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Exhaustive or exhausting? Evidence on respondent fatigue in long surveys ☆

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ABSTRACT

Living standards measurement surveys require sustained attention for several hours. We quantify survey fatigue by randomizing the order of questions in 2–3 hour-long in-person surveys. An additional hour of survey time increases the probability that a respondent skips a question by 10%–64%. Because skips are more common, the total monetary value of aggregated categories such as assets or expenditures declines as the survey goes on, and this effect is sizeable for some categories: for example, an extra hour of survey time lowers food expenditures by 25%. We find similar effect sizes within phone surveys in which respondents were already familiar with questions, suggesting that cognitive burden may be a key driver of survey fatigue.

1. Introduction

Many of the surveys that are administered in development economics or by multilateral agencies such as the World Bank to measure poverty or as part of evaluations are long and complicated, and require the sustained attention of a respondent for several hours. For any researcher who has observed such a survey, it is clear that some respondents disengage as the survey drags on, because they are exhausted, bored, or because their attention wanders. As a result, response quality during the later part of a long survey may suffer, a phenomenon known as survey fatigue.

While survey fatigue is well-documented in the literature,[1] until recently there has been comparatively little research to rigorously quantify its effects. In this paper, we provide such a quantification by randomizing the order in which modules appear in a long survey, generating exogenous variation in the time-into-survey when a particular question was asked. This random order of questions allows us to compare responses to the *same* question when it is asked sooner in the survey versus when it is asked later, and quantify the divergence in responses. We conduct this experiment within surveys administered at baseline and endline for a randomized evaluation of cash transfers in rural Liberia and Malawi (Aggarwal et al., 2022). These surveys were long, averaging about 2.5 h, and the experimental randomization induced meaningful variation in the time it took to reach a specific question: the average time to reach a specific question was changed by as much as about 30 min as a result of the randomization.

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[1] For example, survey fatigue has its own entry in the Encyclopedia of Survey Research Methods.

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We have two main findings. First, and consistent with other work, we find clear evidence of survey fatigue. We estimate survey fatigue separately for two ways of asking questions. The first is an "open-ended" method which we used for the questions in which there is no top code or pre-listed set of options. For example, for transfers given out, respondents were asked to provide the number of transfers that they gave, and could list as many or as few as they wanted. For such questions, we find that each additional hour of surveying causes a 26%–64% decrease in the number of items listed. The second method, or "fixed list" method, is one in which the list of items was pre-coded. For example, in the food expenditures section, we generated a list of around 35 food items, and asked about each of these items separately. Survey fatigue might be reduced with this method, if the listing serves as a memory aid for those who need help with recall later in the survey as they begin to tire out. However, we still observe survey fatigue in this method, though much less than in the prior method: for every additional hour, respondents are about 10%–19% more likely to report no value for a given item. While survey fatigue appears less prevalent when using the fixed list method, we are unable to definitively attribute this to the question type, since the method is not random — it is also possible that these categories are less subject to survey fatigue.

Second, we quantify the extent to which this skipping reduces the *value* of aggregate categories such as the total value of transfers or expenditures. For any skipped question, the value of that category would be set to zero by default, and so we would expect survey fatigue to lower aggregated values. This effect might be modest if the categories that are skipped tend to be more marginal. However, the effects we find are sizeable: for example, an additional hour of survey time reduces the value of food expenditures by 25%, and has even larger effects (in percentage terms) on smaller categories (such as transfers).

This paper contributes to a recent literature that experimentally evaluates the effect of survey time on survey fatigue. Laajaj and Macours (2021) randomize the order of cognitive, non-cognitive and technical questions in a sample of farmers in Western Kenya but, unlike us, find no effect of survey time on reporting. Two other experiments were conducted contemporaneously to this study, and find similar results to ours. Ambler et al. (2021) randomize the order of a household labor supply module, where questions are asked about the labor supply of each household member, but the order in which the household members are listed was randomized. The authors find a 2% reduction in the number of activities reported when a household member is moved back by one position in the household roster. Abay et al. (2021) employ a methodology similar to ours, in which the authors randomize the placement of a dietary diversity module within a phone survey in Ethiopia. Like us, they find large effects: a 15 min increase in survey time before the module leads to an 8%–17% decline in reported dietary diversity.[2] Finally, in a similar but different design and different context, Backor et al. (2007) conduct a web-based time-use survey in the US in which an extra question is included at a random order, creating variation in how many hours had already been asked about when a particular question appeared in the survey. Similar to these other papers, the authors find that an additional hour lowers the number of activities reported in each subsequent hour by 5 percentage points.

While our experiment was not designed to explore *why* survey fatigue occurs, our data offers some suggestive evidence. Past research suggests that survey fatigue may be driven by people deliberately choosing to not answer questions in order to expedite the end of the survey, or if people become more likely to inadvertently make mistakes as they become tired. Some researchers have also conjectured that, over time, respondents learn that answering "no" to a question often invokes a "skip code" that will allow them to skip a number of follow-up questions. This behavior, known as "satisficing", has been documented in survey settings (Krosnick, 1991). We have two pieces of evidence on this point. First, besides our in-person baseline and endline surveys, we also randomized the order of modules within phone surveys that we conducted with a subset of respondents repeatedly every 2 months. These surveys took about 30–40 min to complete. We only introduced question-order randomization in the phone surveys more than a year after the phone surveys had started, when each respondent had already answered several rounds of the phone survey. Therefore, at the time of the phone survey experiment, we would expect that respondents were already familiar with the structure of the surveys, including the mechanics of skip patterns, over time as they go through multiple rounds of the survey. If respondents were satisficing, they would answer fewer questions from the outset during the later rounds of the phone surveys, and there would be no evidence of experimental survey fatigue *within* a survey round. However, we find evidence of survey fatigue similar to our baseline and endline surveys, suggesting that this behavior is likely driven by cognitive burden as the survey progresses. On the other hand, we find some evidence that satisficing may also be at play. When we examine survey fatigue by topic, we find effects for both more and less memorable items; whereas if recall issues were the only channel, we would expect stronger fatigue effects for more easily forgettable categories (such as details of expenditures, as opposed to durable goods or livestock ownership). Our evidence therefore suggests both channels may be at play, though we leave a more definitive analysis to future work.

Finally, since our survey experiment is layered on top of another experimental study (of cash transfers), we attempt to examine whether survey fatigue systematically reduces the measured treatment effects of the primary intervention. Our hypothesis is that the measured treatment effects will likely be attenuated in the presence of fatigue if one of the treatment arms has systematically more to report, for example, in Aggarwal et al. (2022), the cash transfer treatment arm reports having more assets. We find mixed evidence of the hypothesized attenuation, which is ultimately, entirely inconclusive as we are not sufficiently powered for this analysis. We leave this question to future research.

The rest of this paper proceeds as follows. Section 2 explains the data and experimental design, Section 3 presents results, and Section 4 concludes.

2. Data and experimental design

2.1. Setting

We use data from baseline and endline surveys conducted as part of a cash transfer RCT with the NGO GiveDirectly in Liberia and Malawi. In the experiment, the treatment group received cash transfers via mobile money. The average amount of the transfer was $500; however, the amount and other implementation details were varied experimentally — see our trial registry on the AEA website (Aggarwal et al., 2020) and the paper describing the main experimental results (Aggarwal et al., 2022) for more details on the design of the underlying experiment.[3]

In each country, the project took place in rural areas, with universal targeting in treatment villages (i.e. all households in treatment villages received transfers). For this reason, the total allocation to a village

[2] Another related paper is Kilic and Sohnesen (2019), who find that poverty incidence differs when measured in a short or a long survey in Malawi. However, in their case, since everybody got the same long survey or the same short survey, it is not possible to disentangle the effects of survey length from those of question order, i.e., when your responses are impacted by a question being preceded by another question (see here).

[3] In both countries, the size of the transfer was varied between $250, $500, and $750. In addition, in Liberia, cash was disbursed either as a "lump-sum" or via quarterly payments. However, even the lump sum was disbursed in increments of $250 per month, so that cash was paid out over 3 months for the largest transfer.

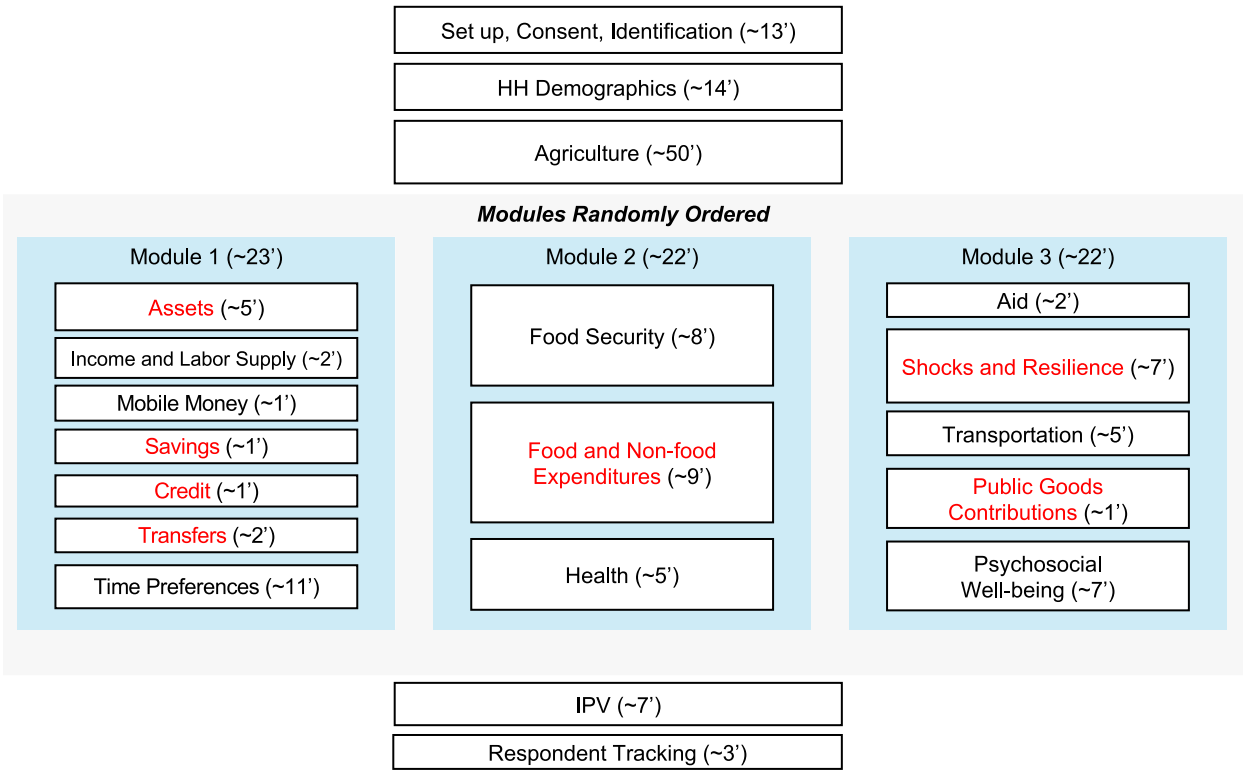

Fig. 1. Sections in In-person Surveys.
Note: Approximate duration for each section (in minutes) are reported in parentheses. In red are the sections for which survey questions are relevant for analysis in this paper.

depends on its size; to ensure liquidity, the NGO decided to only include villages which were small. Operationally, we set a population threshold based on the most recent population census.[4] In Liberia, the study takes place in Bong and Nimba Counties; in Malawi, it takes place in Chiradzulu and Machinga Districts. In each country, the project enrolled 300 villages, with half selected for treatment.

In each village, we attempted to enroll 10 households into the survey sample.[5] We chose to target women for the study, though many questions were asked at the household level. Male heads were interviewed only when the female was not present, and would not be reachable within a few days; our sample was ultimately 76% female in Liberia and 94% in Malawi.

Two of the 10 sampled households in each village were further randomly sampled to participate in a monthly panel survey that was conducted over the phone and was designed to measure a pre-defined set of outcomes at a high frequency. While the major focus of these surveys was to measure food security, they also included questions on income, labor supply, transfers, savings, and credit. We designed these surveys such that each household was called every other month, but the 2 households in each village alternated months, such that each village provided a data point every month. The phone surveys took about 30–40 min to complete.

Fig. A.1 shows the timeline of project activities.

[4] In Malawi, the upper threshold was 100 household per village according to the 2008 national census. In Liberia, we conducted the experiment in two cohorts; the first cohort included villages that had up to 25 households in the 2008 national census, and the threshold for the second cohort was 125, reflecting the larger village sizes in the study region.

[5] It was not always possible to enroll 10 households per village. The total sample size is 2,715 in Liberia and 2,944 in Malawi.

2.2. Question order randomization

This experiment takes place within baseline and endline surveys which are similar to the World Bank's LSMS surveys and take about 2.5 h to complete on average. The surveys contain 19 self-contained sections, including household demographics, agriculture, income, expenditures, savings, assets, labor supply, shocks, and other topics. We show the full list of sections in Fig. 1.

The beginning of the survey (which included household identifying information, demographics, and agriculture) and the end of the survey (which had a section on intimate partner violence, followed by the collection of household tracking information) were the same across all versions. The remaining sections were grouped into 3 modules, and the order of these 3 modules was randomized, giving us 6 versions of the survey (which we refer to as versions A–F — see Fig. 2). The survey software records the amount of time elapsed (since beginning) at each question, allowing us to calculate the exact time at which a question appeared in the survey.

The amount of time it takes to progress through the survey varies depending on a number of factors, including respondent and enumerator characteristics, and the details of a household's circumstance. For example, because our survey had a focus on agriculture, a household which grew multiple crops would be asked a number of questions about each one of them. Table A.1 shows information on the average survey duration. The baseline and endline surveys took on average 2.3 and 2.7 h respectively in Liberia; and 3 and 2.8 h respectively in Malawi. The standard deviation in survey time is sizeable, ranging from 0.7 to 1.1 h. Fig. A.2 shows a CDF of the time until completion of different points of the survey (using survey Version A only) for both countries and for both baseline and endline pooled together (i.e., for 4 country-survey combinations). The figure shows CDFs for various quantiles in the survey time distribution (i.e. relative to completing the question which makes up the pth percentile of the overall distribution of time to survey completion). The CDFs show that even 10% into the survey,

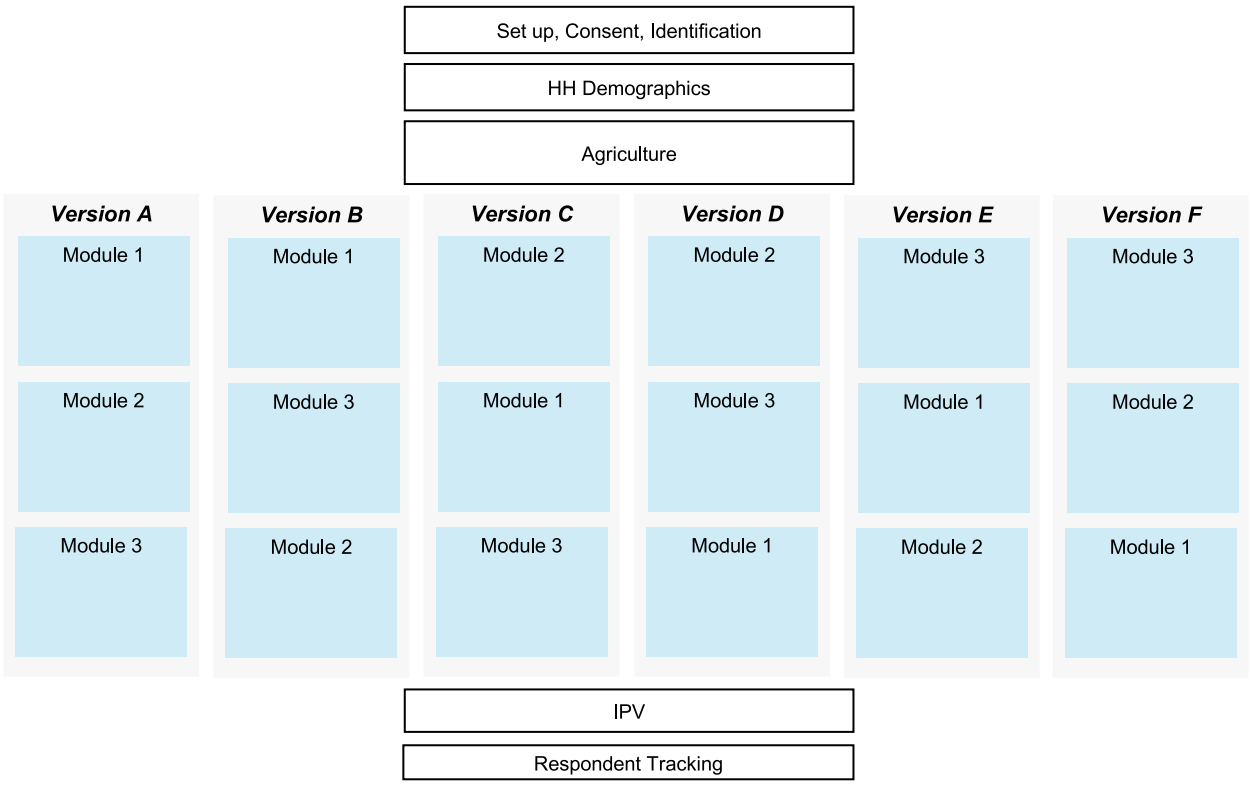

Fig. 2. Randomized Order of Modules in In-person Surveys.
Note: A respondent is randomly provided with one among Versions A–F. For every version, surveyset-up, demographics, and agriculture come at the beginning, while IPV and respondent trackingare at the end.

the standard deviation of time is already over 30 min and that for all percentiles, there are surveys that take a large amount of time. For example, about 10% of people take over 3 h to even get halfway through the survey (Panel C).

Finally, although not the main focus of this paper, we also randomized survey order for the final 2–3 rounds of the phone survey. In order to do this, we randomized the location of the Expenditures and Transfers sections to appear at either the very beginning or the very end of the survey, and the order between the two sections, generating 4 possible permutations (Fig. A.3). We return to this randomization in the discussion section, when we discuss possible explanations for survey fatigue.

Table 1 shows the effect of the randomized survey versions on the time until which the first question of each section was administered. The reported means and standard deviations at the bottom of the table are those pertaining to that section for Version A of the survey. As can be seen from this table, the module randomization introduced significant variation in the time-into-survey when a section starts. For example, looking at Column 1, we can see that the Assets section started just after the 80th minute on average for those who got Version A of the survey. However, the full range for when this section started ranges from 77th minute (version B) to 106th minute (Version F) - a difference of around 30 min. Similar range of difference is consistently observed across all sections.

We use the survey version that was used for each respondent as an instrument for the time-into-survey when a particular set of questions began to be asked of that respondent. While the validity of module randomization as an instrument is largely intuitive, we also show this formally: first-stage F-statistics are at the bottom of Table 1, and range from 35 to almost 200.

2.3. Respondent characteristics and randomization check

Table 2 presents summary statistics for several basic demographic indicators, as well as comparisons across treatment groups. We present these statistics only for those indicators which were asked before the module randomization kicked in as the variables from the later sections would by definition be imbalanced under our central hypothesis for this paper. We show the balance across versions separately for the baseline and endline surveys, but pool them across the 2 countries. For each survey (baseline or endline), we show the mean and standard deviation (for non-binary variables) pertaining to Version A of the survey (chosen arbitrarily), followed by the *p*-value for the joint test of equality across all 6 versions of the survey. Panel A shows respondent characteristics. Almost 90% of the sample is female, three-quarters are married, and the average age is 41. Average years of education (for the respondent) is only 4.2, and 57% are literate (these last 2 variables were measured at baseline only).

Panel B shows household characteristics. At baseline, the average household has 4.8 members, and 96% were engaged in farming. About 40% of the sample live in a house with a thatch roof, and 80% live in a house with a mud floor. About 77% own their dwelling and only 2% have electricity. We cannot reject equality across treatments for all of these variables. Finally, Panel C shows the other experimental treatments. Cash was randomly given out to 50% of villages (and given that we sampled about 10 households per village, it was given, by design, to roughly 50% of the respondents). The phone surveys were administered to about 20% of the respondents. As expected, the survey experiment is orthogonal to both of these cross-randomized treatments.

3. Results

3.1. Quantifying survey fatigue

We start by examining the impacts of time-into-survey on the count of items or instances reported in response to the open-ended questions (questions described in Fig. A.4). To do this, we run the following regression:

$$Y_{ics} = \beta Hours_{ics} + \phi_s + \varepsilon_{ics}, \quad (1)$$

Table 1
Experimental variation in time before which sections were administered.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Time into survey (min) at the beginning of following section:						
	Module 1				Module 2	Module 3	
	Assets	Savings	Credit	Transfers	Expenditure	Shocks	Contributions
Version B	−3.30***	−2.84**	−2.79**	−2.63*	6.39***	−12.20***	−8.83***
	(1.28)	(1.36)	(1.36)	(1.37)	(1.37)	(1.47)	(1.50)
Version C	19.21***	17.71***	17.54***	17.67***	−16.83***	−4.74***	−3.24**
	(1.27)	(1.36)	(1.36)	(1.37)	(1.36)	(1.46)	(1.50)
Version D	23.96***	22.52***	22.24***	22.35***	−18.00***	−16.52***	−5.45***
	(1.27)	(1.36)	(1.36)	(1.37)	(1.36)	(1.46)	(1.50)
Version E	6.61***	6.01***	5.67***	6.04***	5.79***	−25.74***	−15.79***
	(1.27)	(1.35)	(1.36)	(1.37)	(1.36)	(1.46)	(1.50)
Version F	26.06***	24.56***	24.01***	24.07***	−8.38***	−27.57***	−14.49***
	(1.28)	(1.36)	(1.36)	(1.38)	(1.37)	(1.47)	(1.50)
Version A: Mean	80.01	93.47	93.89	95.61	109.39	125.53	134.72
Version A: SD	38.78	40.34	40.26	40.87	44.23	47.39	49.78
F-statistic: joint significance	197.30	151.42	146.55	143.33	127.92	114.25	35.05
Number of respondents	5,591	5,597	5,597	5,597	5,597	5,597	5,592
Observations	10,153	10,226	9,952	10,228	10,227	10,224	10,154

Note: The omitted group is Version A. Observations include in-person baseline and endline survey data. Regressions include a survey fixed effect (i.e. baseline and endline, for each country separately, as well as differentiating Wave 1 and 2 in Liberia). ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 2
Summary statistics and randomization check.

	Baseline Survey		Endline Survey	
	Version A (Mean/SD)	*p*-value: test of equality over 6 versions	Version A (Mean/SD)	*p*-value: test of equality over 6 versions
Panel A. Respondent Characteristics				
=1 if female	0.87	0.188	0.89	0.308
=1 if currently married or has partner	0.76	0.970	0.74	0.188
Age	40.50	0.661	40.95	0.388
	(15.20)		(14.31)	
Years of education	4.18	0.553		
	(3.75)			
=1 if can read/write in English	0.57	0.667		
	(0.50)			
Panel B. Household Characteristics				
Number of household members	4.77	0.436	4.98	0.744
	(2.11)		(2.16)	
=1 if household engaged in farming past year	0.96	0.786	0.90	0.803
=1 if thatch roof	0.40	0.206	0.24	0.780
=1 if mud/dirt floor	0.80	0.848	0.77	0.392
=1 if owns dwelling	0.77	0.844	0.77	0.840
=1 if has electricity in dwelling	0.02	0.280	0.02	0.523
Panel C. Cross-randomized groups				
Cash Treatment Group	0.53	0.216	0.51	0.914
Phone survey group	0.21	0.640	0.22	0.655
Observations	4,879		5,349	

Note: Column 1 and 3 (Version A) represent control mean with standard deviation in parentheses. Columns 2 and 4 present *p*-values from the joint test of equality of the means for all the 6 survey versions, A–F.

These regressions are run separately for each category of questions (specifically, ROSCAs, VSLAs, transfers received, transfers sent, and credit purchases). Within each category, the unit of observation is at the *respondent-survey* level (i.e. there are 2 surveys for most respondents, baseline and endline, for each country). In the regression, Y_{ics} refers to the count of items reported by survey respondent i within category c in country-survey sample s, $Hours_{ics}$ denotes elapsed time into survey (in hours) at which category c is administered to respondent i, instrumented with the randomized module order (Versions A–F) that was fielded to the respondent, ϕ_s represents a survey fixed effects (i.e. country, baseline/endline, Waves 1 and 2 in Liberia), and ϵ_{ics} is the error term.

In this analysis, there is no reason to expect heterogeneity in responses based on outcomes — *ex ante*, we expect similar results for any question category. Therefore, to discipline our analysis, we present results exhaustively for every relevant outcome, and adjust the standard errors to account for a false discovery rate (FDR) using the procedure in Anderson (2008). For each outcome, we present only *q*-values from this procedure, and statistical significance is ascertained only based on the *q*-values obtained after FDR correction.

Finally, please note that for ease of exposition, we run our analyses and interpret results in terms of 1-hour delays in the survey. It may be useful however, to slightly scale down these effects as the actual survey delays that we observe are slightly more modest, as shown in Table 1.

We present these results in Table 3. We show 5 outcomes: the number of Rotating Savings and Credit Associations (ROSCAs) and Village Savings and Loan Associations (VSLAs) that the respondent reported being part of in the savings section; the reported number of transfers received and given during the past month; and the number

Table 3
Survey time and the number of items reported ("Open-ended" questions).

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following:				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Hours into Survey	0.002	−0.058**	−0.074*	−0.209***	−0.095*
	[0.613]	[0.042]	[0.081]	[0.001]	[0.081]
Dependent variable: Mean	0.056	0.205	0.275	0.328	0.366
Hours into Survey: Mean	1.9	1.9	1.9	1.9	1.9
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0
Number of respondents	5,596	5,597	5,596	5,594	5,597
Observations	10,225	10,224	10,223	10,215	10,228

Note: There is 1 observation per respondent per survey. Baseline and endline surveys are pooled in each country, so for most individuals there are 2 observations. We report TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include a survey fixed effect (i.e. baseline and endline, for each country separately, as well as differentiating Wave 1 and 2 in Liberia). See Table B.1 for results by country and Table C.1 for results by survey type (baseline/endline). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

of credit purchases during the past month.[6] Four out of 5 of these outcomes are statistically significant at 10% (and 2 are significant at 5%), even with the FDR adjustment. The effect sizes are large: an extra hour reduces the number of items by 26%–64%. Because these surveys average 2.5 h, this implies that the decision to place a question at the beginning rather than the end of the survey can have a large effect.

Next, we investigate the impacts of elapsed survey time on choosing an item in questions asked via the fixed-list method (questions described in Fig. A.5). Recall that our hypothesis is that going through a pre-set list of items may serve as an aid to memory (for example, it may be easier to remember if the enumerator asks the respondent whether her household consumed say, bananas in the past week than it would be to recall if the enumerator asks her to list all the items that the household consumed in the past week). We run the following regression:

$$Y_{icsj} = \beta Hours_{ics} + \phi_s + \varepsilon_{icsj}, \quad (2)$$

The main difference for this approach is that, for each category, there are multiple *items* where Y_{iscj} is a binary indicator of whether respondent i in survey sample s responded "yes" to having consumed/bought/experienced item j in category c of the survey, $Hours_{ics}$ elapsed time into survey (in hours) at the beginning of category c, instrumented with the randomized module order (Versions A–F), ϕ_s survey fixed effects (i.e. country, baseline/endline, Waves 1 and 2 in Liberia), and ε_{iscj} the error term. Like before, we adjust the standard errors for multiple testing, and report only the FDR-corrected q-values in our tables.

Table 4 presents this analysis for a set of 9 categories: livestock, farm tools, durable goods, savings, loans, food expenditures, non-durables expenditures, household shocks, and public goods contributions. Note that these regressions are at the category-item level, and so are much better powered than the previous set of regression results: we find that 4 of 9 outcomes are significant at 5% (and even of those not significant, nearly all are negative signed).[7] As we hypothesized, effect sizes are more moderately measured than for the "open-ended" questions, ranging from 10%–19% for the statistically significant outcomes. Nevertheless, survey fatigue is clearly evident here as well.[8]

One advantage that our data provides over the remainder of the literature on this topic is that we have repeated observations of the same person as our phone surveys are a panel, and even our in-person measurements were taken twice, at baseline and at endline (except for Liberia Wave 1, for which the survey order experiment was introduced only for endline surveys). We can use these repeat measurements in a fixed-effects set-up to control for all individual specific traits that may affect survey responses. We show these in Appendix D for our phone surveys as well as the in-person surveys. We find no meaningful differences in these tables relative to the regressions without fixed effects.

Finally, we hypothesize that survey fatigue may not evolve linearly, but instead, there may be an inflexion point beyond which there is a change in the slope. We investigate this in Appendix E, where, for the outcomes which show significant effects of fatigue in Tables 3 and 4, we show a scatter plot and a non-linear fit through these scatter points. The evidence varies, depending on the outcome in question, although the underlying scatter points suggest that a linear fit provides a good approximation of respondent behavior.

We note however, that our range of hours into survey begins only at 1.5 h (or more) as the initial sections were fixed across all respondents. It is possible, therefore, that non-linearities may have set in before then. As a result, we leave a fuller investigation of non-linear effects of fatigue to future research.

3.2. Effect of survey fatigue on aggregated values

The prior section implies that aggregated values of categories such as expenditures or transfers will be attenuated by survey fatigue; in this section, we quantify this attenuation. We run regressions identical to (1), except that the dependent variable is now in dollar amounts, rather than counts; in addition, results are shown for both open-ended and fixed list questions.

Results are shown in Table 5. We find that the vast majority (9 of 11) of point estimates are negative, more than half of which (5) are significant at conventional statistical significance levels despite being corrected for multiple hypothesis testing. In addition, 2 of the coefficients – those for farm tools and public goods – are marginally significant at 17% and 13% respectively. Moreover, the effect sizes are economically meaningful. Focusing on just the statistically significant effects, the coefficient magnitudes range from 25% of the mean (for food expenditure) to 86% (for transfers given).

In some cases, effect sizes for reported monetary values (as shown in Table 5) are much larger in percent terms than they are for the counts that were collected via the open-ended and the fixed-list questions in Tables 3 and 4, respectively. This is especially true for some of the small categories such as transfers given, where an extra hour reduces the value by $0.59, on a base of just $0.69, or 86%, while the effect of

[6] For both transfers and credit purchases, some earlier survey versions included questions recalling for the past 3 months instead. Later for analysis on aggregated values, the monetary values collected from these versions are divided by 3, comparable to the past-month values.

[7] See Appendix B and Appendix C for heterogeneity in these results by country and by survey type (baseline or endline).

[8] Please note, however, that in both Tables 3 and 4, the effect sizes in percent terms are slightly overestimated due to the fact that the dependent variable means are calculated across all versions and are therefore, depressed due to survey duration effects. Nevertheless, the effects are large enough in an absolute sense to be economically meaningful.

Table 4
Survey time and the probability of reporting an item ("Fixed list" questions).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	=1 if item is selected (not skipped):								
	Livestock	Farm tools	Durable	Savings	Loans	Food expend	Non-durables	Shocks	Public goods
Hours into Survey	−0.007*	−0.004	−0.001	−0.002	0.000	−0.025***	−0.038***	−0.025***	−0.002
	[0.081]	[0.236]	[0.613]	[0.555]	[0.613]	[0.001]	[0.001]	[0.001]	[0.613]
Dependent variable: Mean	0.072	0.154	0.176	0.060	0.020	0.203	0.249	0.130	0.050
Hours into Survey: Mean	1.7	1.7	1.8	1.9	1.9	1.9	1.9	2.0	2.0
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2
Number of items: Liberia	11	21	20	12	14	37	11	16	9
Number of items: Malawi	15	20	22	11	14	35	11	17	9
Number of respondents	5,594	5,594	5,594	5,597	5,597	5,597	5,597	5,597	5,349
Observations	134,831	208,281	212,373	114,045	138,711	366,947	112,497	166,524	48,141

Note: Each column represents a different category of questions in the survey. Each category includes multiple items (e.g., livestock includes 11 types of animals). We report TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include a survey fixed effect (i.e. baseline and endline, for each country separately, as well as differentiating Wave 1 and 2 in Liberia). See Table B.2 for results by country and Table C.2 for results by survey type (baseline/endline). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets

Table 5
Survey time and reported total monetary value of aggregated categories.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total value of reported items for the following:										
	Livestock	Farm Tools	Durables	Savings	Loans	Food Expend	Non-durables	Public goods	Transfers received	Transfers given	Credit purchases
Hours into Survey	−13.47	−1.32	4.68	−1.47	0.73	−4.12***	−2.52***	−0.10	−0.51**	−0.59***	−0.65***
	[0.344]	[0.172]	[0.344]	[0.367]	[0.344]	[0.001]	[0.001]	[0.130]	[0.011]	[0.001]	[0.002]
Dependent variable: Mean	95.78	10.48	58.11	15.52	6.40	16.22	7.93	0.14	0.95	0.69	0.81
Hours into Survey: Mean	1.7	1.6	1.8	1.9	1.9	1.9	2.0	2.1	1.9	1.9	1.9
Hours into Survey: SD	1.0	1.3	1.0	1.0	1.0	1.3	1.3	1.6	1.0	1.0	1.0
Number of respondents	5,594	5,349	5,594	5,597	5,597	5,597	5,597	5,349	5,597	5,597	5,597
Observations	10,189	5,349	10,189	10,226	9,952	10,227	10,227	5,349	10,228	10,228	10,228

Note: All values in USD. There is 1 observation per respondent per survey. Baseline and endline surveys are pooled in each country, so for most individuals there are 2 observations. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include a survey fixed effect (i.e. baseline and endline, for each country separately, as well as differentiating Wave 1 and 2 in Liberia). For transfers and credit purchases, some earlier survey versions included questions recalling for the past 3 months instead of past month. See Table B.3 for results by country and Table C.3 for results by survey type (baseline/endline). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

an hour on the count in Table 3 is a reduction of 0.21 transfers on a base of 0.33 (or 64%). But even for a larger category like food, the percent decline in value is 25%, compared to 12% in skipping in Table 4. One possible explanation is that fatigue causes respondents to report lower values (because the value questions come after the counts). This is consistent with studies such as Brzozowski et al. (2017), who show that recall errors in surveys tend to not be mean zero, but are in fact, negatively correlated with true behavior - i.e., when respondents make mistakes, they tend to overstate the low values and understate the high values.

3.3. Effect of survey time on estimated treatment effects of cash

An important implication of these results is that the effects of any program might be attenuated if effects are measured later in the survey. This may happen through two distinct channels: (1) survey fatigue may proportionally reduce the number of items mentioned by respondents, in which case treatment-control differences will become smaller (in absolute value, though not in percentages) if measured later in the survey; or (2) if there exist non-linearities, for example if there is some threshold level of cognitive load that the treatment group is more likely to encounter because they have more to report, treatment effects can be attenuated in both absolute and percentage terms.

To understand the interaction of fatigue with the primary treatment, we examine if the effect of the cash transfer differs when outcomes are measured later in the survey, by regressing outcomes on cash, time into the survey, and their interaction. Specifically, we run the following regressions analogous to Eqs. (1) and (2), but with cash interactions.

$$Y_{isc} = \beta Hours_{isc} + \gamma Cash_{v(i)} + \kappa Cash_{v(i)} \times Hours_{isc} + \phi_s + \psi_m + \varepsilon_{isc}, \quad (3)$$

$$Y_{iscj} = \beta Hours_{isc} + \gamma Cash_{v(i)} + \kappa Cash_{v(i)} \times Hours_{isc} + \phi_s + \psi_m + \varepsilon_{iscj}, \quad (4)$$

where $Cash_{v(i)}$ denotes whether a village v received cash transfers, ϕ_s represent country-wave sample fixed effects,[9] ψ_m represent fixed effects for the cash randomization strata. All other notation is the same as before. In these regressions, we demean the hours variable.

Please note that there is also an alternative way of interpreting these regressions — which is if the cash transfer treatment has an effect on fatigue. This could happen if, for example, better nutrition afforded by the cash improves respondents' cognitive capacity. The coefficient κ will capture either effect — of cash on fatigue or of fatigue on cash treatment coefficients.

We show the results from these regressions in tables Table 6 for open-ended questions and in Table 7 for fixed-list questions; Table A.3 shows results for the aggregated categories.

We find no compelling evidence of a tempering effect of fatigue on the cash effects (or of cash on the fatigue effects). We conjecture that this is perhaps because statistical power is limited since this analysis can only be conducted on the endline, effectively halving our sample size, and because the cash treatment requires standard error clustering at the village level. Moreover, the interaction effect is defined only for the cash treatment group. We leave a further evaluation of this to future work.

[9] There is no survey type fixed effects separately for baseline and endline because the cash effects are measurable only at endline

Table 6
Effect of survey time on measured treatment effects of cash ("Open-ended questions").

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Time into Survey (h)	−0.02	−0.13	0.03	−0.15	−0.22
	[0.594]	[0.228]	[0.705]	[0.228]	[0.228]
Cash × Time into Survey (h)	−0.02	0.21	−0.29	−0.05	0.16
	[1.000]	[0.276]	[0.135]	[1.000]	[1.000]
Cash	0.01*	0.04*	0.02	0.05**	−0.02
	[0.087]	[0.098]	[0.152]	[0.021]	[0.178]
Control Mean	0.03	0.24	0.16	0.15	0.34
Hours into Survey: Mean	0.0	−0.0	−0.0	−0.0	0.0
Hours into Survey: SD	0.9	0.9	0.9	0.9	0.9
Observations	3,961	3,962	3,962	3,958	3,962

Note: Regressions include baseline measurement of outcome, fixed effects for cash treatment randomization strata, and country-wave fixed effects. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values (calculated from *p*-values based on standard errors clustered at village level) in brackets.

Table 7
Effect of survey time on measured treatment effects of cash ("Fixed-list questions").

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	=1 if item is selected (not skipped)								
	Livestock	Farm tools	Durable	Savings	Loans	Food expend	Non-durables	Shocks	Public goods
Time into Survey (h)	0.01	−0.00	−0.01	−0.01	−0.01	−0.02	−0.08	0.00	−0.01
	[0.591]	[0.766]	[0.591]	[0.256]	[0.256]	[0.591]	[0.222]	[1.000]	[0.594]
Cash × Time into Survey (h)	−0.02	−0.01	−0.02	0.00	0.01	0.01	0.08	−0.02	0.00
	[0.304]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[0.276]	[1.000]	[1.000]
Cash	0.01***	0.01*	0.02***	0.01***	0.00	0.01*	0.02***	−0.01*	−0.00
	[0.001]	[0.072]	[0.001]	[0.001]	[0.266]	[0.087]	[0.003]	[0.072]	[0.376]
Control Mean	0.06	0.13	0.15	0.05	0.02	0.18	0.20	0.08	0.04
Hours into Survey: Mean	1.7	1.7	1.8	1.9	1.9	1.9	2.0	2.2	2.2
Hours into Survey: SD	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	1.0
Observations	54,714	80,419	82,023	44,761	51,489	141,028	43,582	63,392	35,658

Note: Regressions include baseline measurement of outcome, fixed effects for cash treatment randomization strata, and country-wave fixed effects. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values (calculated from *p*-values based on standard errors clustered at village level) in brackets.

Table 8
Survey fatigue in phone surveys.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of distinct items reported for the following:					=1 if item is selected (not skipped):			
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases	Savings	Loans	Food expend	Non-durables
Hours into Survey	0.050	0.308	0.091	-0.246	-0.346	0.048	-0.014	-0.103***	-0.069
	[0.250]	[0.182]	[0.224]	[0.159]	[0.159]	[0.182]	[0.212]	[0.001]	[0.182]
Dependent variable: Mean	0.088	0.372	0.205	0.190	0.283	0.140	0.031	0.216	0.351
Hours into Survey: Mean	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Hours into Survey: SD	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1
Number of respondents	780	780	780	780	780	780	780	780	780
Observations	1,762	1,762	1,762	1,762	1,762	18,678	24,654	63,059	20,083

Note: For columns 1–5, there is 1 observations per respondent per survey. For most individuals, 2–3 rounds of phone surveys are included in this table. For columns 6–9, each column represents a separate set of questions and each set includes multiple items (e.g., food expenditure includes 35 types of food). All regressions include a survey fixed effect (i.e., country and Wave 1 and 2 in Liberia). Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

3.4. Descriptive evidence on pathways

In this subsection, we investigate whether the practice known as "satisficing" is likely an explanation behind the observed pattern of results. Satisficing is a term used to describe the phenomenon where respondents may be answering questions in such a way that helps them avoid or shorten follow-ups, and therefore, reduce survey length (see Roberts et al. (2019) for a review of the evidence about this behavior). In this case, satisficing would entail responding "no" to questions, or list fewer number of items such as transfers, in order to avoid follow-up questions on those items. Satisficing requires that respondents learn that answering "no" to a question reduces the number of follow-up questions, and so can only be present if respondents learn this pattern over the course of the survey, or if fatigue makes people more likely to satisfice. Empirically, if respondents already suspect that answering no to particular questions will lessen the number of follow-up questions and behave strategically from the start, then satisficing will not be detectable even though it is present.

While our study was not set up to answer this question, we produce two pieces of descriptive evidence. First, as mentioned in Section 2.1, we randomly selected 20% of our sample to participate in phone surveys, which contained a subset of questions from the in-person surveys and began shortly after the baseline survey. Respondents were called once every 2 months for about 16–26 months (or 8–13 rounds).

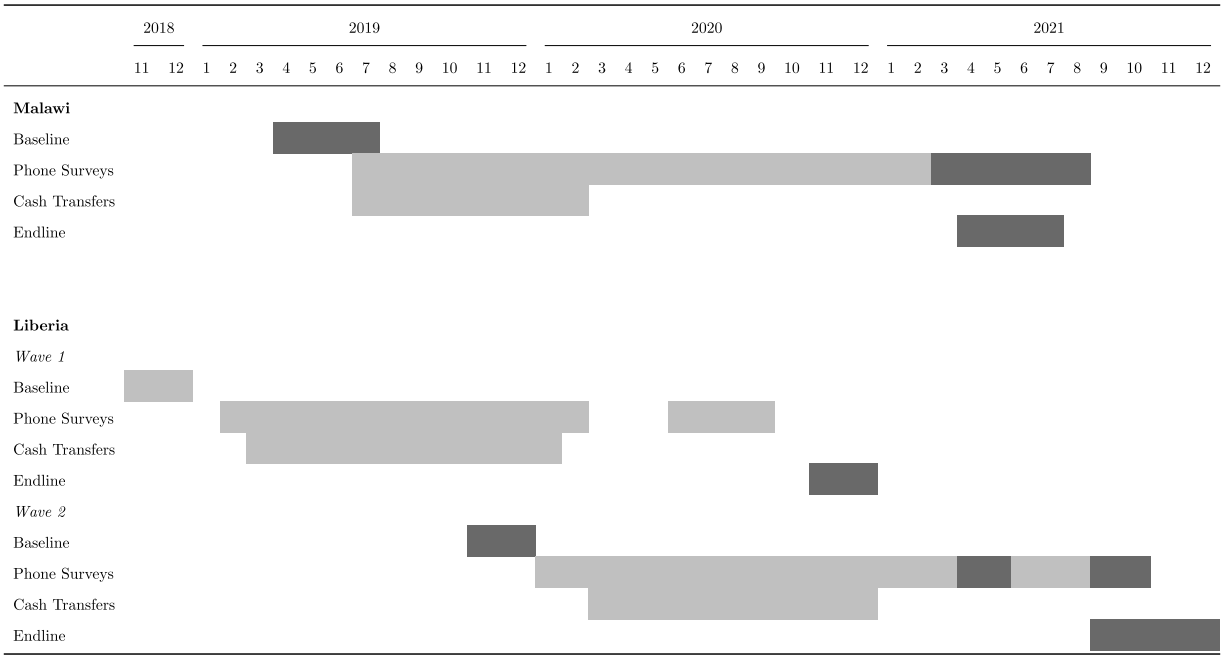

Fig. A.1. Timeline of Survey Activities.
Note: Darker gray blocks indicate the survey rounds where module order randomization was conducted and thus data for which are included for analysis in this paper.

After deciding to implement the survey-order randomization into the longer in-person surveys, we later decided to also randomize the order in the phone surveys. Importantly, the randomization began around the 8th round of the survey in Liberia and the 11th in Malawi, so respondents already had lots of experience with the questionnaire.[10] If satisficing is an explanation, we would expect survey fatigue to be minimal in this experiment (since based on prior experience, people would be equally able to skip questions wherever they appeared in the survey).[11] The randomization was very similar to the longer surveys, though less involved: specifically, as shown in Fig. A.3, we varied the location of the expenditure and transfers sections within the survey.

Results are shown in Table 8.[12] Columns 1–5 analyze responses to open-ended questions, and Columns 6–9 show outcomes for questions that follow the fixed list pattern. To study these, we run the same regressions as in (1) and (2) respectively, except that the outcomes are now drawn from the phone survey.

Contrary to the predictions of a satisficing hypothesis, we find evidence of negative effects of survey duration on food expenditures reported by the respondents. This is similar qualitatively to the results in the main survey, for which respondents had much less experience. In fact, we find that our observed fatigue effects over the phone are similar in magnitude to those documented in Abay et al. (2021), who find that a 15 min delay in the timing of the food consumption module leads to an 8%–17% decline in the household dietary diversity score (similar to the effect sizes we document). Moreover, we find that the fatigue effects for food expenditures are in fact, much stronger over the phone than they are in person: in Table 4, we document a fatigue effect of about 10% for an hour delay during an in-person survey, but this effect is of the order of 50% over the phone. This is in line with the evidence laid out in Abate et al. (2021), who show that survey fatigue comes about much sooner over the phone relative to in person surveys.

Table A.1
Average duration by survey versions (in hours).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Survey Version						Overall
	A	B	C	D	E	F	
Panel A: Liberia							
Baseline	2.28	2.27	2.24	2.31	2.29	2.24	2.27
	(0.69)	(0.65)	(0.69)	(0.75)	(0.67)	(0.70)	(0.69)
Endline	2.73	2.64	2.74	2.68	2.72	2.77	2.71
	(1.04)	(1.05)	(1.12)	(1.02)	(1.09)	(1.16)	(1.08)
Panel B: Malawi							
Baseline	3.15	3.03	3.06	3.03	3.01	3.04	3.05
	(1.02)	(0.89)	(0.93)	(0.92)	(0.91)	(0.90)	(0.93)
Endline	2.75	2.81	2.80	2.76	2.75	2.78	2.77
	(0.80)	(0.82)	(0.81)	(0.79)	(0.82)	(0.82)	(0.81)

Note: Standard deviations in parentheses.

Second, as suggested by an anonymous referee, we note that Table 5 and Appendix F show survey fatigue effects on different categories of items. In earlier work such as Ambler et al. (2021) and Abay et al. (2021), researchers have found larger effects on less memorable items and smaller effects on more memorable ones. However, we find evidence consistent with a nearly across-the-board negative effect of fatigue, rather than differential effect based on salience. While not definitive, this result muddies the picture, since it is more consistent with satisficing than with cognitive burden.

[10] See Fig. A.1 for the specific survey rounds when order randomization was implemented.

[11] Another implication of survey fatigue is that the total survey time, and thus the value of categories, should decline over time as respondents learn the skip codes. However, we have no way of testing this since the number of rounds is colinear with time trends.

[12] Table A.2 shows the randomization induced significant variation in the time each section was administered, similar to what we show in Table 1. In Table A.4, we show the impacts on the value of aggregated categories, a replication of the analysis that we show in Table 5.

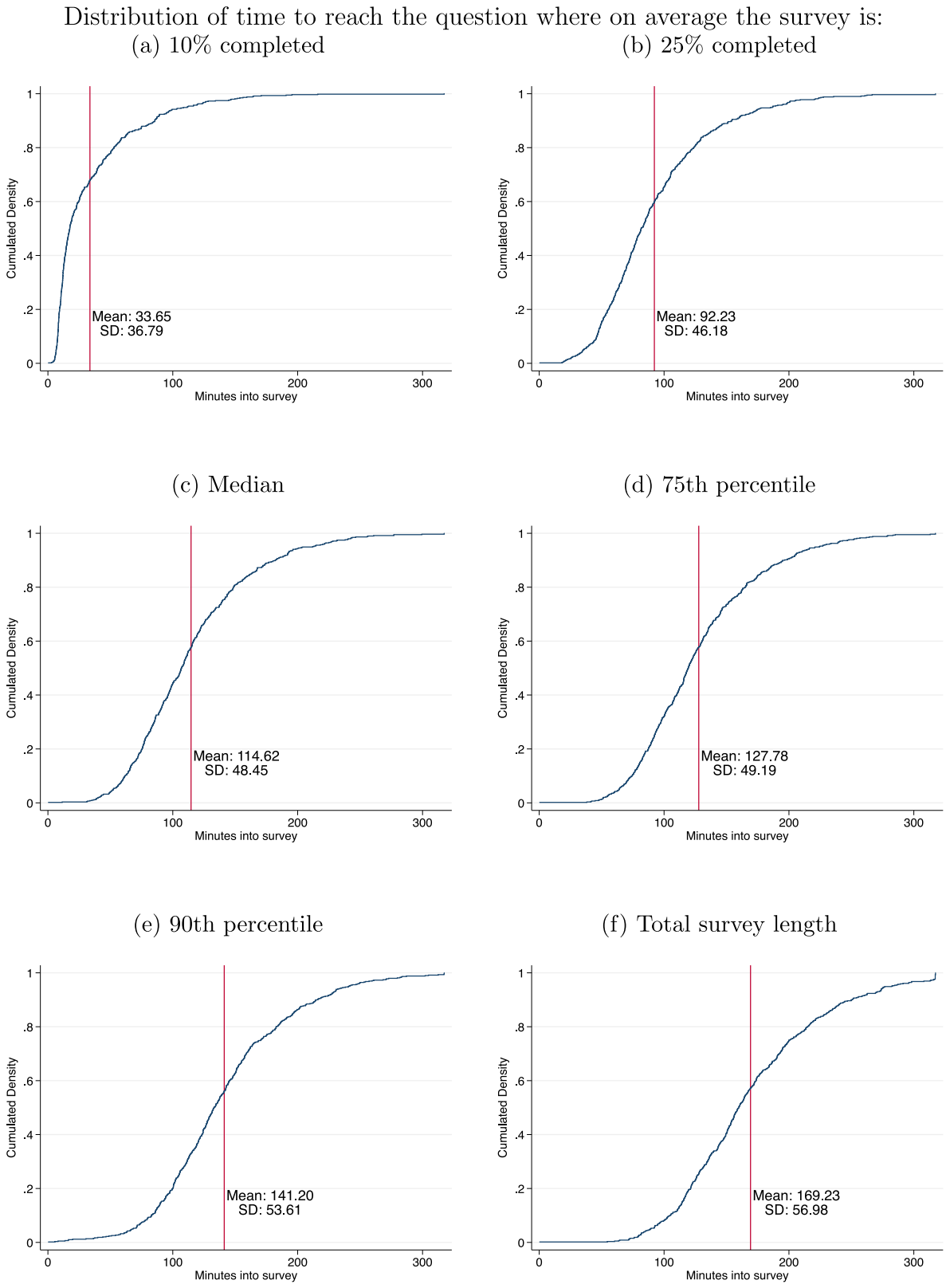

Fig. A.2. Distribution of Survey Time. Note: Based on Version A only.

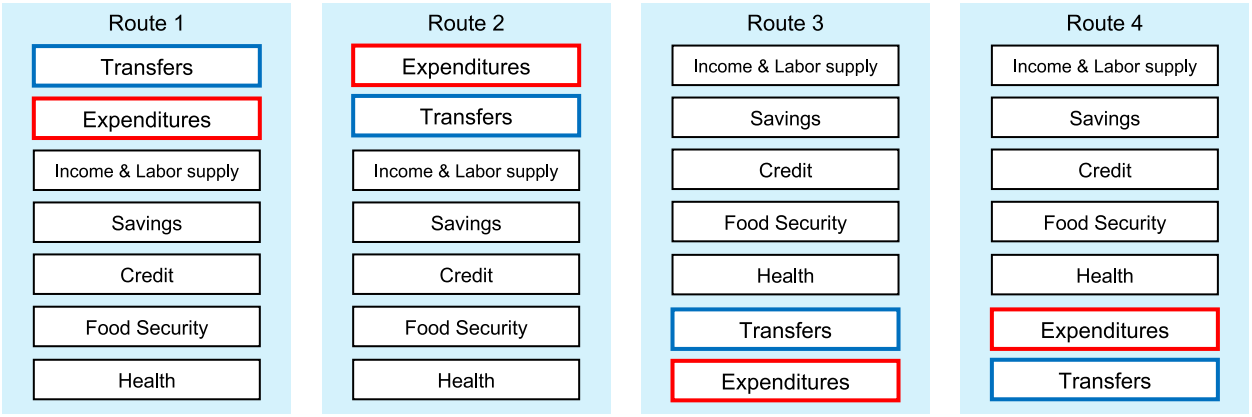

Fig. A.3. Randomized Order of Modules in Phone Surveys. Note: A respondent is randomly provided with one among Routes 1–4.

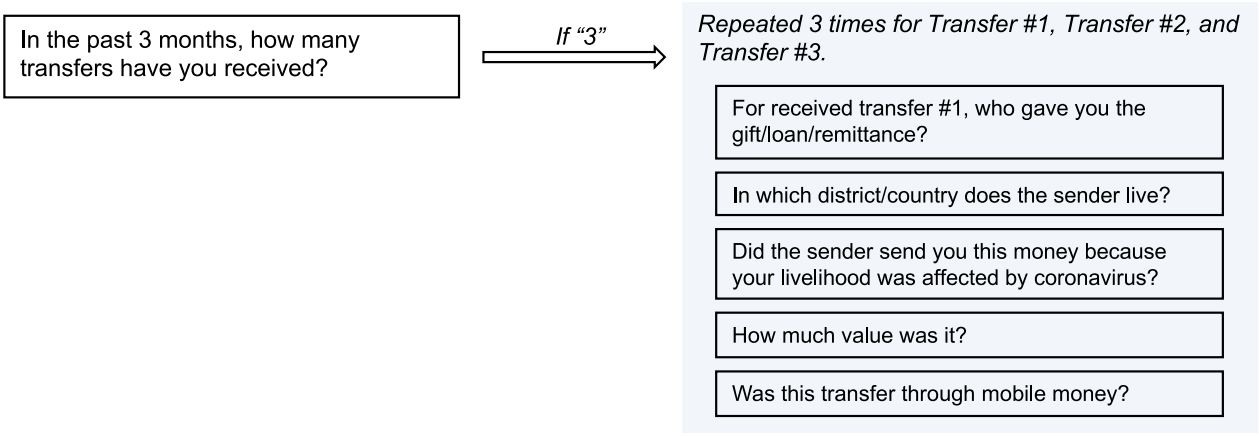

Fig. A.4. Example of "Open-Ended" Question Order.

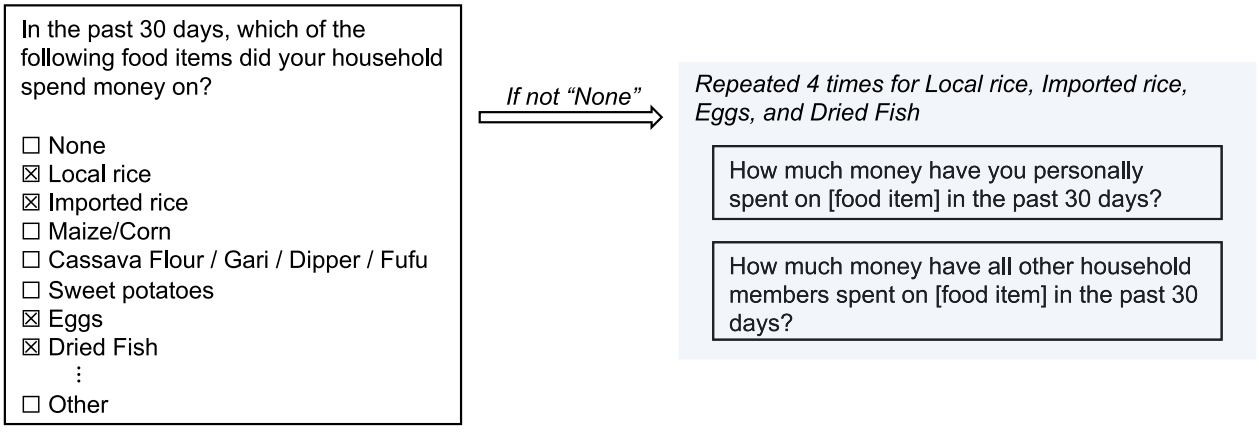

Fig. A.5. Example of "Fixed List" Question.

Ultimately then, we do not have a definitive piece of evidence on pathways. Instead we conclude that both effects may be at play, and we leave a fuller investigation to future work.

4. Conclusion

In this paper, we randomize the order of questions asked as part of the baseline and endline surveys of a cash transfer experiment to provide evidence on the impact of survey duration on the quality of responses elicited during the survey. Our results point to strong fatigue effects, on the order of a 10%–64% reduction in the count of reported items, which leads to even bigger effects on the reported monetary values of categories that aggregate over these items.

Is there a way for these findings to inform survey design? Survey fatigue is not a recent discovery, and practitioners suggest a variety of remedies to address this concern, most of which boil down to fielding shorter surveys, or splitting surveys into multiple shorter versions. For example, Aggarwal et al. (2021) is an example of a multi-day baseline survey. Other strategies involve sacrificing the scope of data collection, for example by splitting the survey into shorter versions, administering

Table A.2
Experimental variation in time before sections were administered (phone surveys).

	(1)	(2)	(3)	(4)
	Time into survey (minutes) at the beginning of following section:			
	Savings	Credit	Transfers	Expenditure
Version B	−0.17	−0.08	8.66***	−1.45***
	(0.32)	(0.34)	(0.34)	(0.29)
Version C	−9.14***	−9.03***	10.48***	9.95***
	(0.31)	(0.33)	(0.34)	(0.28)
Version D	−9.66***	−9.59***	17.52***	8.53***
	(0.31)	(0.32)	(0.33)	(0.28)
Version A: Mean	15.47	16.53	3.21	4.81
Version A: SD	6.89	6.98	3.10	3.70
F-statistic: joint significance	585.88	523.70	941.79	837.01
Number of respondents	780	780	779	780
Observations	1,762	1,762	1,759	1,760

Note: Observations include only phone survey data. Regressions include country-sample fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table A.3
Effect of survey time on measured treatment effects on monetary value of aggregated categories.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Expenditure		Assets					Transfers	
	Food	Nondurables	Livestock	Farm tools	Durables	Savings	Loans	Given	Received
Time into Survey (h)	−0.55	−0.39	6.94	−2.47	−7.09	−7.71	−3.98	0.14	−1.94
	[1.000]	[1.000]	[1.000]	[0.999]	[1.000]	[1.000]	[0.999]	[1.000]	[1.000]
Cash × Time into Survey (h)	−0.21	1.12	−45.35	0.30	36.20	−5.41	7.99	−2.70	−2.15
	[1.000]	[1.000]	[1.000]	[1.000]	[0.962]	[1.000]	[0.286]	[0.286]	[1.000]
Cash	0.19	0.27	26.00**	1.47***	21.02***	4.56***	−0.19	0.26	1.33**
	[0.197]	[0.227]	[0.034]	[0.004]	[0.001]	[0.007]	[0.545]	[0.197]	[0.019]
Control Mean	3.08	6.30	90.00	9.75	56.32	8.68	6.94	1.66	6.85
Control SD	4.90	9.37	367.73	10.66	138.21	55.59	19.14	6.58	14.53
Hours into Survey: Mean	1.9	2.0	1.7	1.7	1.8	1.9	1.9	1.9	1.9
Hours into Survey: SD	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.9	0.9
Observations	3,962	3,962	3,962	3,962	3,962	3,962	3,687	3,962	3,962

Note: Regressions include baseline measurement of outcome, fixed effects for cash treatment randomization strata, and country fixed effects. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values (calculated from *p*-values based on standard errors clustered at village level) in brackets.

Table A.4
Effect of survey time of total value of aggregated categories, phone surveys.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total value of reported items for the following:						
	Savings	Loans	Food Expend	Non-durables	Transfers received	Transfers given	Credit purchases
Hours into Survey	8.56	−2.45	−9.63**	−2.62	2.68*	−0.73	−2.38*
	[0.200]	[0.399]	[0.036]	[0.200]	[0.067]	[0.173]	[0.061]
Dependent variable: Mean	10.19	8.63	13.37	7.49	1.55	0.59	1.28
Hours into Survey: Mean	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Hours into Survey: SD	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Number of respondents	780	780	780	780	780	780	780
Observations	1,762	1,762	1,762	1,762	1,762	1,762	1,762

Note: Observations at respondent level, and regressions include sample fixed effects (i.e., country and Wave 1 and 2 in Liberia). Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table B.1
Heterogeneity by country in open ended questions question.

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following:				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Panel A. Liberia					
Hours into Survey	−0.001	−0.036	−0.037	−0.157**	−0.180
	[0.786]	[0.127]	[0.331]	[0.019]	[0.389]
Dependent variable: Mean	0.106	0.063	0.297	0.381	0.349
Hours into Survey: Mean	1.7	1.7	1.8	1.8	1.8
Hours into Survey: SD	1.2	1.2	1.2	1.2	1.2

(*continued on next page*)

Table B.1 (*continued*).

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following:				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Number of respondents	2,652	2,653	2,652	2,650	2,653
Observations	4,500	4,500	4,498	4,494	4,501
Panel B. Malawi					
Hours into Survey	0.004	−0.077	−0.122	−0.240**	−0.016
	[0.786]	[0.127]	[0.331]	[0.019]	[0.389]
Dependent variable: Mean	0.017	0.316	0.258	0.285	0.380
Hours into Survey: Mean	2.0	2.0	2.1	2.1	2.1
Hours into Survey: SD	0.8	0.8	0.8	0.8	0.8
Number of respondents	2,944	2,944	2,944	2,944	2,944
Observations	5,725	5,724	5,725	5,721	5,727

Note: Observations at respondent level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table B.2
Heterogeneity by country in fixed list questions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	=1 if item is selected (not skipped):								
	Livestock	Farm tools	Durable	Savings	Loans	Food expend	Non-durables	Shocks	Public goods
Panel A. Liberia									
Hours into Survey	−0.012	0.002	0.001	−0.002	0.001	−0.033***	−0.053**	−0.011	0.006
	[0.405]	[0.411]	[0.741]	[0.731]	[0.661]	[0.005]	[0.019]	[0.136]	[0.385]
Dependent variable: Mean	0.097	0.196	0.171	0.048	0.009	0.189	0.234	0.065	0.075
Hours into Survey: Mean	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8
Hours into Survey: SD	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.5
Number of respondents	2,653	2,653	2,653	2,653	2,653	2,653	2,653	2,653	2,566
Observations	49,511	94,521	90,020	54,012	62,397	166,537	49,511	72,016	23,094
Panel B. Malawi									
Hours into Survey	−0.002	−0.011	−0.001	−0.002	−0.001	−0.016***	−0.025**	−0.028	−0.014
	[0.405]	[0.411]	[0.741]	[0.731]	[0.661]	[0.005]	[0.019]	[0.136]	[0.385]
Dependent variable: Mean	0.057	0.119	0.179	0.071	0.028	0.214	0.261	0.180	0.028
Hours into Survey: Mean	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2
Hours into Survey: SD	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9
Number of respondents	2,941	2,941	2,941	2,944	2,944	2,944	2,944	2,944	2,783
Observations	85,320	113,760	122,353	60,033	76,314	200,410	62,986	94,508	25,047

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects and question-item level fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table B.3
Heterogeneity by country on total monetary values of aggregated categories.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total value of reported items for the following:										
	Livestock	Farm Tools	Durables	Savings	Loans	Food Expend	Non-durables	Public goods	Transfers received	Transfers given	Credit purchases
Panel A. Liberia											
Hours into Survey	−22.28	0.14	−3.04	−0.47	1.06	−6.05**	−4.10*	−0.15	−0.59*	−0.87**	−1.25
	[0.520]	[0.359]	[0.396]	[0.426]	[0.517]	[0.028]	[0.079]	[0.386]	[0.088]	[0.014]	[0.311]
Dependent variable: Mean	155.11	11.12	53.59	27.39	4.62	21.42	10.59	0.28	1.50	1.23	1.39
Hours into Survey: Mean	1.5	1.5	1.6	1.7	1.8	1.7	1.8	1.9	1.8	1.8	1.8
Hours into Survey: SD	1.3	1.6	1.3	1.2	1.2	1.8	1.8	2.2	1.2	1.2	1.2
Number of respondents	2,653	2,566	2,653	2,653	2,653	2,653	2,653	2,566	2,653	2,653	2,653
Observations	4,501	2,566	4,501	4,501	4,501	4,501	4,501	2,566	4,501	4,501	4,501
Panel B. Malawi											
Hours into Survey	−4.48	−3.86	15.58	−1.51	0.22	−2.41**	−1.08*	−0.01	−0.39*	−0.26**	−0.02
	[0.520]	[0.359]	[0.396]	[0.426]	[0.517]	[0.028]	[0.079]	[0.386]	[0.088]	[0.014]	[0.311]
Dependent variable: Mean	48.83	9.89	61.68	6.18	7.87	12.13	5.83	0.02	0.52	0.26	0.36
Hours into Survey: Mean	1.9	1.8	1.9	2.0	2.0	2.1	2.1	2.3	2.1	2.1	2.1
Hours into Survey: SD	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8
Number of respondents	2,941	2,783	2,941	2,944	2,944	2,944	2,944	2,783	2,944	2,944	2,944
Observations	5,688	2,783	5,688	5,725	5,451	5,726	5,726	2,783	5,727	5,727	5,727

Note: Observations at respondent level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table C.1
Heterogeneity by survey (Baseline or Endline) in open-ended questions.

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following:				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Panel A. Baseline surveys					
Hours into Survey	0.020	−0.076	−0.085	−0.267***	−0.043
	[0.348]	[0.201]	[0.212]	[0.010]	[0.207]
Dependent variable: Mean	0.067	0.204	0.382	0.494	0.414
Hours into Survey: Mean	2.0	2.0	2.0	2.0	2.0
Hours into Survey: SD	0.8	0.8	0.8	0.8	0.8
Number of respondents	4,877	4,875	4,874	4,870	4,879
Observations	4,877	4,875	4,874	4,870	4,879
Panel B. Endline surveys					
Hours into Survey	−0.010	−0.029	−0.061	−0.139***	−0.159
	[0.348]	[0.201]	[0.212]	[0.010]	[0.207]
Dependent variable: Mean	0.046	0.205	0.178	0.176	0.323
Hours into Survey: Mean	1.8	1.8	1.8	1.9	1.9
Hours into Survey: SD	1.2	1.2	1.2	1.2	1.2
Number of respondents	5,348	5,349	5,349	5,345	5,349
Observations	5,348	5,349	5,349	5,345	5,349

Note: Observations at respondent level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

Table C.2
Heterogeneity by survey (Baseline or Endline) in fixed list questions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	=1 if item is selected (not skipped):								
	Livestock	Farm tools	Durable	Savings	Loans	Food expend	Non-durables	Shocks	Public goods
Panel A. Baseline surveys									
Hours into Survey	−0.008	−0.003	0.008	0.005	0.002	−0.032**	−0.044**	−0.026	
	[0.243]	[0.355]	[0.172]	[0.257]	[0.355]	[0.011]	[0.018]	[0.106]	
Dependent variable: Mean	0.076	0.166	0.191	0.069	0.022	0.227	0.289	0.194	
Hours into Survey: Mean	1.9	1.8	1.9	2.0	2.0	1.9	2.0	2.0	
Hours into Survey: SD	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	
Number of respondents	4,840	4,840	4,840	4,877	4,877	4,878	4,878	4,875	
Observations	64,860	98,735	102,610	52,640	67,977	174,600	53,658	80,940	
Panel B. Endline surveys									
Hours into Survey	−0.005	−0.005	−0.012	−0.009	−0.002	−0.017**	−0.032**	−0.017	−0.002
	[0.243]	[0.355]	[0.172]	[0.257]	[0.355]	[0.011]	[0.018]	[0.106]	[0.404]
Dependent variable: Mean	0.068	0.144	0.162	0.053	0.018	0.180	0.212	0.070	0.050
Hours into Survey: Mean	1.6	1.6	1.7	1.8	1.8	1.8	1.9	2.0	2.0
Hours into Survey: SD	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Number of respondents	5,349	5,349	5,349	5,349	5,073	5,349	5,349	5,349	5,349
Observations	69,971	109,546	109,763	61,405	70,734	192,347	58,839	85,584	48,141

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects and question-item level fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

only one of the versions to each respondent, and imputing responses to the unasked questions (Herzog and Bachman (1981); Raghunathan and Grizzle (1995)). Another strategy is to replace ordinal questions with binary ones Dolnicar et al. (2011). However, each of these remedies comes with its own set of problems, either in terms of detail and measurement error, or in terms of cost.

While we have no easy fixes to recommend, an obvious remedial step would be to place the most important questions (for example, those about the primary outcomes in an RCT), as early as possible in the survey. Relatedly, it may also be good survey practice for enumerators to suggest taking a short break before they start asking important questions that are placed later in the survey. This may be an important consideration especially for interventions in which the primary outcome is sensitive (for example, intimate partner violence, which was placed at the end of these surveys for exactly this reason).[13] Researchers often choose to place such sensitive questions later in the survey to allow respondents some time to become familiar with the enumerator and with the survey, but this paper suggests that this consideration should be balanced against the risk of survey fatigue.

In general, it may make sense for enumerators to be trained to pay more attention to signs of fatigue and disengagement, and for survey protocols to have a set of remedial actions to take in such a scenario, like taking a break or playing a short game. Future research should identify such remedial actions.

[13] See Park et al. (2022) and Park and Kumar (2022) for related work on the pitfalls of measuring IPV in this and a related sample in Liberia.

Table C.3
Heterogeneity by survey type (baseline or endline) on total monetary values of aggregated categories.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total value of reported items for the following:										
	Livestock	Farm Tools	Durables	Savings	Loans	Food Expend	Non-durables	Public goods	Transfers received	Transfers given	Credit purchases
Panel A. Baseline surveys											
Hours into Survey	−15.61		6.40	−4.45	1.78	−4.65**	−2.50**		−0.36	−0.44**	−0.27*
	[0.212]		[0.287]	[0.295]	[0.229]	[0.046]	[0.050]		[0.107]	[0.041]	[0.063]
Dependent variable: Mean	51.24		46.06	18.16	6.60	16.93	8.31		0.83	0.71	0.54
Hours into Survey: Mean	1.8		1.8	2.0	2.0	1.9	2.0		2.0	2.0	2.0
Hours into Survey: SD	0.7		0.7	0.8	0.8	0.8	0.7		0.8	0.8	0.8
Number of respondents	4,840		4,840	4,877	4,878	4,878	4,878		4,879	4,879	4,879
Observations	4,840		4,840	4,877	4,878	4,878	4,878		4,879	4,879	4,879
Panel B. Endline surveys											
Hours into Survey	−11.42	−1.32	3.29	0.33	−0.53	−3.06**	−2.06**	−0.10	−0.59	−0.69**	−1.06*
	[0.212]	[0.140]	[0.287]	[0.295]	[0.229]	[0.046]	[0.050]	[0.127]	[0.107]	[0.041]	[0.063]
Dependent variable: Mean	136.08	10.48	69.01	13.11	6.21	15.57	7.57	0.14	1.05	0.67	1.06
Hours into Survey: Mean	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.1	1.8	1.9	1.9
Hours into Survey: SD	1.3	1.3	1.3	1.2	1.2	1.7	1.7	1.6	1.2	1.2	1.2
Number of respondents	5,349	5,349	5,349	5,349	5,074	5,349	5,349	5,349	5,349	5,349	5,349
Observations	5,349	5,349	5,349	5,349	5,074	5,349	5,349	5,349	5,349	5,349	5,349

Note: Observations at respondent level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table D.1
Survey time and probability of reporting an item in phone surveys (with Household FE).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of distinct items reported for the following:					=1 if item is selected (not skipped):			
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases	Savings	Loans	Food expend	Non-durables
Hours into Survey	0.081	−0.047	−0.145	−0.062	−0.199	0.012	−0.009	−0.090***	−0.124
	[1.000]	[1.000]	[1.000]	[1.000]	[0.888]	[1.000]	[1.000]	[0.010]	[0.160]
Dependent variable: Mean	0.074	0.394	0.200	0.175	0.255	0.140	0.031	0.216	0.351
Hours into Survey: Mean	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Hours into Survey: SD	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Number of respondents	610	610	610	610	610	780	780	780	780
Observations	1,592	1,592	1,592	1,592	1,592	18,678	24,654	63,059	20,083

Note: For columns 1–4, observations at respondent-question-item level, and regressions include country-sample fixed effects, question-item level fixed effects and household level fixed effects. Regressions drop singleton observations (there are 170 of these). For columns 5–9, observations at respondent level, and regressions include country-sample fixed effects. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table D.2
Survey time and the number of items reported in in-person surveys (with Household FE).

	(1)	(2)	(3)	(4)	(5)
	Number of distinct items reported for the following:				
	ROSCAs	VSLAs	Transfers received	Transfers given	Credit purchases
Hours into Survey	−0.013	−0.087**	−0.149**	−0.327***	−0.060
	[0.757]	[0.032]	[0.032]	[0.001]	[0.757]
Dependent variable: Mean	0.055	0.220	0.273	0.330	0.372
Hours into Survey: Mean	1.9	1.9	1.9	2.0	2.0
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0
Number of respondents	4,629	4,627	4,627	4,621	4,631
Observations	9,258	9,254	9,254	9,242	9,262

Note: Observations at respondent level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects and household level fixed effects. Regressions drop singleton observations (there are 966 of these). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Another implication from this paper is that, for those working with secondary data collected via long surveys, such as the LSMS or the DHS surveys, it may be useful to recognize that cross-country comparisons or even within country comparisons across survey waves may be complicated because of varying survey duration. It may be important to design panel surveys such that outcomes are measured at similar points in the survey over waves.

Finally, we note that in addition to the cognitive decline faced by respondents, enumerators are also human participants in a survey and may be constrained by mental bandwidth in the administration of long

Table D.3
Survey time and the probability of reporting an item in in-person surveys (with Household FE).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	=1 if item is selected (not skipped):							
	Livestock	Farm tools	Durable	Savings	Loans	Food expend	Non-durables	Shocks
Hours into Survey	−0.005	−0.003	−0.001	−0.002	0.002	−0.020***	−0.028**	−0.021***
	[0.710]	[0.822]	[1.000]	[0.847]	[0.757]	[0.001]	[0.023]	[0.001]
Dependent variable: Mean	0.072	0.154	0.176	0.060	0.020	0.203	0.249	0.130
Hours into Survey: Mean	1.7	1.7	1.8	1.9	1.9	1.9	1.9	2.0
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Number of respondents	5,594	5,594	5,594	5,597	5,597	5,597	5,597	5,597
Observations	134,831	208,281	212,373	114,045	138,711	366,947	112,497	166,524

Note: Observations at respondent-question-item level. Each regression is an IV regression, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). Regressions include country-sample fixed effects, question-item level fixed effects and household level fixed effects. ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

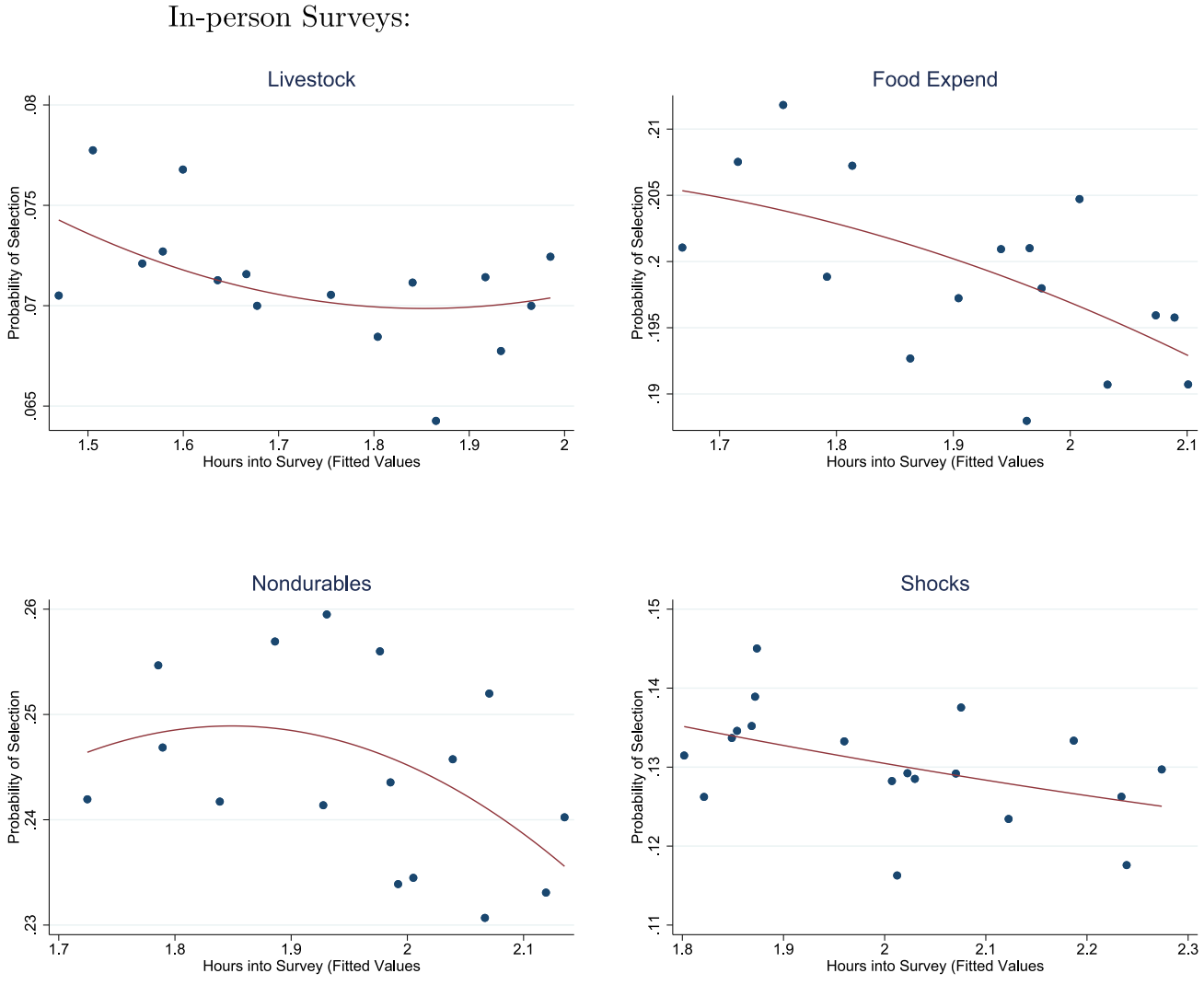

Fig. E.1. Probability of selection against the predicted time to reach the question.

surveys. In this paper, we have no way of disentangling the effects of fatigue on enumerators from those on respondents as both start and end the survey together. However, measuring these effects separately as well as identifying remedies should be a focus of future research.

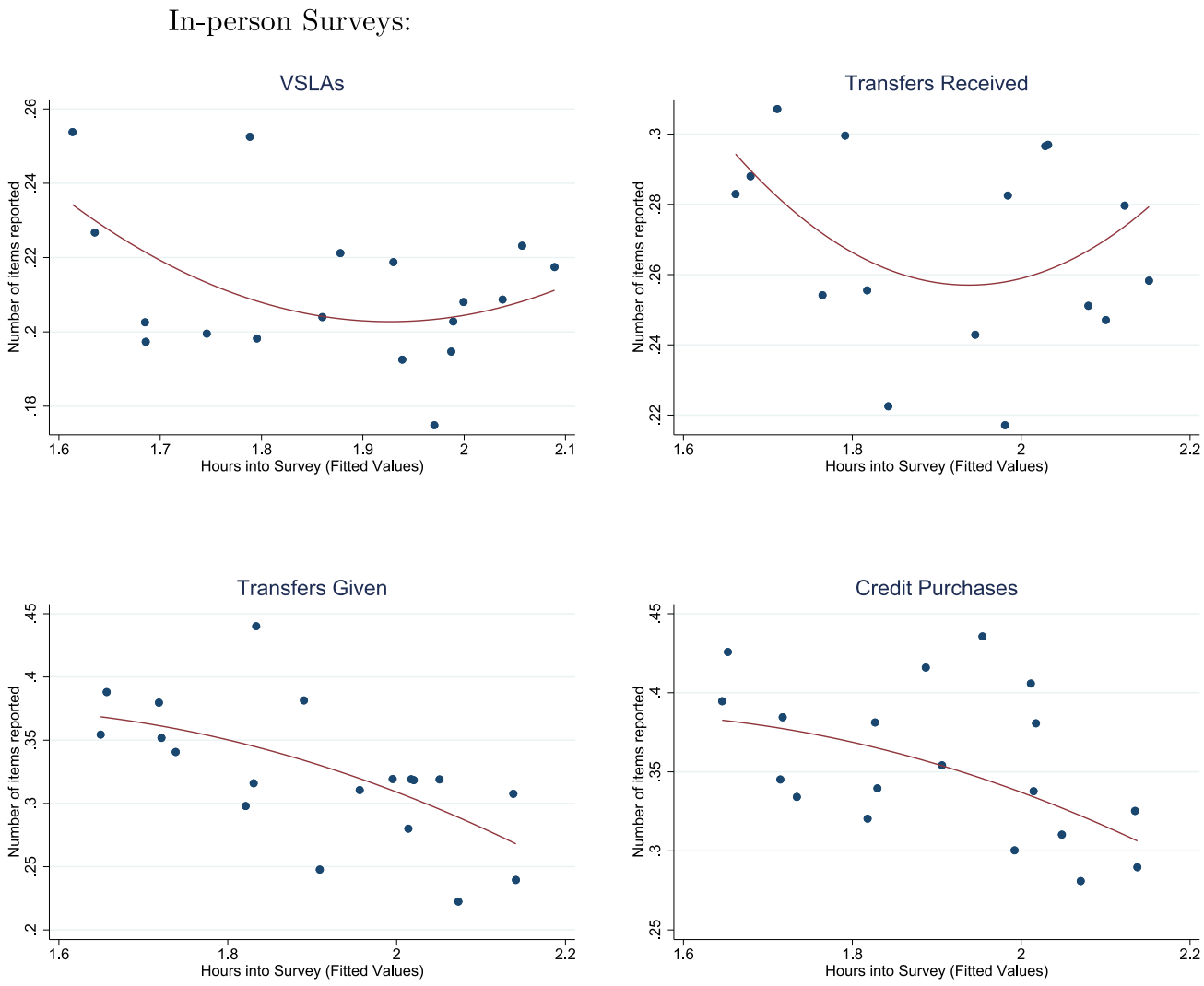

Fig. E.2. Number of items reported against the predicted time to reach the question.

Table F.1
Livestock.

	(1)	(2)	(3)	(4)	(5)
	=1 if item is selected (not skipped):				
	Goat	Pig	Chicken	Dog	Goat(local)
Hours into Survey	−0.025	−0.002	−0.040	−0.007	−0.001
	(0.263)	(0.900)	(0.114)	(0.752)	(0.974)
	[0.541]	[0.895]	[0.396]	[0.787]	[0.895]
Dependent variable: Mean	0.121	0.060	0.534	0.126	0.214
Hours into Survey: Mean	1.5	1.5	1.7	1.5	1.9
Hours into Survey: SD	1.2	1.2	1.0	1.2	0.8
Number of respondents	2,653	2,653	5,594	2,653	2,941
Observations	4,501	4,501	10,189	4,501	5,688

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened q-values in brackets.

Data availability

Data will be made available on request.

Appendix A. Main appendix figures and tables

See Figs. A.1–A.5 and Tables A.1–A.4.

Appendix B. Heterogeneity by country

Tables B.1–B.3.

Appendix C. Heterogeneity by survey type

Tables C.1–C.3.

Appendix D. Robustness to household fixed effects

Tables D.1–D.3.

Appendix E. Non-linearities in the relationship between survey time and the probability of skipping

See Figs. E.1 and E.2.

Appendix F. Analysis of fatigue on disaggregated categories

See Tables F.1–F.8.

Table F.2
Farm tools.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	=1 if item is selected (not skipped):									
	Handhoes	Cutlass	Shovels	Diggers	Axes	Filling Tools	Cans/Buckets	Pingalays	Knives	Hooks
Hours into Survey	−0.046	−0.006	0.014	0.015	−0.040	−0.011	−0.042	0.033	−0.031	0.034
	(0.011)	(0.777)	(0.452)	(0.201)	(0.086)	(0.504)	(0.072)	(0.118)	(0.185)	(0.190)
	[0.124]	[0.787]	[0.697]	[0.508]	[0.367]	[0.697]	[0.367]	[0.396]	[0.504]	[0.504]
Dependent variable: Mean	0.855	0.575	0.165	0.055	0.283	0.118	0.355	0.107	0.450	0.174
Hours into Survey: Mean	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.7	1.6
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.0	1.2
Number of respondents	5,594	5,594	5,594	5,594	5,594	5,594	5,594	2,653	5,594	2,653
Observations	10,189	10,189	10,189	10,189	10,189	10,189	10,189	4,501	10,189	4,501

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.3
Saving places.

	(1)	(2)	(3)	(4)
	=1 if item is selected (not skipped):			
	Saving group	Cash home	VSLA	Livestock
Hours into Survey	−0.025	0.002	−0.046	0.015
	(0.366)	(0.918)	(0.021)	(0.490)
	[0.559]	[0.895]	[0.148]	[0.697]
Dependent variable: Mean	0.193	0.193	0.175	0.078
Hours into Survey: Mean	1.7	1.9	1.9	2.0
Hours into Survey: SD	1.2	1.0	1.0	0.8
Number of respondents	2,653	5,597	5,597	2,944
Observations	4,501	10,226	10,226	5,725

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.4
Loan sources.

	(1)	(2)
	=1 if item is selected (not skipped):	
	Neighbors or friends	VSLA
Hours into Survey	−0.002	−0.009
	(0.901)	(0.571)
	[0.895]	[0.743]
Dependent variable: Mean	0.079	0.098
Hours into Survey: Mean	1.9	1.9
Hours into Survey: SD	1.0	1.0
Number of respondents	5,597	5,470
Observations	9,950	9,361

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.5
Food expenditures (Part-I).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	=1 if item is selected (not skipped):												
	Local rice	Imported rice	Maize/ Corn	Cassava roots	Cassava Flour	Sweet potatoes	Irish potatoes	Dried Beans	Ground-nut	Palm nuts	Palm oil	Tomatoes	Onions
Hours into Survey	−0.001	−0.074	0.012	0.007	−0.016	0.027	−0.020	−0.017	−0.031	−0.042	−0.043	−0.020	−0.057
	(0.946)	(0.011)	(0.604)	(0.696)	(0.313)	(0.270)	(0.135)	(0.459)	(0.171)	(0.107)	(0.352)	(0.339)	(0.054)
	[0.895]	[0.124]	[0.754]	[0.787]	[0.553]	[0.543]	[0.396]	[0.697]	[0.487]	[0.390]	[0.559]	[0.559]	[0.278]
Dependent variable: Mean	0.069	0.451	0.192	0.096	0.091	0.294	0.060	0.192	0.187	0.086	0.520	0.525	0.524
Hours into Survey: Mean	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.7	1.7	1.9	1.9
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.0	1.0
Number of respondents	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	2,653	2,653	5,597	5,597
Observations	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	4,501	4,501	10,227	10,227

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.6
Food expenditures (Part-II).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	=1 if item is selected (not skipped):												
	Okra	Bananas	Oranges	Eggs	Goat meat	Chicken	Dried Fish	Fresh Fish	Salt	Sugar	Breads	Other Veg.	Vita/Maggi
Hours into Survey	−0.040	−0.022	−0.007	−0.031	−0.019	−0.021	−0.029	−0.029	−0.026	−0.061	−0.062	−0.034	−0.002
	(0.076)	(0.245)	(0.657)	(0.170)	(0.219)	(0.360)	(0.309)	(0.223)	(0.130)	(0.029)	(0.007)	(0.162)	(0.949)
	[0.367]	[0.508]	[0.787]	[0.487]	[0.508]	[0.559]	[0.553]	[0.508]	[0.396]	[0.167]	[0.124]	[0.487]	[0.895]
Dependent variable: Mean	0.179	0.121	0.082	0.198	0.076	0.261	0.635	0.335	0.904	0.362	0.186	0.261	0.868
Hours into Survey: Mean	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.7
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2
Number of respondents	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	2,653
Observations	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227	4,501

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.7
Non-durables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	=1 if item is selected (not skipped):							
	Transport-ation	Air-time	Home supplies	Personal hygiene	Cleaning supplies for home	Kitchen supplies	Cosmetics	Barber
Hours into Survey	−0.123***	−0.020	−0.044	0.003	−0.011	−0.061	−0.066	−0.040
	(0.000)	(0.490)	(0.082)	(0.931)	(0.695)	(0.011)	(0.014)	(0.098)
	[0.003]	[0.697]	[0.367]	[0.895]	[0.787]	[0.124]	[0.128]	[0.367]
Dependent variable: Mean	0.473	0.407	0.234	0.620	0.300	0.187	0.270	0.214
Hours into Survey: Mean	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Number of respondents	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597
Observations	10,227	10,227	10,227	10,227	10,227	10,227	10,227	10,227

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

Table F.8
Shocks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	=1 if item is selected (not skipped):												
	Flood	Drought	Land erosion	Food inflation	Loss of belongings	Lack of inputs for crops	Crop disease	Pesticide	Lack of inputs for livestock	Livestock disease	Low crop/ livetock prices	Severe illness in family	Death in household
Hours into Survey	−0.006	−0.049	−0.018	−0.064	−0.024	−0.058	−0.026	−0.059	−0.011	−0.021	0.000	−0.063*	−0.046
	(0.812)	(0.024)	(0.348)	(0.023)	(0.094)	(0.008)	(0.214)	(0.017)	(0.439)	(0.128)	(0.979)	(0.001)	(0.004)
	[0.826]	[0.148]	[0.559]	[0.148]	[0.367]	[0.124]	[0.508]	[0.134]	[0.697]	[0.396]	[0.895]	[0.052]	[0.124]
Dependent variable: Mean	0.308	0.164	0.125	0.387	0.063	0.181	0.163	0.252	0.071	0.061	0.061	0.125	0.083
Hours into Survey: Mean	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Hours into Survey: SD	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Number of respondents	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597	5,597
Observations	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224	10,224

Note: Observations at respondent-question-item level. Reported are TOT estimates, where elapsed time into survey (in hours) is instrumented with the randomized module order (Versions A–F). ***, **, and * represent significance at 1%, 5%, and 10%, respectively, based on the false discovery rate (FDR) sharpened *q*-values in brackets.

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