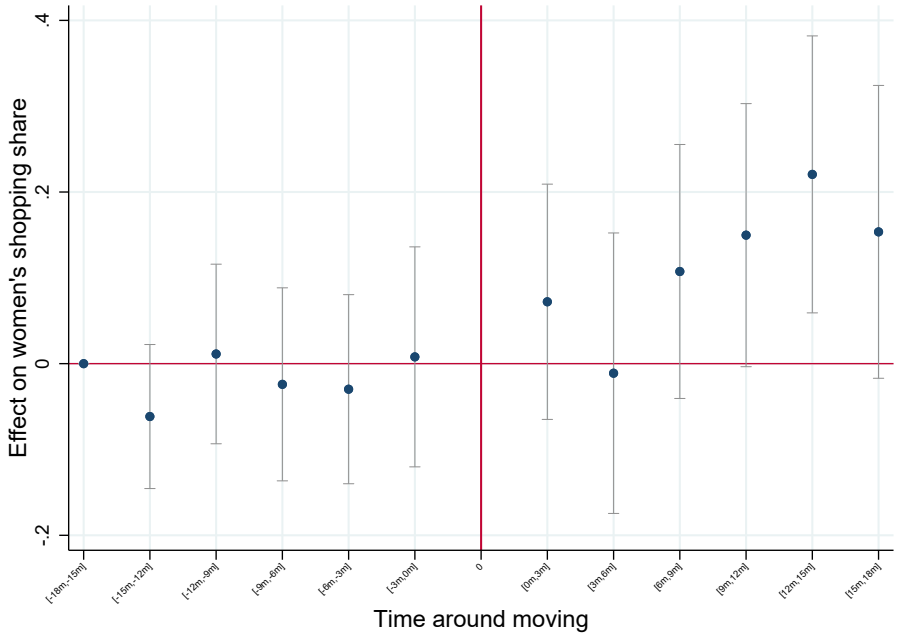


Figure 6.4: The dynamic treatment effect of the change in the gender norm on the household's shopping labor division

CHAPTER 7

DISCUSSION ON THE DIFFERENCES IN SHOPPING BEHAVIORS

7.1 Local environment influence on the household labor division

I have documented large asymmetry in the shopping shares between men and women residing in the same households, where women undertake a substantially larger proportion of shopping tasks than men. This pattern serves as compelling evidence of gender inequality in household labor division, particularly in the shopping domain. While the pronounced asymmetry in shopping shares can be attributed to various factors, including specialization across household chores, individual preferences, and prevailing social and cultural norms, I focus on exploring the influence of the local environment on the division of shopping labor. In particular, using a sample of married households that moved to counties with different gender norm, this study offers insight into one possible explanation for the persistent asymmetry observed in the shopping labor division – the impact of the local environment. By examining the changes in the share of shopping trips conducted by women around moving, I find that the local gender norm significantly affects how shopping labor is divided within the household. In particular, when a household move to a county which is relatively more gender equal in terms of the shopping labor division, the man is likely to shoulder a larger share of the shopping tasks than a man moving to counties with the opposite characteristics. The finding underscores the role of the local environment in perpetuating the unequal share of shopping labor withing households. The current state of high share of women's shopping trips across US may contributes to reinforcing the unequal shopping shares and hinder the convergence towards a more equal share of shopping labor. On the other hand, the finding also suggests that policies aiming at promoting a more gender equal environment may facilitate a more equal share of shopping labor within households and help improve gender

equality.

Accompanying the highly asymmetric shopping shares, I observe substantial heterogeneity in the product choices and store visits across shoppers living in the same household. I show that shoppers tend to bring home items under different brands and at different prices. Men and women also visit different types of stores and conduct shopping trips with different sizes. The findings suggest that individuals living in the same household show quite different shopping behaviors. It could be worthwhile for policymakers to consider the intra-household differences when setting policies, such as designing recommendation systems that best fit the individual preferences. These shopping behavior differences between men and women also suggest that the asymmetry in shopping labor division may potentially have an effect on what the households purchase. If true, there could be a large return to retailers and manufacturers in influencing who shops, where the strategy could be particularly lucrative in instances where it is difficult to influence the purchase decisions of a given shopper. For example, the existence of blue laws that restrict the operation hours of retailers on Sundays in certain states may increase the shopping cost for joint trips and potentially change the household purchase decisions.

Although the data does not directly address this casual effect, using the same sample of households moving to different counties, I present some suggestive evidence on the changes in the households' product choices around the time of moving. Similar to the analysis in Chapter 6, I regress the gender score of the purchase bundle in each shopping trip on whether the trip is conducted post moving and on the interaction with the changes in the retail environment score. Table 7.1 and Figure 7.1 presents the estimated changes in the gender score of the purchase bundles around the time of moving, where Table 7.1 presents the estimates using the retail environment score with different cutoff points, and Figure 7.1 illustrates the dynamics in the gender score changes using counties with at least ten households that factored into the score construction. I find that the purchased brands

become more similar to the purchases of single women when households move to counties with higher retail environment scores, i.e., to counties with less gender equal environment. This finding shows that the purchase decision of households changes significantly with the change in the local retail environment, which is also consistent with the direction of changes in the household shopping labor division. I acknowledge that many factors may contribute to the purchase decision changes following the moving, such as changes in the household's real income, so that the different changes in purchases is not necessarily induced by the changes in the shopping shares alone. However, the significant difference in the gender score changes suggests the possibility of a causal link and offers a potential direction for future research.

Table 7.1: Change in the gender score of the purchased bundles associated with the changes in the retail environment around the time of moving

	(1)	(2)	(3)
VARIABLES	Gender Score	Gender Score	Gender Score
Post moving	-0.00548***	-0.00592***	-0.00612***
	(0.00189)	(0.00192)	(0.00209)
Post moving * Change in retail score	-0.0648***	-0.0728**	-0.0595**
	(0.0201)	(0.0209)	(0.0266)
Constant	0.282***	0.283***	0.283***
	(0.000926)	(0.000942)	(0.00105)
Observations	1,027,365	1,005,061	867,846
R-squared	0.047	0.046	0.044
Household FE	Yes	Yes	Yes
Retail Score	All households	More than 10 households	More than 30 households

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.2 Other factors contributing to the asymmetric shopping labor shares

In this study, I mainly focused on investigating the impact of the retail environment on the household shopping labor division. As discussed in the literature, other factors also contribute to how shopping labor is divided within married households. In this section, I

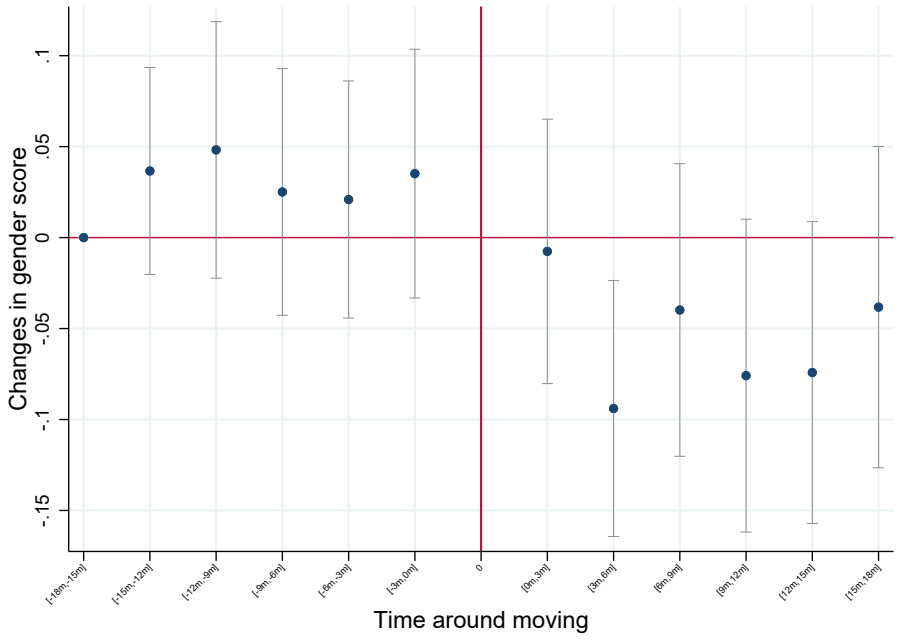


Figure 7.1: Dynamics in the change in the gender score of the purchased bundles associated with the changes in the retail environment around the time of moving

provide a brief discussion on the other factors that could give rise to asymmetric shopping shares and their implications.

Different individual level preferences: Different preferences over shopping across men and women can be one reason driving the gap between the shopping shares. A number of studies have highlighted in gender differences in shopping and presented the different motivations of shopping between men and women, where women are found to spend more time shopping, present higher motivations for searching and bargaining while shopping, and focus more on the social and hedonic perspective of shopping (Dennis et al. 2018; Otnes and McGrath 2001; Laroche et al. 2000; Kotzé et al. 2012). Surveys on the time use also reveals a larger fraction of time spent in shopping among both the single and married women than men (Aguiar and Hurst 2007; Browning et al. 2011).

In the data, I find some differences between the way men and women shop as well. In terms of the number of shopping trips conducted, on average, a single men in our panel

takes 4.1 shopping trips per week, while a single women takes 3.8 shopping trips per week. A t-test suggests that the number of shopping trips conducted by single women per week is significantly less than the trips conducted by single men in our panel. In married households, I observe a different pattern where women conduct a higher share of shopping trips over men. On the other hand, in terms of the weekly spending, I find single women spend $125.51 while single men spend $119.23 per week on average. A t-test on the spending difference suggests that single women spend significantly more than single men each week. Thus, the data suggests that single women tend to conduct fewer shopping trips but purchase more per week compared to single men. Although single and married individuals may have inherently different shopping preferences, the finding provides some suggestive evidence that men and women may differ in their individual level preferences over shopping, which may contribute to how the shopping labor is divided within households. Further, apart from the possibility that women may inherently have higher preferences on shopping, it is also possible that women may strategically engage in shopping more to obtain the products they like. When the person who shops influences what gets purchased, individuals with strong preferences dissimilar from their partners' may prefer to shop themselves. As a result, individual level differences over shopping may contribute to the asymmetric shopping shares observed in the data.

Specialization: Specialization offers another explanation for the asymmetric share of shopping labor in married households. A literature dating back to Becker [1991] suggests that household members tend to exploit their comparative advantage and engage in different home production tasks to improve efficiency in home production (Becker 1991; Pollak and Wachter 1975; Chiappori 1997, etc.). Thus, women may undertake a higher share of shopping labor if they are the more efficient shopper in the household, leading to the asymmetry in shopping labor division. In the data, I observe some suggestive evidence on this as I find women tend to spend less money on the same product than men (Table 5.1). I also find

that purchasing for the other household members is common within married households. In general, whether a purchase is intended for the shopper or for another individual is unobserved by the researcher. However, exception exists for some special product categories. I identify a set of products that are private and assignable, where the products are intended for a specific gender. Examples of such products include makeup, clothing, and footwear etc. Given that the gender of both the shopper and the consumer is known for these products, I am able to examine instances where purchases are intended for another household member.

Table 7.2 presents the annual dollar amount spending and the share of purchases that are intended for another household member. I identify several product categories that are private and assignable in our data – deodorants and fragrance, clothing and footwear, makeup and feminine product, and maternity product. For each product category, we compute the total annual spending by women for themselves, men for themselves, women purchasing for men, and men purchasing for women, and the corresponding expenditure shares for each household, among the households that have ever made a purchase in the product category. Table 7.2 presents the average annual spending and shares across households. Using these product categories, I find that buying for other household members is common in married households, where the mean share of purchases intended for another household member ranges from 6.2% to 31.0% in the assignable goods categories that I examine. In particular, in the two categories where both men and women consume, I find a even larger portion of purchases made by women for men than men made for themselves. The share of purchases made by women for men appear larger than the share of purchases made by men for women. In categories where women are the only consumers, I also find instances where men shop and purchase the products for women.

Table 7.2 reveals a non-trivial proportion of shopping trips where the shopper and the consumer are different. Together with the shopping behavior differences between men and women, the finding suggests that interaction among household members is common and

households may engage in specialization across shopping tasks. The tendency to specialize in different tasks offers one more explanation for the asymmetry in the household shopping shares. Specialization would further imply that some of the differences in the intra-household product choices may come from the differences in the shopping tasks that household members are assigned. Thus, for example, when we find that a woman spend more in snacks than her partner, it does not necessarily suggest that she has higher intrinsic preferences for snacks. While I provide several descriptive evidence on the shopping behaviors between men and women residing in the same household, one limitation of the data is that I cannot address the question of how changes in the shopping labor division causally impact household members' shopping and purchasing decisions. I believe this question offers a potential direction for future research and the findings open up an interesting avenue for researchers in marketing to further investigate the shopping behaviors across different household members.

Table 7.2: Annual spending ($) and the share of expenditure in private and assignable product categories among the married households that have ever purchased the product category

Product	Num.Households	Women for self	Men for self	Women for men	Men for women
Deodorants and fragrance	55,650	$8.85	$3.01	$6.24	$1.37
		(0.454)	(0.155)	(0.321)	(0.070)
Clothing and footwear	57,511	$36.51	$8.43	$17.48	$3.47
		(0.554)	(0.128)	(0.265)	(0.053)
Makeup and feminine products	59,406	$43.17	-	-	$4.54
		(0.905)			(0.095)
Maternity	101	$21.45	-	-	$2.28
		(0.904)			(0.096)

CHAPTER 8

CONCLUSION

This paper highlights the asymmetry in the shopping labor division in married households, where women undertake a much larger share of shopping trips than men. The asymmetric shopping shares widely exist across households with different demographics and residing in different regions. I show that the local environment has an impact on how the shopping labor is divided within the household and offers one explanation for the persistent gender inequality in shopping labor division. Since households are influenced by the local retail environment in deciding who undertakes a shopping trip, the current state of women as the major shopper for households may perpetuate the high shopping shares of women and cause the shopping labor asymmetry to be persistent. Along with the asymmetric shopping shares, I also document large differences in the shopping behaviors between men and women. I show that men and women conduct shopping trips with different sizes, visit different types of stores, and bring home different products in terms of the brand they choose and the prices they pay for the same product. The substantial differences in the shopping behavior further underscores the importance of understanding the shopping labor division within households, as looking at the household level, the household may behave very differently in how they shop and what they purchase from trip to trip. In particular, I show that the household's purchases, as measured by the gender score of the purchased bundle, also changes significantly along with the changes in the shopping shares when a household move to a different county. Although this study does not directly speak to the causality between the shopper changes and the brand choice changes, the estimates reveal a positive correlation between the two changes and offer a potential direction for future research. Apart from the influence of the local gender norm on the shopping labor division, I also discussed other possible sources leading to the unequal division of shopping labor including individual preference differences and specialization across different home production tasks. I present some suggestive evidence

supporting these reasons, such as the existence of shopping behavior differences between single men and women, and instances where individuals purchase products intended for other household members. While intra-household shopping behavior differences have previously received limited attention in marketing research, this study demonstrates that what happens inside the household is worth exploring for researchers to better understand the shopping and purchases of multi-member households.

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APPENDIX A

BREAKDOWN OF THE GENDER RATIO BY MARITAL STATUS

In Table A.1, I provide the gender breakdown across different marital status as an additional information on the sample demographics. In particular, I notice a high share of women among the married households. This is because that women tend to be the individual that is associated with the Numerator in many of the married households. However, among these households, the gender ratios of women and men are both 50% given our sample restriction on the family structure.

Table A.1: Comparison of the gender ratios in Numerator single households and the ACS statistics

	(1) ACS		(2) Numerator (Weighted)		(3) Numerator (Unweighted)	
	Women	Men	Women	Men	Women	Men
Never married	0.4593	0.5407	0.4801	0.5199	0.6850	0.3150
Divorced	0.5694	0.4306	0.7363	0.2637	0.8527	0.1473
Separated	0.5758	0.4242	0.6012	0.3988	0.7661	0.2339
Widower	0.7615	0.2385	0.8687	0.1313	0.9282	0.0718
Married	0.4818	0.5182	0.8138	0.1862	0.8336	0.1664

APPENDIX B

COMPARISON OF THE HOUSEHOLD'S SHOPPING LABOR DIVISION WITH THE PREDICTION FROM THE CES INCOME

Figure B.1 presents the comparison of the observed household's shopping shares with the predicted shopping shares using the reported individual income from the 2022 CES surveys. I model the shopping share as a function of the inverse ratio of the household member's income:

$$\frac{s_f}{s_m} = (\frac{I_m}{I_f})^{\alpha}$$

where s_f and s_m are the shopping shares of women and men respectively, and I_f and I_m are the annual income of women and men. The point estimate for α is 0.933. The predicted shopping shares of men and women are thus

$$\hat{s}_m = \frac{1}{(\frac{I_m}{I_f})^{\hat{\alpha}} + 1}$$

$$\hat{s}_f = 1 - \frac{1}{(\frac{I_m}{I_f})^{\hat{\alpha}} + 1}$$

Figure B.1 plots the observed Numerator shopping shares against the predicted shares obtained above. I add a normally distributed random noise with mean zero to each predicted share to better illustrate the distribution.

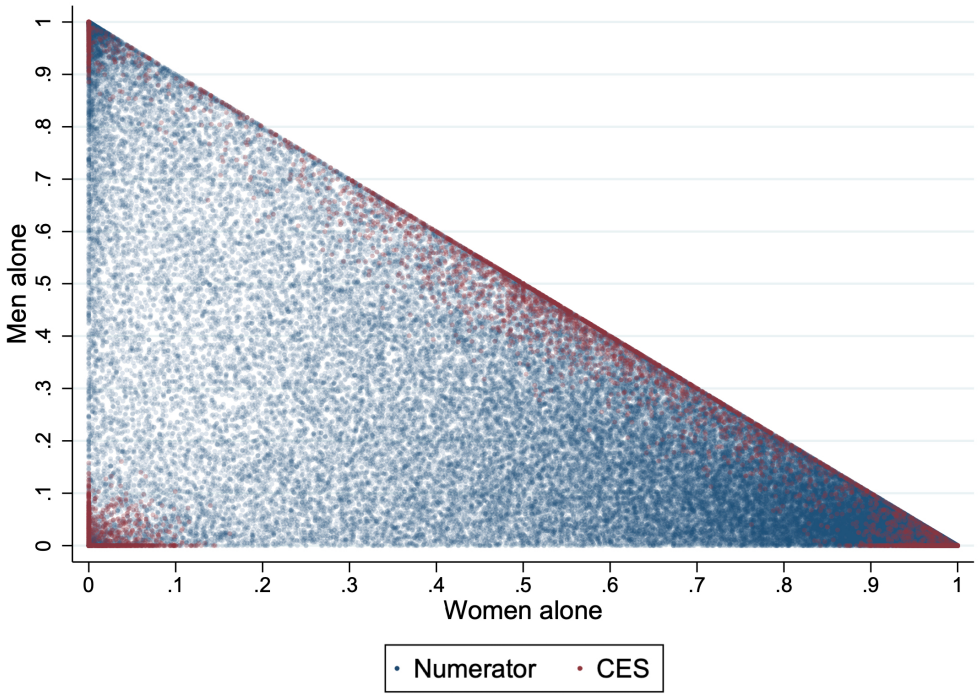


Figure B.1: Numerator household's shopping shares overlay with the predicted shopping shares using the CES income data

APPENDIX C

THE EFFECT OF EXPERIENCE AND GENDER ON THE PRICE PAID

In Section 5.1, I show that women are more likely to purchase at a lower price compared to men. This may come from the possibility that married men and women have different price preferences. Men could be less price sensitive than women, and thus they are willing to pay more for the same product. An alternative reason could be that married women, who are more likely to be the more experienced shopper in the household, are better at finding a deal. It is possible that the price gap we observe is a reflection of the difference in shopper's experience, independent of preferences across gender. To disentangle the effect of the experience on the price difference, I run the following regression using the sample of solo shopping trips:

$$\log(p_{ijt}) = \beta_0 + \beta_1 \mathbb{1}(Woman_{it}) + \beta_2 \mathbb{1}(Experience_{ic}) + \beta_3 \mathbb{1}(Woman_{it}) * \mathbb{1}(Experience_{ij}) + \Lambda + \epsilon_{ijt} \tag{C.1}$$

$\mathbb{1}(Women_{it})$ is an indicator function for whether trip t of household i is taken by the woman. $\mathbb{1}(Experience_{ij})$ indicates whether the shopper of trip t is the more experienced shopper in household i for product department c, where the purchased product $j \in c$. Λ is a set of fixed effects that are controlled for in the regression. The errors are clusters at the household level.

Estimates for regression (C.1) are presented in Table C.1. I find that both the gender and the experience have significant effects on purchase prices. Column (3) shows that both women and the more experienced shoppers tend to purchase the same product from the same type of store at a lower price than their partners. The interaction term is positive and smaller than the estimated coefficient for experience. This suggests that experience leads to a small improvement on getting a better price, the size of which appears larger for

men over women. For men, being more experienced leads to about 1.12% lower price paid, while conditional on women taking a shopping trip, being more experienced in buying from a particular product category results in a further reduction in purchase prices with the size of 0.0112-0.00981=0.139%, which is smaller than the gain from experience than men. For both men and women, it appears that being more experienced is associated with a higher likelihood of getting a better deal on purchasing the same product.

Table C.1: Price paid difference across gender and experience

	(1)	(2)	(3)
VARIABLES	Log Price	Log Price	Log Price
Is women	-0.0856***	-0.0218***	-0.0219***
	(0.00199)	(0.000588)	(0.000588)
Is more experienced shopper	-0.0473***	-0.0113***	-0.0112***
	(0.00294)	(0.000940)	(0.000938)
Is more experienced*Is women	0.0451***	0.00985***	0.00981***
	(0.00376)	(0.00118)	(0.00117)
Constant	1.036***	0.982***	0.982***
	(0.00144)	(0.000428)	(0.000428)
Observations	183,481,932	182,786,456	182,786,456
R-squared	0.350	0.871	0.871
Household FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Department FE	Yes	No	No
Item ID FE	No	Yes	Yes
Store Type FE	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX D

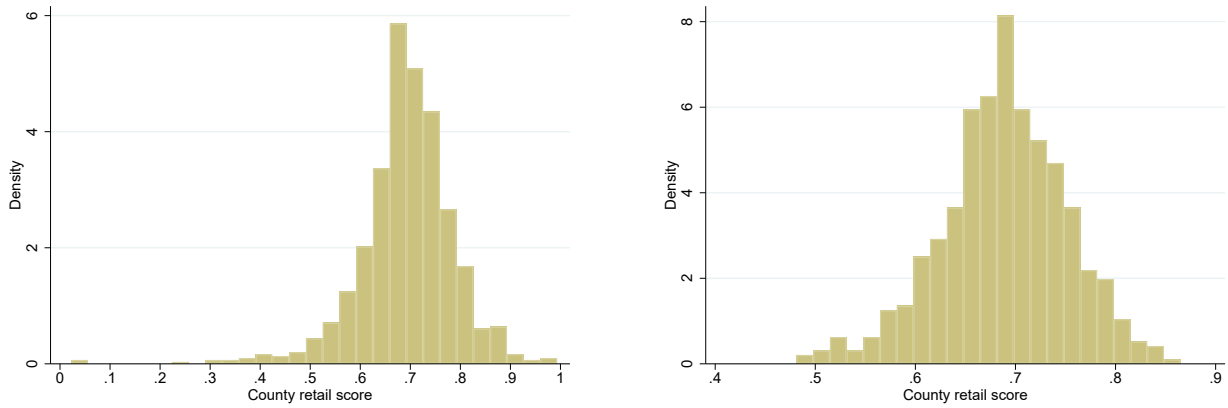
EFFECT OF THE LOCAL RETAIL ENVIRONMENT WITH ALTERNATIVE CUTOFFS

In Chapter 6, I present a description of the retail environment score and the corresponding estimation of the environment effect on the household's shopping labor division using counties where at least ten households factored into the construction of the county level retail environment score. In this section, I present the analysis with alternative cutoff points for the retail environment score. Specifically, I present the results with all counties regardless of the number of households that contributed to the construction of the county level retail environment score, and the results with counties that consists at least 30 households in the score construction.

Figure D.1 presents the distribution of the county level retail scores using the alternative cutoffs. The mean retail score stays quite stable across different cutoffs. Table D.1 presents the summary statistics on the changes in the retail scores among the married households that moved using different cutoff points, while Figure D.2 presents the corresponding distribution of the changes in the retail score among married households that moved. Table D.2 presents the estimated effect on the household's shopping labor division using the alternative cutoff points. The estimates on the interaction term suggest that the effect is robust to different sets of counties.

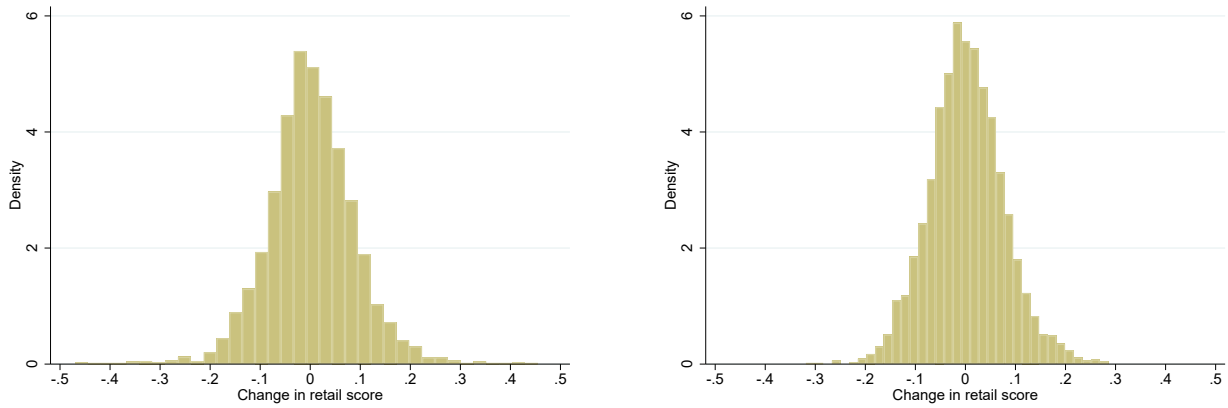
Table D.1: Summary of the changes in the retail score

VARIABLES	(1) Mean	(2) SD	(3) Min	(4) Max
Change in retail score (using all counties)	0.00220	0.0885	-0.470	0.455
Change in retail score (using counties with more than 10 households)	0.00224	0.0855	-0.470	0.455
Change in retail score (using counties with more than 30 households)	0.00244	0.0750	-0.319	0.286



(a) All counties (b) Counties with at least 30 households

Figure D.1: Distribution of the county level retail score



(a) All counties (b) Counties with at least 30 households

Figure D.2: Distribution of the changes in the retail score around moving

Table D.2: Effect of the change in retail environment on the shopping labor division using alternative cutoff points

VARIABLES	(1) Women	(2) Women
Post moving	-0.00949**	-0.00978*
	(0.00448)	(0.00504)
Post moving * Change in retail score	0.0938**	0.119**
	(0.0431)	(0.0603)
Constant	0.694***	0.688***
	(0.00221)	(0.00253)
Observations	1,443,100	1,211,753
R-squared	0.469	0.465
Household FE	Yes	Yes
Retail Score	All counties	More than 30 households

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1