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Division of financial responsibility among mixed-gender couples

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Division of Financial Responsibility among Mixed-Gender Couples

Marcin Hitczenko

Working Paper 2021-8
February 2021

Abstract: This paper uses individuals' self-assessments of their contribution to four household activities to study how mixed-gender couples divide household responsibility. Household responsibility dynamics are characterized according to a three-point ordinal variable, whose distribution is linked to a variety of household demographics via a proportional odds model fit using survey data from both members of 327 couples. The data reveal that household tendencies depend on household demographics, albeit differently across the four activities. For household shopping, gender is the primary determinant of dynamics, with females consistently shouldering more responsibility than males. For activities more closely linked to financial decision making, however, greater responsibility aligns more with higher income and educational standing within the household. In addition, there is evidence that gender links less with role assignments in more highly educated households, but not in younger households.

JEL classification: A14, C51, D13, J16

Key words: gender roles, household finance, proportional odds model, Survey of Consumer Payment Choice

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Please address questions regarding content to Marcin Hitczenko, Research Department, Federal Reserve Bank of Atlanta, 1000 Peachtree Street NE, Atlanta, GA 30309, marcin.hitczenko@atl.frb.org.

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1 Introduction

Every household must decide how to allocate responsibility for finances among its members. Most theoretical models of how this is accomplished assume some combination of cooperation and bargaining between members, based on each individual's external opportunities and preferences. Bennett (2013) and Himmelweit et al. (2013) provide overviews of these models from a sociological and economic perspective, respectively. Overall, these theories suggest that household roles should be heavily influenced by the members' relative standing within the household with respect to knowledge, expertise, and income. For example, the "economic exchange hypothesis" posits that partners with greater resources essentially "buy out" of doing unenviable tasks (Huston and Burgess 1979; Mannino and Deutsch 2007).

Not surprisingly, empirical research has shown that in the case of mixed-gender households, cultural influences, most notably presumptions about gender, also play a major role in determining household dynamics (Pahl 1989a; Woolley 2000; Vogler and Pahl 1994; Vogler, Lyonette, and Wiggins 2008). In general, financial control increases as income increases, though not necessarily in the same way for each gender (Dobbelsteen and Kooreman 1997; Woolley 2000; Vogler and Pahl 1994). On the other hand, many chore-like activities are still viewed as inherently masculine or feminine, with responsibility for each task more likely to be controlled by their respective gender affiliation, regardless of economic variables (Bianchi et al. 2000; Lam, McHale, and Crouter 2012; South and Spitze 1994). In fact, there is evidence that housework is used to neutralize gender discrepancies when males earn less than their partners (Bittman et al. 2003; Gupta 2007; Parkman 2004; Schneider 2012).

The negotiation process results in assumed household roles that carry varying levels of responsibility for different types of financial activity. In her foundational analysis, Pahl (1983) identified several different schemes that couples adopt to manage money, each of which has different implications for who is responsible for what. In this context, sociologists distinguish between "implementation," associated with everyday management of finances, and "orchestration," associated with control of financial decisions (Safilios-Rothschild 1976; Vogler, Lyonette, and Wiggins 2008). While the former is more akin to routine household chores, the latter relates more to a household's long-term goals and well-being. As such, each might have a different division of responsibility within a household. The importance of certain financial decisions might make joint consideration more common. In addition, control of financial planning seems more likely to be given to the primary earner, while regular financial management may be more closely

associated with the individual with more available time.

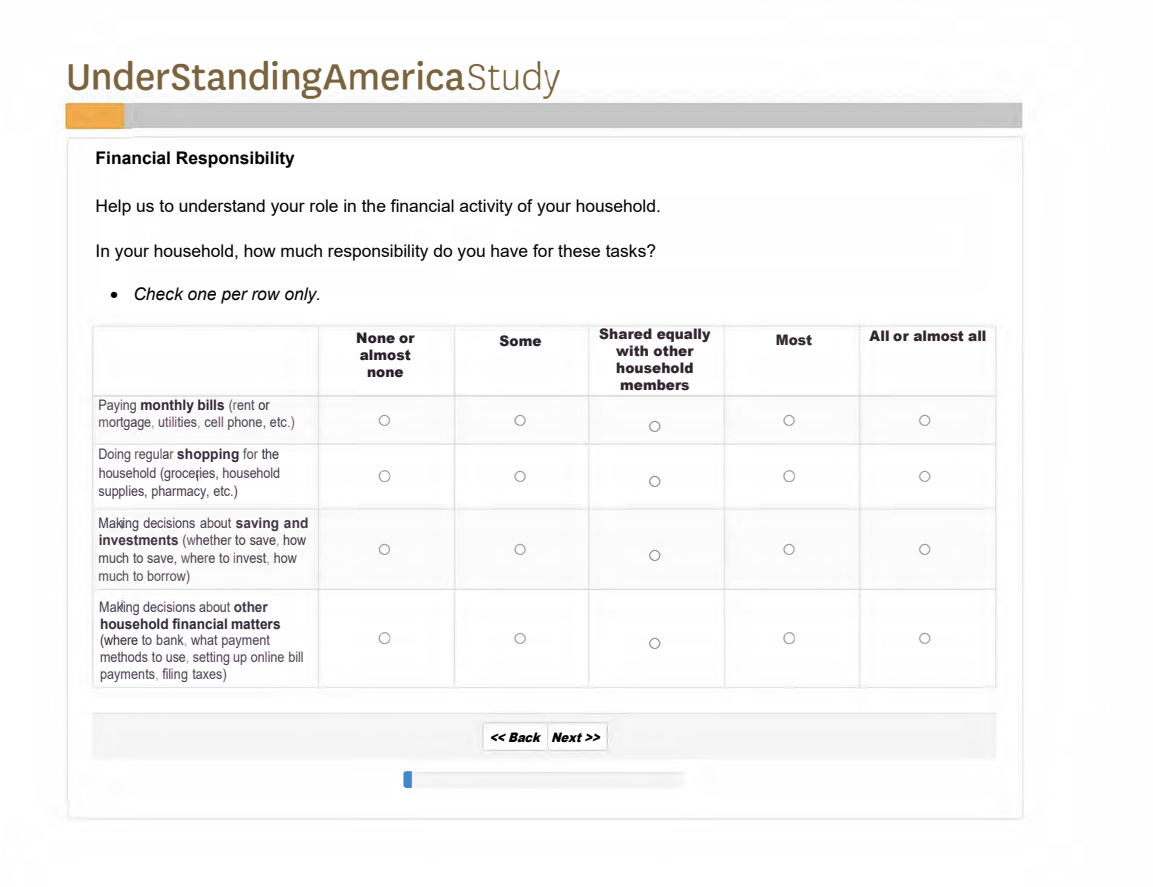
Understanding the factors that determine the household division of financial responsibility has important policy implications related to household well-being. For example, households in which males, rather than females, control finances tend to invest less in children and spend less on communal household expenditures (Blumberg 1991; Pahl 1989b). In addition, control of household finances relates to power dynamics and satisfaction with the relationship, (Blumstein and Schwartz 1983; Henau and Himmelweit 2013; Kirchler et al. 2001; Vogler, Lyonette, and Wiggins 2008).

In this paper, I use survey data from the Survey of Consumer Payment Choice (SCPC) to study how mixed-gender couples, a social unit that makes up a plurality of U.S. households and includes the traditional nuclear family, divide responsibility for four financial activities. The data used are respondents' self-assessments, which, unlike more concrete measures such as time use diaries, can offer insight into dynamics of more abstract and hard-to-quantify household endeavours. Indeed, the four financial activities studied in this work, shown in a screenshot from the 2019 SCPC survey in Figure 1, range from routine tasks (shopping) to decision-making with potentially major implications (savings and investments).

The analysis in this work centers around categorizing households into one of three types, indicating whether responsibility is shared equally or, if not, which gender assumes more responsibility. Classifying sample households in this way is not always straightforward, because self-assessments are prone to response error (Moore and Healy 2008; Bennett 2013; Cantillon 2013; Fowler 1995). In this work, I rely on data from both members of each sampled household to reduce the burden on modeling to adjust for potential data quality issues. Distributions of the constructed household variable are assumed to vary across on household demographics, corresponding to aggregate properties of the couple as well as characterizations of the members' relative standing. Unlike models of the self-assessments themselves, the focus on household characterizations allows direct estimates of the fundamental quantities of interest: how likely each adult is to take responsibility for a given financial activity. Additionally, the model structure used gives insight into how gender relates to role assignment.

The paper is structured in the following way. Section 2 introduces the SCPC sample and the relevant survey data, and describes the processing done to generate the variables used in analysis. Section 3 outlines the Bayesian estimation procedure used to infer relationships from the sample, detailing the adopted proportional odds model along with assumed parameterizations and prior distributions. The implications of the model fit, including an analysis on the impact of gender, are discussed in Section 4.

Finally, Section 5 provides a brief overview of the findings and potential future work.



UnderStandingAmericaStudy

Financial Responsibility

Help us to understand your role in the financial activity of your household.

In your household, how much responsibility do you have for these tasks?

- *Check one per row only.*

	None or almost none	Some	Shared equally with other household members	Most	All or almost all
Paying **monthly bills** (rent or mortgage, utilities, cell phone, etc.)	○	○	○	○	○
Doing regular **shopping** for the household (groceries, household supplies, pharmacy, etc.)	○	○	○	○	○
Making decisions about **saving and investments** (whether to save, how much to save, where to invest, how much to borrow)	○	○	○	○	○
Making decisions about **other household financial matters** (where to bank, what payment methods to use, setting up online bill payments, filing taxes)	○	○	○	○	○

<< Back Next >>

Figure 1: A screenshot of the financial responsibility questions in the 2019 SCPC.

2 Data

2.1 Survey Sample

The data used in this analysis come from the Survey of Consumer Payment Choice (SCPC), an online survey fielded by the Federal Reserve Bank every fall, between mid-September and mid-October, since 2008. The SCPC primarily collects information about consumers' attitudes toward, adoption and typical use of various payment methods, but also includes some basic questions about household demographics and finances. Over the lifetime of the survey, SCPC respondents have been recruited from two different panels: RAND's American Life Panel (ALP) from 2008 to 2013 and the Center for Economic and Social Research's Understanding America Study (UAS) from 2014 to the present.

Detailed information about each panel can be found at their respective websites, but both rely pre-

dominantly on address-based sampling (AAPOR) to generate a pool of individuals aged 18 or older who provide quarterly updates to basic demographic information via the My Household Questionnaire and are eligible for invitations to survey opportunities. Selected panelists are offered a monetary incentive, proportional to the estimated length of the survey, to participate, but may decline the invitation. A relatively unique of aspect of both panels is that individuals in the panel are encouraged to recruit fellow adult household members to join as well, resulting in roughly 15 to 20 percent of households in the panel represented by more than one adult member in any given year of each panel.

Sample selection for the SCPC itself is motivated by two primary goals: demographic matching of U.S. consumers with respect to broad categories defined by age, income, gender, and race and preserving a longitudinal structure from year to year, within each panel (Schuh and Stavins 2014). To achieve this, demographic sample targets were established and as many respondents with past experience as possible were chosen to fill the strata quota. Partly by necessity due to panel composition and partly by design, the SCPC sample features multi-member households at roughly the same percentage as the panels themselves. An incentive of $30 was offered for the roughly 30-minute SCPC survey, and approximately 75 percent of those invited completed the survey every year. The number of SCPC respondents each year varies from around 1,000 in the first year with a panel (2008 and 2014), when the number of available panelists itself is a limitation, to about 3,000 in later years. Exact details of each year's sample, including size, participation rates, demographic composition, and overlap with other years, can be found in the respective technical appendices found in the SCPC website (SCPC).

The subsample used in the ensuing analysis is restricted to the 327 households with adult pairs of opposite gender, both of whom have completed an SCPC survey between 2012 and 2017 and describe themselves as "married or living with a partner" in the My Household Questionnaire immediately preceding the SCPC release. The decision to exclude households for whom only one member was sampled is primarily motivated by a desire for a complete demographic portrait of the household, as certain information is provided by the respondents only for themselves. However, as discussed below, an added benefit of such an approach is that household characterizations based on information from both members are more reliable assessments of true dynamics.

Many of households included in the final subsample have completed the SCPC in more than one year: 125 households are observed in two and 46 households in three of the six survey years. To simplify modeling, any potential longitudinal component arising from households participating in multiple years

is ignored, and only data from the survey year closest to 2014 is used. Table 1 shows the number of households by year of data used, along with the panel of origin. Survey responses span all six years from 2012 to 2017, though almost half were provided in the 2016 iteration. Around two-thirds of sample households come from the UAS panel.

Year	Survey Panel	Number of Households
2012	RAND ALP	63
2013	RAND ALP	7
2014	RAND ALP	32
2015	CESR UAS	49
2016	CESR UAS	142
2017	CESR UAS	34

Table 1: The number of the 327 households in the sample by year of responses used and panel of recruitment.

2.2 Household Demographics

Household demographic information is gathered using a combination of the SCPC and its closest preceding My Household Questionnaire. Every household is described by two variables for each of three demographics, education, age, and income, with one characterizing *intra-household dynamics*, the relative demographic levels of the male and female within the household, and one characterizing *household aggregate characteristics*, the cumulative household level, either an average or maximum value. As a matter of notation, for household h, capital letters, E_h, A_h, I_h, are used for intra-household dynamics and lowercase letters, $e_h, a_h,$ and i_h, for household aggregates with respect to education, age, and income, respectively. Each of the six demographic variables produced are ordinal, with the following paragraphs delineating how each is defined. Aggregate variables are coded by the natural numbers, but intra-household dynamic levels are coded by -1 (female's level is higher), 0 (male and female levels are the same), and 1 (male's level is higher), so that a sign change corresponds to flipping relative dynamics across gender.

Education: Highest education level attained is reported by each respondent in the My Household Questionnaire according to 16 response options, shown in Appendix A. I first map these response data to a four-point ordinal scale: (a.) High school or less, (b.) Some college or Associate's degree, (c.) Bachelor's degree, and (d.) Advanced degree. These four broader levels are then used to categorize households according to gender dynamics, E_h, the difference between male's education level and the female's education

level, and household educational status, e_h the maximum education level achieved:

$$E_h = \begin{cases} -1, & \text{male has higher education level than female} \\ 0, & \text{male and female have equal education level} \\ 1, & \text{female has higher education level than male} \end{cases} \quad \text{and} \quad e_h = \begin{cases} 1, & \text{max. household education level is High school or less} \\ 2, & \text{max. household education level is Some college or Associate's degree} \\ 3, & \text{max. household education level is Bachelor's degree} \\ 4, & \text{max. household education level is Advanced degree} \end{cases}$$

Age: Each respondent's age at the time of the SCPC is calculated from the birth dates provided in the My Household Questionnaire. Household age characteristics are defined as

$$A_h = \begin{cases} -1, & \text{female 3 or more years older than male} \\ 0, & \text{male and female within 2 years of each other} \\ 1, & \text{male at least 3 years older than female} \end{cases} \quad \text{and} \quad a_h = \begin{cases} 1, & \text{mean household age is less than 35} \\ 2, & \text{mean household age is in } (35, 50] \\ 3, & \text{mean household age is in } (50, 65] \\ 4, & \text{mean household age is more than 65} \end{cases}$$

Income: Unlike for age and education, household income dynamics and aggregate income levels are based on responses to two different survey questions. In addition, since both survey questions ask the respondent to categorize the household, rather than the individual, one must deal with discrepancies between household members. First, income dynamics are based on an SCPC question asking each respondent to quantify his or her income ranking within the household, with response options: (a.) Highest in my household, (b.) About equal to the highest, (c.) 2nd highest, and (d.) 3rd highest or lower. I mapped the response combinations to an ordinal variable according to

$$I_h = \begin{cases} -1, & \text{female claims highest income(a.) AND male claims 2nd or lower income(c. or d.)} \\ 0, & \text{female OR male claims about equal to highest income (b.)} \\ 1, & \text{male claims highest income(a.) AND female claims 2nd or lower income(c. or d.)} \end{cases}$$

In this sample, 75 percent of households recorded income dynamic responses that were internally consistent. Among the 81 households with inconsistent results, 43 households were characterized by only one member selecting "about equal to highest" and another 28 were characterized by one member claiming

highest and another claiming 3rd highest or lower. Even without considering survey response error, it is not surprising that members of the same household might have different assessments, partly due to the vagueness of the response options, especially the term "about equal", and partly due to out-of-date information about or inaccurate estimation of income in the household on the part of one or both members.

Household income is based on both member's responses to a drop-down in the My Household Questionnaire with 17 income bins, shown in Appendix A. I generate an estimate for each household by taking the average of each member's selected bin midpoint and define

$$i_h = \begin{cases} 1, & \text{average of selected bin midpoints is less than \$45K} \\ 2, & \text{average of selected bin midpoints is in } (\$45K, \$75K] \\ 3, & \text{average of selected bin midpoints is in } (\$75K, \$100K] \\ 4, & \text{average of selected bin midpoints is more than \$100K} \end{cases}$$

Again, because each household member provides an assessment, there is room for discrepancies to arise. However, 66 percent of sample households have members agree exactly on the household income and 89 percent differ by no more than one bin, suggesting that household incomes are relatively reliable. Perhaps most importantly, by binning households into four broad income categories, it is very unlikely that a household is misclassified.

The two left-most panels of Figure 2 plot couples' ages and education levels by gender, and the third panel shows the joint distribution of household income and income dynamics, among sample households. Around half of couples are within three years of each other, but otherwise, the males tend to be older in three out of four households. With regard to education, about 45 percent have the same level of education, though females are slightly more likely to have a higher level, 29 percent to 24 percent. As might be expected, household income is considerably more skewed across gender, with 57.5 percent of males in the sample being the higher earner and only 16.8 percent of females holding that title. Overall, the frequencies observed are within a few percent of what was found among married couples in the 2008–2011 American Community Survey Bertrand, Kamenica, and Pan (2015) and married households with children under 18 limited to the 2011 American Community Survey (Pew). This consistency perhaps serves as an endorsement of the representativeness of our sample.

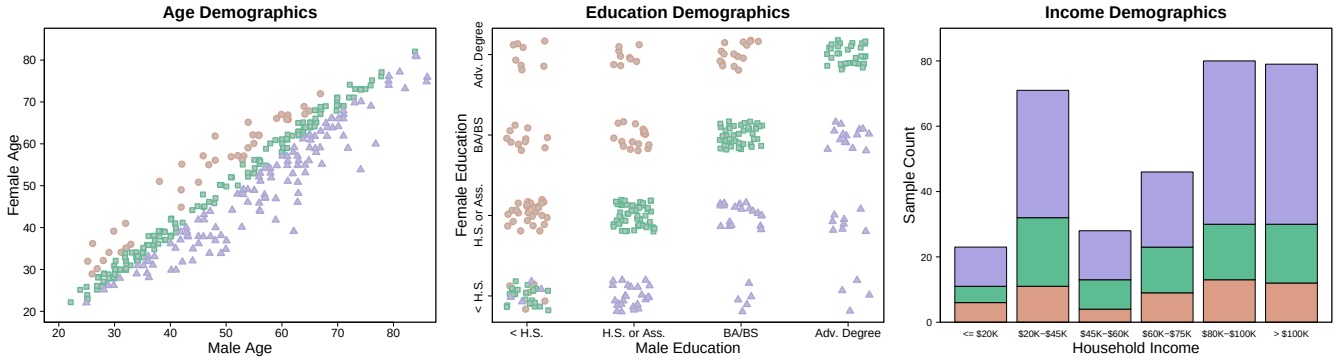


Figure 2: Distribution of household age, education, and income demographics. Colors represent intra-household dynamic variable values of A_h, E_h, and I_h, with coral corresponding to a value of 1 (female's level is greater than male's level), green a value of 2 (equal levels), and purple a value of 3 (female's level is less than male's level).

2.2.1 Financial Responsibility Data

The analysis in this paper focuses on studying the distribution of household responsibility for four different financial activities, as shown in the screenshot in Figure 1. Although all four activities relate to finances in some way, there are clear differences in their nature. On one extreme, household shopping can be seen as a routine chore, for which the availability of time is most important. On the other extreme, decisions about savings and investments rely more on knowledge and expertise and, because such considerations potentially have major implications for both household members, might be more likely to be made jointly. The two other activities, paying bills and making other financial decisions, seem to fall somewhere between, with the definition of the latter in the survey question, shown in Figure 1, being notably vague.

Survey responses to this question in the SCPC are provided on a 5-point ordinal scale, which I code numerically from 1 ("None or almost none") to 5 ("All or almost all"). Figure 3 shows the recoded data from all sample households according to gender. A few trends stand out. First, as with income characteristics above, the survey question involves respondents making assessments about the household, so responses from both household members may be inconsistent, yielding a household sum other than six. The percent of consistent households ranges from 45 percent for financial decision-making and savings to 56 percent for paying bills. When one includes households whose sum is five or seven, the range is from 80 percent to 86 percent, suggesting a general agreement about dynamics.

A second phenomenon apparent in Figure 3 is that household inconsistencies are not symmetric, with vastly more overstatements or household sums greater than six than understatements or household sums

less than six. For shopping and bill paying a little over 80 percent of inconsistencies involve overstatement, while for financial decision-making that number is about 70 percent.

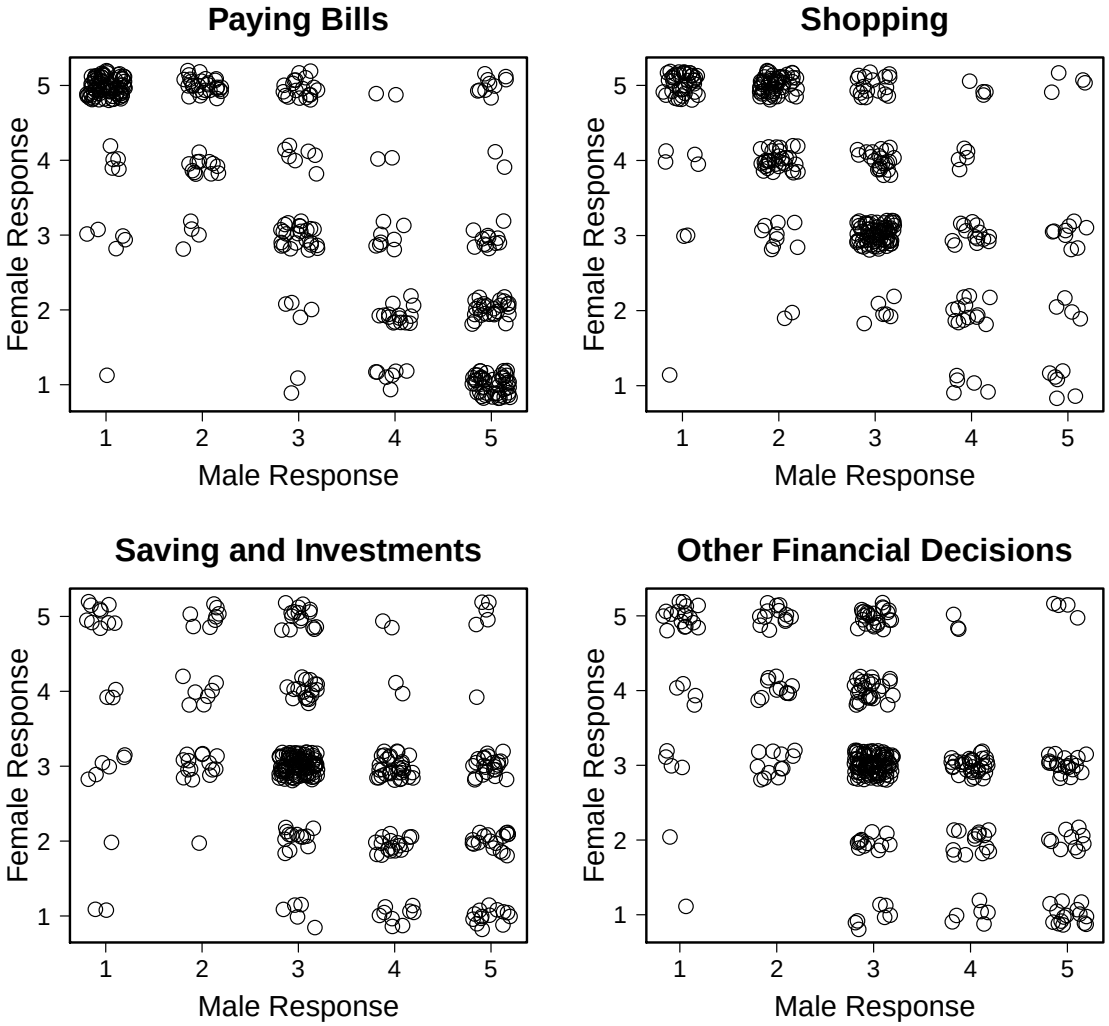


Figure 3: Reported self-assessments of financial responsibility within the household for four financial activities.

Self-assessments need not accurately represent the truth. Indeed, studies comparing self-assessments to diary data by Bianchi et al. (2000) and Mizan (1994) consistently reveal systematic over-valuing of one's own contributions to household labor. Men, in particular, have been known to inflate their role in carrying out household chores (Kamo 2000; Lundeber, Fox, and Punccohar 1994). This phenomenon makes it difficult to assess household dynamics, particularly when only one household member provides assessments; response error obscures true household dynamics. Only observing data from one household member requires modeling assumptions about response errors and the selection process determining which members are in the sample, in addition to the underlying model for household roles (Hitczenko

2020).

Sampling both household members naturally provides more information about the household. In fact, under fairly uncontroversial assumptions, the problem reduces to dealing with inconsistent households. One option, adopted by Dobbelsteen and Kooreman (1997), is to discard inconsistent households. Beyond further reducing the sample size, this strategy assumes a dubious missing at random (Rubin and Little 2002) condition by which inconsistency of household responses is unrelated to the true, underlying dynamics. A second solution is to incorporate uncertainty about the true household dynamics into the statistical model. Although epistemically preferable, implementation is awkward due to a necessary departure from standard modeling fameworks, as seen in Hitczenko (2020). Instead, in this work, I adopt a deterministic mapping of inconsistent results to household classifications, that are then treated as observed. To help reduce the impact of inconsistencies, a three-point ordinal scale for household classifications is used. For ease of notation, I ignore distinctions between the four financial activities and let R_h represent the classification of household h, defined by:

$$R_h = \begin{cases} 1, & \text{male takes greater share of responsibility than female} \\ 2, & \text{male and female share responsibility equally} \\ 3, & \text{female takes greater share of responsibility than male.} \end{cases}$$

As a measure of sensitivity, I consider two different methods from mapping household pairs of rankings to the household-wide variable, R_h, outlined below:

Method A: Define R_h according to the relative ratings on the original 5-point scale given by each household member, so that $R_h = 1$ whenever male's reported share is greater than female's reported share.

Method B: First, recode each respondents household ranking to a three-point scale according to "majority" ($R_h = 4, 5$), "about equal" ($R_h = 3$), and "minority" ($R_h = 1, 2$)) of responsibility. Then, define R_h according to the relative ratings of these new variable constructs.

The distribution of R_h in the sample based on each mapping method is shown for each method in Table 2. For consistent households, both methods will yield the same value of R_h. More generally, the methods map to the same value for 82 percent of households to 95 percent of households. Cases where they differ involve different ratings on one side of the equilibrium, such as a 5 and a 4, which would be assigned

$R_h = 1$ under Method A and $R_h = 2$ under Method B. As expected, Method B results in a greater number of inconsistent households being assigned a value of $R_h = 2$. While it seems to me that either approach could be justified, the remainder of the paper focuses on results using Method B. One external validation of this choice is the fact that similarly high proportion of households reported sharing responsibility for major financial decisions in other studies (Vogler and Pahl 1994; Woolley 2000). A basic comparison of results when adopting Method A as opposed to Method B to define R_h is given in Appendix C.

Financial Activity	**Method**	**# $R_h = 1$**	**# $R_h = 2$**	**# $R_h = 3$**	**% hhs with same R_h**
Paying Bills	A	126	37	164	95.4
	B	118	52	157	
Shopping	A	57	82	188	88.7
	B	43	119	165	
Savings and Investments	A	132	111	84	84.7
	B	100	161	66	
Other Financial Decisions	A	116	96	115	82.0
	B	84	155	88	

Table 2: The sample distribution of R_h under Method A and Method B, and the percent of households for which Method A and Method B produce the same rating.

3 Statistical Model

The goal of the statistical model is to relate the distribution of R_h to the household demographic variables introduced in Section 2. A natural choice is a proportional odds model (McCullagh and Nelder 1989) given by

$$\text{logit}\left[\text{Prob}(R_h \leq k)\right] = \begin{cases} -\alpha - \mu_h, \text{if } k = 1 \\ \alpha - \mu_h, \text{if } k = 2, \end{cases} \tag{1}$$

where $\text{logit}[x] = \frac{\log(x)}{\log(1-x)}$, and the household-specific parameter is modeled as:

$$\mu_h = \beta + \beta_{A_h}^{(\text{age_dyn})} + \beta_{E_h}^{(\text{edu_dyn})} + \beta_{I_h}^{(\text{inc_dyn})} + \beta_{e_h}^{(\text{edu_agg})} + \beta_{a_h}^{(\text{age_agg})} + \beta_{i_h}^{(\text{inc_agg})}. \tag{2}$$

The model in (2), employing only first-order effects with no interactions between household characteristics, has a relatively simple form that is unlikely to perfectly reflect dynamics for all 1,728 strata defined by the six demographic characteristics. However, limited sample size provides little ability to differentiate

the plausibility of more complex models. Therefore, while the model-implied dynamics for any particular household strata are influenced by small sample sizes and model degrees-of-freedom, the broader first-order effects meaningfully shed light on how households share responsibility. A probit model, by which the cumulative distribution function of the standard Normal distribution is used to generate probabilities rather than the logit function in (1), yielded similar results.

For parameter identification purposes, the sum of the level effects within each demographic category is set to be 0: $\sum_i \beta_i^{(c)} = 0$ for all c. Then, the parameter β represents a baseline that corresponds to an overall gender effect, with larger values of β indicating an increased likelihood of females taking on a majority of responsibility, or $R_h = 3$. One useful interpretation of the model in (1) and (2) is to consider $\beta + \beta_i^{(\text{edu_agg})} + \beta_j^{(\text{age_agg})} + \beta_k^{(\text{inc_agg})}$ as representing a baseline gender effect for households of aggregate education, age, and income defined by levels i, j, and k, respectively, that combines with the three intra-household dynamic variables to define responsibility dynamics according to gender roles.

As an additional component of the model, I impose a condition of monotonicity, so that for household characteristic, c, with $i = 1, \ldots, \ell_c$ levels ($\ell_c = 3$ for intra-household dynamics and $\ell_c = 4$ for household aggregates)

$$\beta_1^{(c)} < \beta_2^{(c)} < \ldots < \beta_{\ell_c}^{(c)} \quad \text{or} \quad \beta_1^{(c)} > \beta_2^{(c)} > \ldots > \beta_{\ell_c}^{(c)}. \tag{3}$$

The specification in (3) enforces that trends do not oscillate across levels of a characteristic, but rather evolve in a consistent direction, without reverting away from a general trend. For example, it precludes model estimates in which the distributions of R_h in two age groups are more similar to one another than to an age group in between. In cases with relatively small sample sizes explicitly enforcing condition (3) provides substantial guidance and helps reduce error in parameter inference. Unlike many natural parametric choices, such as a linear model, (3) makes no explicit restrictions on the size of the changes from level to level, allowing for relatively flat progressions as well as larger jumps across levels.

3.1 Parameter Estimation

Parameter estimation is done under a Bayesian paradigm, necessitating a prior on all parameters. In general, I adopt weakly informative priors, meant to guide estimates away from unrealistic values rather than serve as an influential source of information. With respect to the cutoff parameter, α, I assume a prior

of $\alpha \sim \text{Normal}(0, 1)$, so that very little mass is placed on cases where households are almost exclusively concentrated in two of the three dynamic types. As an example, at two standard deviations from 0, if $\alpha = 4$, either $R_h = 1$ or $R_h = 3$ is no likelier than 1.8 percent of the time, a condition that seems unlikely to manifest.

Characteristic level effects that achieve the desired monotonicity condition in (3) are parameterized as follows:

$$\begin{aligned}
\beta_1^{(c)} &\sim \text{Normal}(0, 1) \\
\gamma^c &\sim \text{Normal}(0, 1) \\
\tau_i^c &\sim \text{Normal}^+(0, 1), \text{ for } i = 2, \ldots, \ell_c \\
\beta_i^{(c)} &= \beta_{i-1}^{(c)} + \tau_i^c \times \gamma^c, \text{ for } i = 2, \ldots, \ell_c,
\end{aligned}$$

where $\text{Normal}^+(0, 1)$ refers to a normal distribution with standard deviation 1 restricted to non-negative values. The parameter priors are chosen with regard to the size of the jump from one characteristic level to another, so that such a change, given by $\tau_i \times \gamma$, is less than one-half about 78 percent of the time and less than one about 94 percent of the time, nontrivial changes on the logistic scale. Estimation with a more conservative prior on jump size, $\tau_c^i \sim \text{Normal}^+(0, 0.5)$ was also used and yielded virtually identical 90 percent posterior intervals.

The models are fit using `RStan`, an interface in R that employs Markov Chain Monte Carlo algorithms for Bayesian inference (Gelman and Hill 2009). For each of the four financial activities, I ran 4 independent chains for 6,000 iterations with a burn-in of 3,000, yielding 12,000 posterior draws for each parameter. For all parameters, the statistic $\hat{R}$, a measure of intra- to inter-chain variation used to assess performance of the algorithm, were all estimated as 1, thus suggesting convergence of the chains (Gelman et al. 2004). Trace plots also support this claim.

The quality of the model fit was ascertained through a set of posterior predictive checks, wherein data are simulated based on parameters drawn from their posterior distribution, and then certain properties of the simulated data are compared to those in the observed sample. Graphical assessments can reveal areas in which simulated data differ systematically from the observed data and whether it is plausible for the set of models defined by posterior distributions to generate the observed data. For this purpose, I compare the simulated and observed sample counts of R_h among nine household types defined by

intra-household education (E_h) and income (I_h) dynamics with the assumption that sample size and demographic composition is fixed. The results, provided in Appendix B, suggest the data are consistent with the estimated model.

4 Results

4.1 ANOVA

The model specified in (1) and (2) identifies a linear term, μ_h, defined by a baseline β, which is then adjusted by effects corresponding to levels of household h's characteristics, $\beta_i^{(c)}$. The size of changes across levels, i, in $\beta_i^{(c)}$ thus reflect the degree of difference in the distribution of R_h for different levels of characteristic c. On one extreme, if there is no variation, $\beta_i^{(c)} = 0$ for $i = 1, \ldots, \ell_c$, the distributions of R_h across levels of characteristic c are identical, suggesting no association between characteristic c and how households divide responsibility. By contrast, large differences in $\beta_i^{(c)}$ corresponds to differences in the distribution of R_h. Therefore a study of the degree of variation across levels for each characteristic, akin to the ANOVA analysis proposed in Gelman et al. (2004), identifies the variables most strongly associated with household role dynamics. Figure 4 shows 50% credible intervals for standardized effects, $\frac{\beta}{\alpha}$ and $\frac{\beta_i^{(c)}}{\alpha}$. Scaling by the cutoff, α, makes comparisons across activities somewhat more appropriate by standardizing the effect to its impact on the distribution of R_h.

Perhaps the most apparent phenomenon revealed in Figure 4 is the dichotomy between household dynamics with regard to shopping and the other three financial activities. For shopping, there is very little change in effect sizes across characteristic levels, indicating little variation in dynamics across different household strata. For the other three activities, the size and direction of effects with the most influence are consistent: education and income dynamics, and to a lesser extent, aggregate household education.

Beyond variation in $\beta_i^{(c)}$, the direction of change in the effects determines how changes in characteristic c tend to shift responsibility division between genders. For the three non-shopping activities, the model suggests that having higher income and education level within the household are each associated with greater likelihood of having more responsibility, replicating the general findings of Dobbelsteen and Kooreman (1997). With regard to household aggregate education, higher levels of education consistently shift responsibility toward males. Changes across levels for other characteristics are significantly more likely to be small.

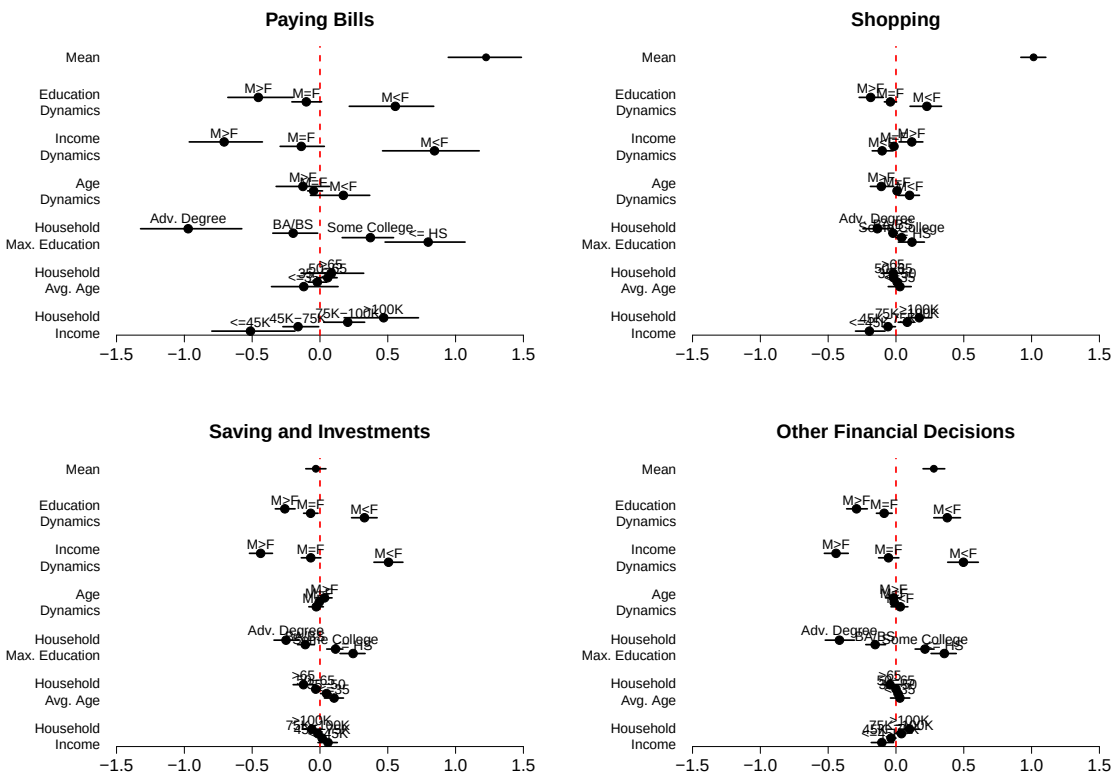


Figure 4: 50 percent credible intervals of demographic relative effects, $\frac{\beta}{\alpha}$ and $\frac{\beta_i^{(c)}}{\alpha}$.

4.2 Role Likelihood at Posterior Mean

Studying the distribution of R_h at the posterior mean of the parameters provides a reasonable guess of household responsibility distributions within the population and helps visualize trends. To simplify the number of household types under consideration, I consider level changes for the three characteristics that show the most effect on variance: education and income dynamics, and aggregate household education. A further simplification is to reduce the aggregate education to two levels, $\tilde{e}_h = 1$ for not completing college ($e_h = 1, 2$) and $\tilde{e}_h = 2$ for at least completing college ($e_h = 3, 4$). Then, for households with education dynamic j_E, income dynamic j_I, and aggregate education $j_{\tilde{e}} = 1, 2$ the distribution of R_h is fully defined by α and parameter given by

$$\mu(j_E, j_I, j_{\tilde{e}}) \quad = \quad \beta + \beta_{j_E}^{(\text{edu_dyn})} + \beta_{j_I}^{(\text{inc_dyn})} + \frac{1\left[j_{\tilde{e}} = 1\right]}{2} \sum_{j=1}^{2} \beta_j^{(\text{edu_agg})} + \frac{1\left[j_{\tilde{e}} = 2\right]}{2} \sum_{j=3}^{4} \beta_j^{(\text{edu_agg})}.$$

Zeroing out the excluded characteristics in this way is exact only if the levels are uniformly distributed within the demographic strata defined by $(j_E, j_I, j_{\tilde{e}})$ or if the level effects are all identically 0. While

neither condition likely holds in reality, the departures are minimal enough that the approximation seems adequate.

Figure 5 shows posterior mean estimates of fitted household ratings for the six household types that show the greatest disparities in role assignment, namely ones in which higher education and income standing belong to the same person within a household. These results suggest that the proportion of households in which responsibility is shared equally is relatively constant across household types, with shifts in role assignment largely affecting which gender is more likely to take a larger share of responsibility. This effect is largely mirrored in the observed data counts shown in purple. For shopping, dynamics are stable across household demographics: males are unlikely to have most of the responsibility and females take on the majority in about 50 percent of households. Overall, this is consistent with previous research (Bianchi et al. 2000; Lam, McHale, and Crouter 2012; South and Spitze 1994) suggesting that women are much more likely to control household shopping, as this household task is traditionally associated with women. Perhaps the lack of change when females earn more is a manifestation of gender neutralization discussed in Bertrand, Kamenica, and Pan (2015), in which greater financial contribution by women is balanced by women having greater responsibility for housework. For savings and investments and other financial decisions, the household member with greater education and income level is considerably more likely to have a majority of responsibility, roughly by a factor of four. With regard to paying bills, the corresponding shift in assuming responsibility is much smaller.

4.3 Gender Asymmetry

One appealing aspect of the model specification is the ability to study the relative importance of gender on the assignment of household roles. The role of gender is of particular interesting, because it potentially represents a cultural effect rather than an attribute that directly affects one's time for, capability, or interest in assuming greater household responsibility. In fact, if one assumes that gender, perhaps like eye color, has no intrinsic value, the influence of gender corresponds to an economically inefficient and unfair way of delineating household responsibilities.

One way of formalizing gender effects is through the degree of gender symmetry, or the extent to which males and females have the same likelihood of a given role if their household standing, as defined by intra-household dynamics, is the same. More precisely, let $\Phi_r(j_E, j_I, j_{\tilde{e}}) = \text{Prob}(R_h = r \mid E_h = j_E, I_h = j_I, \tilde{e}_h = j_e)$. Then, for households with education level $j_{\tilde{e}}$, $\Phi_r(j_E, j_I, j_e) = \Phi_{4-r}(-j_E, -j_I, e)$ for

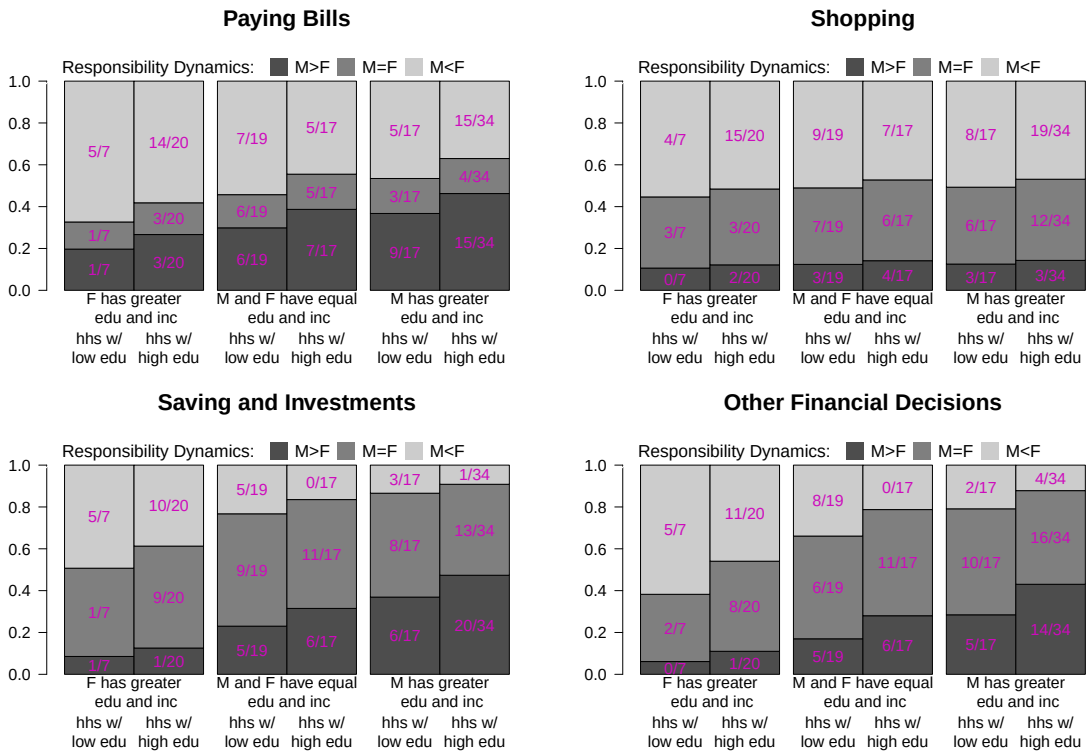


Figure 5: Examples of key trends according to the fitted model, along with observed counts in the sample.

all r is a necessary and sufficient condition for gender symmetry. In other words, under complete gender symmetry, switching intra-household dynamics across gender should simply flip the likelihoods of each household characterization, R_h. From a different viewpoint, under gender symmetry, learning someone's gender does not provide any additional information in determining how likely that person is to take on a role.

Figure 6 shows credible intervals for $\Phi_1(j_E, j_I, j_{\tilde{e}})$ and $\Phi_3(j_E, j_I, j_{\tilde{e}})$. Again, to avoid interpreting implications largely due to model degrees of freedom and small sample sizes, I focus on the general trend within each of two broad household types: households with higher and lower education. Consistent with other findings with regard to shopping, there is a strong gender asymmetry persistent through household types. On the other extreme, with regard to savings and investments, it seems that households, from both education levels, are generally gender symmetric. Perhaps this is not a surprise; given the importance of such decisions, efficiently making these decisions, and not subjecting them to gender norms, makes sense. Finally, for paying bills and financial decisions, it there is more evidence of gender symmetry for higher educated households, but not for the lower educated. A somewhat surprising implication of our model fit is that there is no evidence that gender symmetry differs with household age, a conclusion based on

limited variation in household mean age effects, $\beta_i^{(\text{age_agg})}$.

Under our model, the estimated presence of a gender effect need not correspond to a cultural effect. Instead, it might represent a confounding variable, by which gender has differential distribution with respect to some set of variables that were not included in the model and have a direct effect on household responsibility dynamics. Then, including these variables in the model would lessen, if not eliminate, the measured gender effect. Of course, the hope is that with the inclusion of education, income, and age dynamics, the measured gender effect largely represents the intended effect.

One interpretation of the observed patterns is that for the most consequential of financial activities, households act more efficiently, essentially ignoring gender in determining optimal alignment for decision-making. For paying bills and other financial decisions, where there is evidence that the degree of gender asymmetry differs with aggregate household education, a few justifications seem plausible. Of course, one explanation is that households with higher education place gender is less of a factor in determining responsibility roles. However, the discrepancy might also be explained by a difference in the type of activities being considered among the two education groups, especially since both activities leave some room for interpretation. For example, if lower-educated households tend to think about more routine tasks when answering, while higher-educated households tend to think of tasks related to broader decision-making, the observed difference between the two groups might be a confirmation of the finding in the other two activities, rather than reflecting a difference in underlying operating principles of the household types. A more thorough study would be useful not only to replicate the general result, but also provide more information on its reason.

5 Discussion

The results in this paper present some interesting tendencies in household dynamics, some which are consistent with previous research and some which I have not seen previously discussed. A key contribution of this paper is combining data from both members of the couple with household demographic information to study dynamics in responsibility distribution for four very different financial activities. In general, there is evidence of sharp distinctions in how households assign responsibility across the four activities. The findings are consistent with the idea that more routine labor, such as shopping, is dominated by females, no matter the household dynamics. However, for decision-making, there is not only

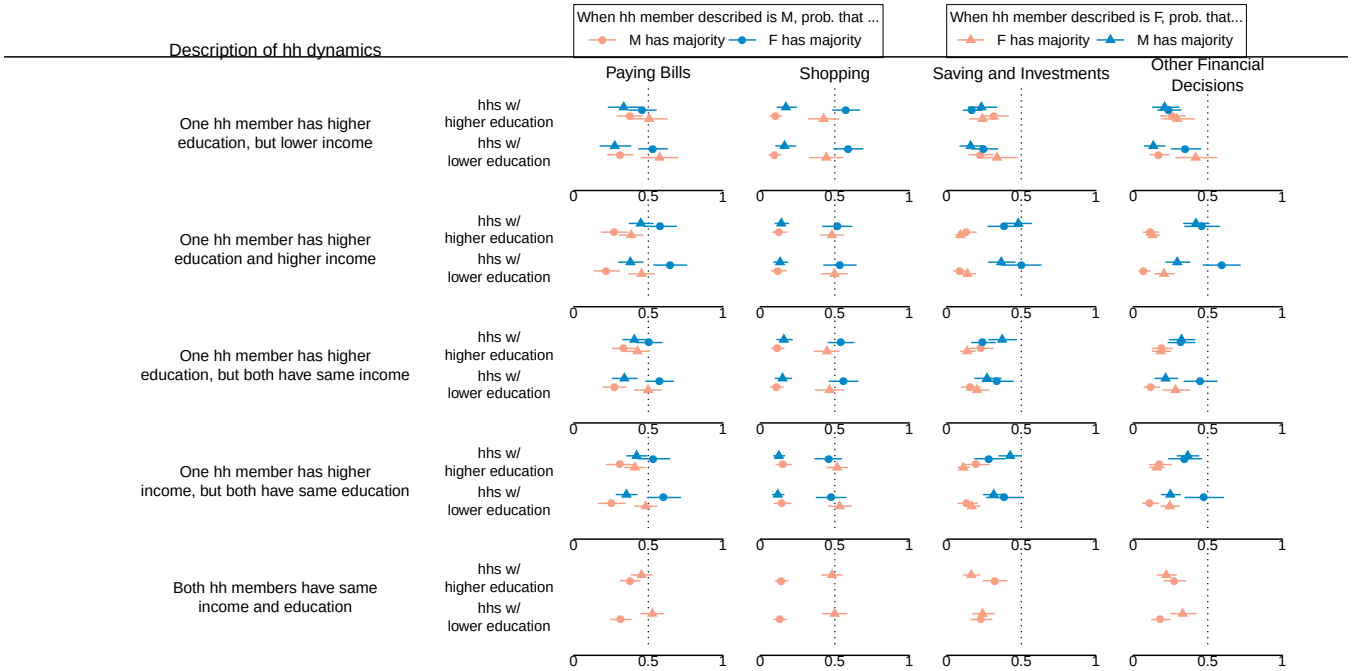


Figure 6: 90 percent credible intervals for $\Phi_r(j_E, j_I, j_e)$ for $r = 1, 3$.

more sharing of responsibility, but also a greater likelihood of the individual with more income or higher educational attainment owning a majority of the responsibility. An interesting finding is that for everyday activities, gender seems to have less impact in better educated households, but has no less influence in younger households than in older households.

Perhaps the biggest disadvantage of my analysis is the limitation of sample size, which makes it difficult to compare the plausibility of more complicated models. Potential models of interest not only feature interactions between the characteristics already used, but also include other variables that likely affect household labor, such as the number of children and financial literacy. As mentioned in Section 2, the SCPC data used in this analysis also have a longitudinal component, making it possible to track many of the households over the years; identifying changes in intra-household dynamics and seeing if they resulted in responsibility shifts would be powerful evidence for causal relations. Finally, I believe it would be of great value and interest to analyze and compare tendencies for other prominent household types, especially same-gender couples.

6 Appendix A

Value	Education Level	Household Income
1	Less than 1st grade	Less than $5,000
2	1st, 2nd, 3rd, or 4th grade	$5,000-$7,499
3	5th or 6th grade	$7,500-$9,999
4	7th or 8th grade	$10,000-$12,499
5	9th grade	$12,500-$14,999
6	10th grade	$15,000-$19,999
7	11th grade	$20,000-$24,999
8	12th grade (no diploma)	$25,000-$29,999
9	High school graduate or GED	$30,000-$34,999
10	Some college, but no degree	$35,000-$39,999
11	Associate degree in occupational/vocational program	$40,000-$49,999
12	Associate degree in academic program	$50,000-$59,999
13	Bachelor's degree	$60,000-$74,999
14	Master's degree	$75,000-$99,999
15	Profession school degree	$100,000-$124,999
16	Doctorate degree	$125,000-$199,999
17		$200,000 or more

Table 3: Numeric values and their corresponding education levels and household incomes.

7 Appendix B

In order to ascertain the quality of fit for the model, I use posterior predictive comparisons (described fully in Gelman et al. (2004)). In each of many iterations, I draw a full set of parameters from the estimated posterior distribution, $\tilde{\alpha}$ and $\tilde{beta}_i^{(c)}$. Then, using the implied $\tilde{\mu}_h$ for each household, $\tilde{R}_h$ is simulated. This effectively resimulates the sample data conditional on the household composition in the household. One can then compare various distributional properties of the simulated values to the relevant statistic in the observed sample. I focus on the number of households with each rating score, grouping households according to education and income dynamics, as these seem to show the most variation across levels. This creates 9 demographic strata, defined by I_h and E_h. Figure 7 shows the 90 percent intervals for the number of households with each rating in each strata under the posterior simulations along with the observed value. While there are a few cases where the simulated range barely captures or does not capture the observed value, in general the observed value falls in the middle of the simulated interval. This suggests the model adequately captures the general first-order effects in the data.

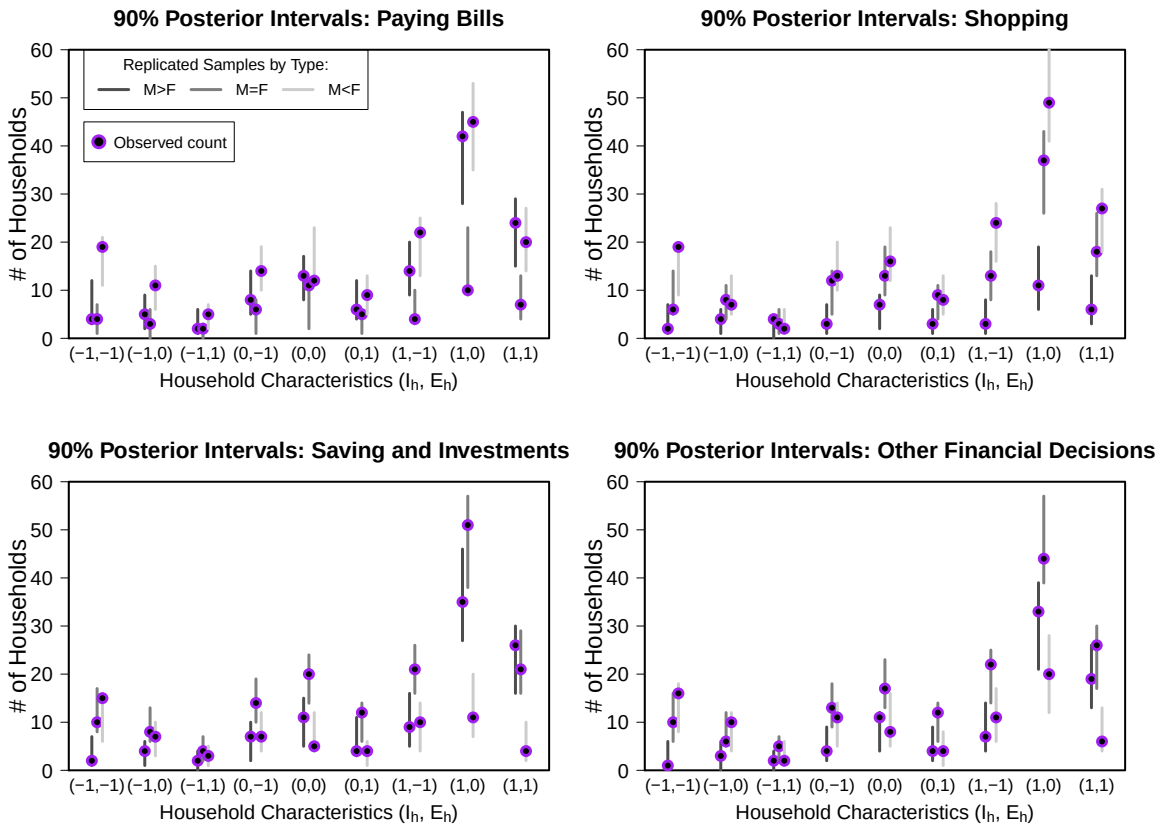


Figure 7: 90% intervals for the number of replicated sample households with each value of R_h along with the observed count.

8 Appendix C

The main difference between Method A and Method B is the estimate of α, which is larger under Method B, especially for the financial decision-making activities. This make sense, because the mapping algorithm produces a greater number of $R_h = 2$.

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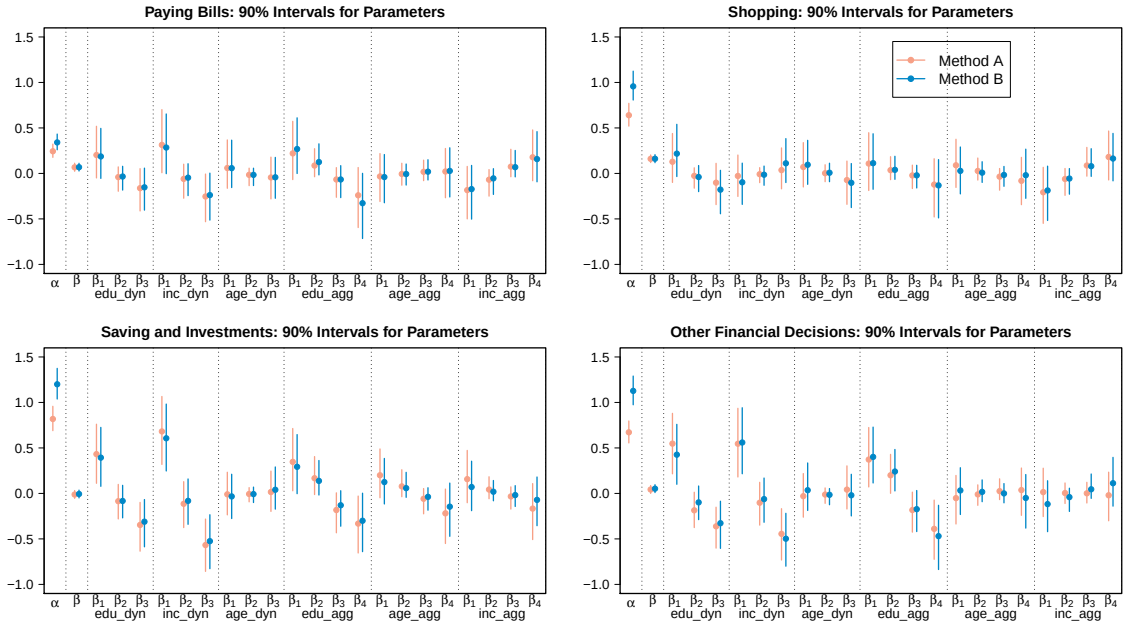

Figure 8: 95% credible intervals for all parameters in (2) under R_h defined by Method A and Method B.

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