

Online Appendix

(Not for publication)

Figure A.1

Panel A. Trial E: Low Difficulty Version

This month you have £1,000 set aside to pay off some of your debts. How will you split this payment across your debts to minimise interest and fees?

	Balance	Interest rate	Minimum payment	Fee for missed minimum payment	This month I will pay off...
Credit card	£1,040.55	22.5% APR	£0.00	£0	£0.00
Overdraft	£466.74	45.9% APR	£0.00	£0	£120.96
Revolving loan	£879.04	49.5% APR	£0.00	£0	£879.04

Best outcome (interest):	£28.81	Worst outcome (interest and fees):	£45.57
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Panel B. Trial E: Medium Difficulty Version

This month you have £1,000 set aside to pay off some of your debts. How will you split this payment across your debts to minimise interest and fees?

	Balance	Interest rate	Minimum payment	Fee for missed minimum payment	This month I will pay off...
Credit card	£1,040.55	22.5% APR	£26.01	£12	£26.01
Overdraft	£466.74	45.9% APR	£0.00	£0	£94.95
Revolving loan	£879.04	49.5% APR	£19.78	£48	£879.04

Best outcome (interest):	£29.19	Worst outcome (interest and fees):	£93.57
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Panel C. Trial E: High Difficulty Version

This month you have £1,000 set aside to pay off some of your debts. How will you split this payment across your debts to minimise interest and fees?

	Balance	Interest rate	Minimum payment	Fee for missed minimum payment	This month I will pay off...
Credit card	£1,040.55	22.5% APR	£26.01	£12	£26.01
Overdraft	£466.74	45.9% APR	£0.00	£0	£94.95
Revolving loan	£879.04	40.9% p.a. (49.5% APR)	£19.78	£48	£879.04

Best outcome (interest):	£29.19	Worst outcome (interest and fees):	£93.57
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Figure **A.2**. Explanation Steps in Robo-advising with Education

Step 1: Pay off minimum payments.
The fee for a missed minimum payment is typically higher than the interest that could be saved elsewhere.



Missing a minimum payment could affect your credit score.

Step 2: Order by APR. APR stands for "annual percentage rate" and measures the interest rate over a year.



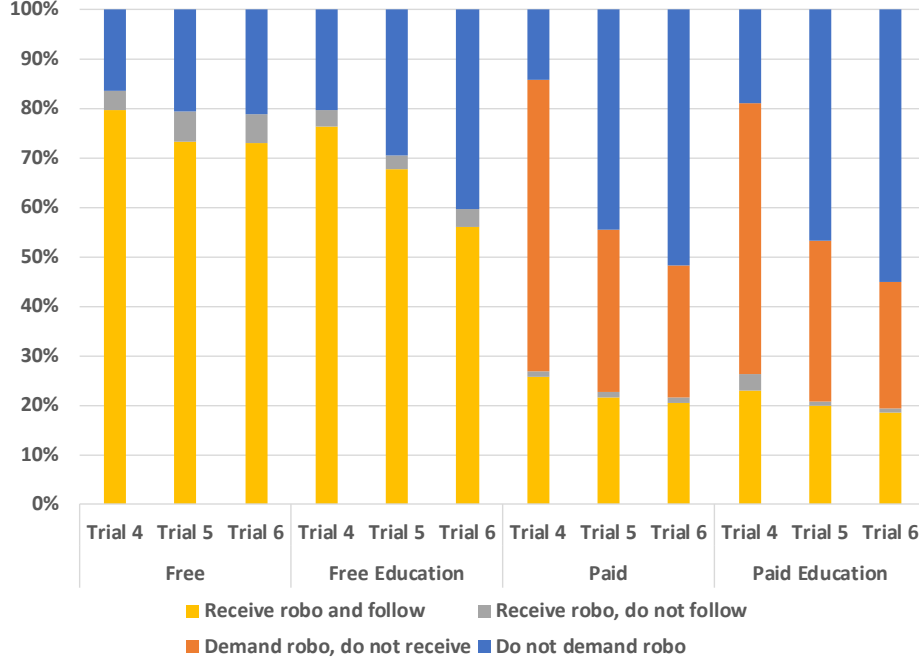
This is the only measure that helps you to compare the overall cost of different debts.

Step 3: Pay off the debts with the highest APR first and work down



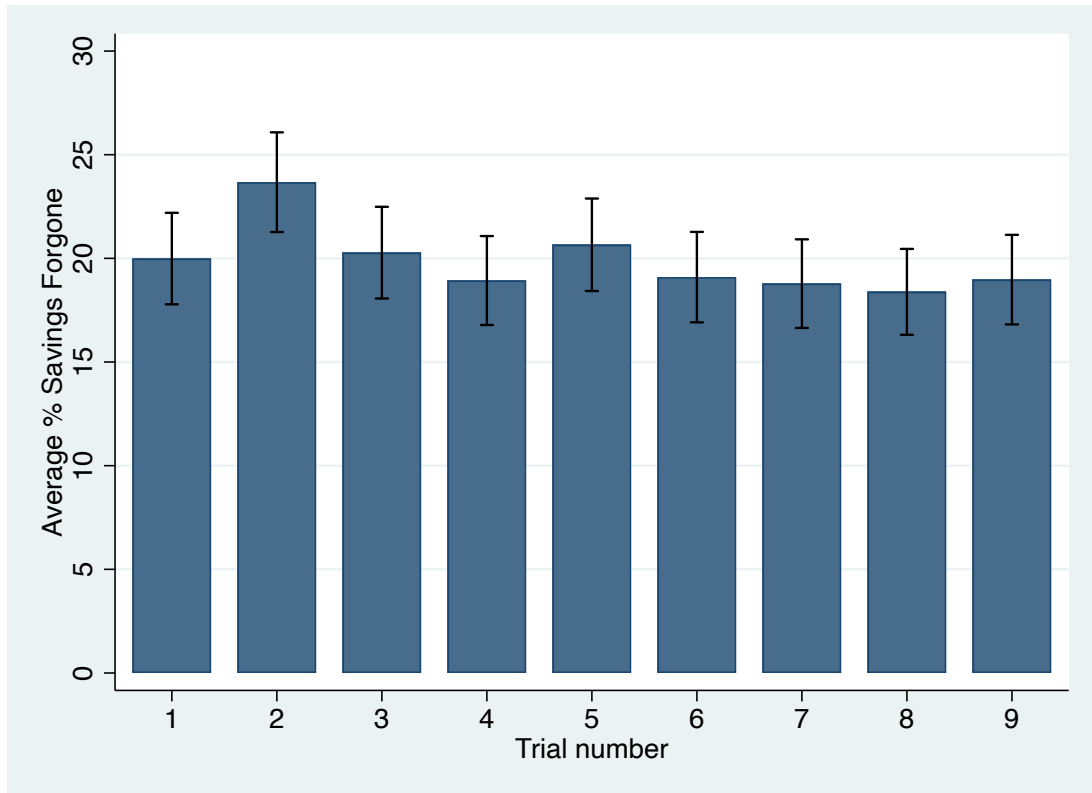
Debts with higher APRs incur more interest per pound borrowed.

Figure A.3: Demand for and Utilization of Robo-Advice



This figure reports the fraction of subjects who: (a) receive and follow robo-advice (yellow bar), (b) receive but do not follow robo-advice (gray bar), (c) demand but do not receive robo-advice (orange bar), and (d) do not demand robo-advice (blue bar). The percentages in the four categories sum to 100%. We report the fractions separately for the four treatment arms, and separately for trials 4, 5, and 6. The sample is limited to those subjects for whom we are able to estimate the regressions in columns (5) and (6) of Table 1. The fewer subjects whose WTP is above the randomly chosen cost for the paid robo-advising tool, the larger the size of the orange bar relative to the yellow plus gray bars. We observe decreased demand for paid robo-advice in trials 5 and 6, but also higher WTP conditional on positive demand.

Figure A.4: Performance of Control Group across Trials



This figure reports the average percentage of savings forgone for the control group within each of the nine trials. The point estimates and 95% confidence intervals are obtained by regressing Actual Savings Forgone (%) on a separate dummy variable for each trial number and omitting the constant term. The average across all subjects is 19.86%. Standard errors are clustered at the subject level.

Table A.1. Time Spent on Experiment

Number of trials where % Savings Forgone is worse than median random allocation	Number of subjects	Average duration (minutes)	Average % Savings Forgone
0	179	25.62	5.77
1	187	26.14	14.03
2	156	24.85	23.86
3	91	24.82	32.21
4	44	19.17	39.25
5	18	18.19	45.10
6	14	21.15	48.75
7	2	9.51	61.24
8	1	11.55	92.22
9	0		
Total	692	24.72	19.86

For each subject in the control group, we count the number of times that their repayment allocation results in % Savings Forgone that is greater than the median outcome obtained when repayment allocations are assigned at random. The minimum number of times possible is zero and the maximum is nine. We report the number of subjects that fall into each of the ten bins, the average amount of time spent completing the experiment, and the average % Savings Forgone across the nine trials.

Table A.2. Summary Statistics

Sample	N	% Subjects with error	Average % savings forgone	Average pound savings forgone	Average pound savings forgone scaled by total debt	% Subjects savings forgone greater than median of random allocation
All Trials	10,269	68.5%	21.9%	5.93	0.29%	20.6%
All Trials with Error	7,034	100.0%	32.0%	8.65	0.42%	30.0%
Low Difficulty	3,423	62.0%	24.5%	4.84	0.22%	16.6%
Medium Difficulty	3,423	68.1%	17.9%	5.77	0.28%	18.0%
High Difficulty	3,423	75.4%	23.3%	7.17	0.37%	27.1%
2 Loans	3,397	63.9%	26.3%	6.84	0.27%	25.7%
3 Loans	3,457	69.3%	19.0%	2.46	0.14%	20.4%
4 Loans	3,415	72.3%	20.5%	8.53	0.46%	15.6%
A Low	358	57.3%	26.3%	0.06	0.01%	12.6%
A Medium/High	771	62.4%	29.7%	0.06	0.01%	16.5%
B Low	366	68.3%	28.7%	0.25	0.01%	24.9%
B Medium/High	774	68.9%	2.6%	0.41	0.01%	24.9%
C Low	379	52.8%	34.4%	18.52	0.74%	31.9%
C Medium/High	749	66.8%	42.0%	21.01	0.84%	39.4%
D Low	391	45.8%	14.4%	0.76	0.09%	9.5%
D Medium/High	759	60.1%	9.0%	2.49	0.28%	26.4%
E Low	382	65.2%	14.9%	2.50	0.10%	9.2%
E Medium/High	757	81.6%	5.6%	3.62	0.15%	18.8%
F Low	401	70.8%	31.9%	1.95	0.05%	19.2%
F Medium/High	767	79.4%	39.5%	2.41	0.07%	28.0%
G Low	370	74.3%	21.5%	2.80	0.29%	9.5%
G Medium/High	762	86.2%	9.4%	7.03	0.72%	5.2%
H Low	349	68.5%	18.0%	5.38	0.14%	6.3%
H Medium/High	757	76.5%	11.1%	8.67	0.22%	11.0%
I Low	427	56.4%	29.7%	10.54	0.52%	24.4%
I Medium/High	750	63.9%	36.8%	13.07	0.65%	33.3%

This table reports summary statistics for all of the loan repayment problems completed during the Pre-Intervention stage. N refers to the number of subject-trials. We report the fraction of subject-trials that involve a suboptimal allocation (“error”), average % Savings Forgone, average savings forgone expressed in pounds, average savings forgone expressed in pounds scaled by the total debt in the loan repayment problem, and the fraction of subject-trials where the outcome is worst than the median outcome associated with all feasible random allocations.

Table A.3. Variable Definitions

Variable	Definition
% Savings Forgone	= Actual interest plus late fees minus minimum possible interest plus late fees scaled by the range in possible interest plus late fees; measured in percentage points; varies between 0 and 100.
WTP	= Willingness to pay for access to the paid robo-advice tool; measured in percentage points (where WTP in pounds is scaled by the difference between the maximum and minimum possible interest plus late fees); varies between 0 and 100.
WTP of Treated	= WTP when the subject received paid robo-advice, and zero otherwise; varies between 0 and 100.
% Net Savings Forgone	= % Savings Forgone + WTP of Treated; WTP of Treated captures cost of paid robo-advice for subset of subjects who seek and receive it; % Net Savings Forgone is equal to % Savings Forgone for all other subjects; because % Savings Forgone (%) and WTP each vary between 0 and 100, % Net Savings Forgone varies between 0 and 200.
Demand Robo-Advice	= 1 if subject seeks access to free or paid robo-advice tool in given trial (during intervention phase); true for 68.07% of subjects in free or paid robo-advice treatment arm during intervention phase.
Receive Robo-Advice	= 1 if subject seeks access to free robo-advice or seeks access to paid-robo advice and sets WTP above the randomly chosen cost; true for 48.94% of all subjects in free or paid robo-advice treatment arm and for 71.90% of subjects with Demand Robo-Advice equal to one.
Change Allocation	= 1 if subject receives recommended allocation from free or paid robo-advice tool but then changes the allocation; only defined for subjects for whom Receive Robo-Advice equals one; true for 5.69% of these subjects.
Prefer Human	= 1 if subject answers “Pay more” when asked “Would you be willing to pay more/less/same for person who is debt advisor?”; true for 32.85% of subjects who were asked the question; question limited to subjects for whom Receive Robo-Advice equals one at least once during intervention phase; = 0 if subject answers “Pay same” (55.34%) or “Pay less” (11.81%).
Trust in Algo	= 1 if subject answers “Automated service” or “Both” when asked “If you were facing problems with paying back multiple debts, would you prefer to work with Automated Service, Human advisor, or Both?”; true for 53.36% of subjects.
Trust in Algo2	= 1 if subject answers “Human advisor” (46.64%) when asked “If you were facing problems with paying back multiple debts, would you prefer to work with Automated service, Human advisor, or Both?”; = 2 if subject answers “Both” (33.24%); = 3 if subject answers “Automated service” (20.13%).
Low Financial Literacy	= 1 if subject answers between 0 and 3 of the 5 financial literacy questions correctly; true for 45.81% of the subjects.
Medium Financial Literacy	= 1 if subject answers 4 of the 5 financial literacy questions correctly; true for 36.90% of subjects.
High Financial Literacy	= 1 if subject answers all 5 financial literacy questions correctly; true for 17.29% of subjects.
Recent Debt	= 1 if subject claims to have used any source of debt in the past 12 months; true for 79.75% of subjects.
Low Debt Experience	= 1 if subject reports having between 0 and 1 sources of debt in the past 12 months; true for 62.90% of subjects.
Medium Debt Experience	= 1 if subject reports having 2 sources of debt in the past 12 months; true for 22.90% of subjects.
High Debt Experience	= 1 if subject reports having between 3 and 7 sources of debt in the past 12 months; true for 14.20% of subjects.
Low Numeracy	= 1 if subject answers between 1 and 7 when asked “How confident do you feel working with numbers when you need to in everyday life? Answer on a scale of 1 to 10”; true for 49.14% of subjects.

Table A.3. Variable Definitions

Medium Numeracy	= 1 if subject answers 8 when asked “How confident do you feel working with numbers when you need to in everyday life? Answer on a scale of 1 to 10”; true for 20.68% of subjects.
High Numeracy	= 1 if subject answers 9 or 10 when asked “How confident do you feel working with numbers when you need to in everyday life? Answer on a scale of 1 to 10”; true for 30.18% of subjects.
Low Financial Confidence	= 1 if subject answers between 1 and 7 when asked “How confident do you feel managing your money? Answer on a scale of 1 to 10”; true for 41.60% of subjects.
Medium Financial Confidence	= 1 if subject answers 8 or 9 when asked “How confident do you feel managing your money? Answer on a scale of 1 to 10”; true for 41.46% of subjects.
High Financial Confidence	= 1 if subject answers 10 when asked “How confident do you feel managing your money? Answer on a scale of 1 to 10”; true for 16.94% of subjects.
Low General Knowledge	= 1 if subject answers between 0 and 3 of the 5 general knowledge questions correctly; true for 57.72% of subjects.
Medium General Knowledge	= 1 if subject answers 4 of the 5 general knowledge questions correctly; true for 27.29% of subjects.
High General Knowledge	= 1 if subject answers all 5 of the general knowledge questions correctly; true for 15.19% of subjects.
Low Patience	= 1 if subject answers between 1 and 6 when asked “Are you willing to give something up today to benefit later? Answer on a scale of 1 to 10”; true for 37.07% of subjects.
Medium Patience	= 1 if subject answers 7 or 8 when asked “Are you willing to give something up today to benefit later? Answer on a scale of 1 to 10”; true for 44.35% of subjects.
High Patience	= 1 if subject answers 9 or 10 when asked “Are you willing to give something up today to benefit later? Answer on a scale of 1 to 10”; true for 18.58% of subjects.
Low Risk Aversion	= 1 if subject answers between 1 and 3 when asked “Are you a person that takes risks with finances? Answer on a scale of 1 to 10”; true for 42.30% of subjects.
Medium Risk Aversion	= 1 if subject answers between 4 and 6 when asked “Are you a person that takes risks with finances? Answer on a scale of 1 to 10”; true for 35.12% of subjects.
High Risk Aversion	= 1 if subject answers between 7 and 10 when asked “Are you a person that takes risks with finances? Answer on a scale of 1 to 10”; true for 22.58% of subjects.
Male	= 1 if subject identifies as Male; true for 48.9% of subjects.
Education Categories	= “General Certificate of Secondary Education (GCSE)” (12.88%), “A level” (17.67%), “Higher Education” (10.96%), “Degree” (36.49%), “Higher degree” (21.41%), and “Other including Overseas” (0.58%).
Age Categories	= 18-24 (11.36%), 25-34 (19.19%), 35-44 (17.85%), 45-54 (17.24%), 55-64 (22.99%), 65-74 (10.17%), and 75+ (1.20%).
Ethnicity Categories	= “Asian” (4.38%), “Black” (2.22%), “Mixed” (1.52%), “Other” (0.79%), “Prefer not to say” (0.26%), “White” (50.95%), and not answered (39.88%); missing values arise because ethnicity question was not included in Wave 2.
Language Categories	= Response to question about whether English is first language: “English” (72.86%), “Not English” (8.50%), and not answered (18.64%).
Paid Treatment	= 1 if subject is assigned to either paid robo-advice treatment; true for 39.32% of subjects.
Education Treatment	= 1 if subject is assigned to free or paid robo-advice treatment that includes education; true for 39.59% of subjects.
Experimental Wave	= 1 for 40.17% of subjects; 2 for 39.88% of subjects; 3 for 19.95% of subjects.

Table A.4. Demand for and Utilization of Robo-Advice

	Free Robo				Free Robo with Education				Both Free Treatments			
	Trial 4	Trial 5	Trial 6	Trials 4-6	Trial 4	Trial 5	Trial 6	Trials 4-6	Trial 4	Trial 5	Trial 6	Trials 4-6
Receive robo and follow	79.6%	73.2%	72.9%	75.2%	76.4%	67.7%	56.1%	66.7%	78.0%	70.5%	64.6%	71.0%
Receive robo, do not follow	3.8%	6.1%	5.8%	5.3%	3.1%	2.8%	3.6%	3.2%	3.5%	4.5%	4.7%	4.2%
Demand robo, do not receive	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Do not demand robo	16.6%	20.7%	21.3%	19.5%	20.5%	29.4%	40.3%	30.1%	18.5%	25.0%	30.7%	24.7%
	Paid Robo				Paid Robo with Education				Both Paid Treatments			
	Trial 4	Trial 5	Trial 6	Trials 4-6	Trial 4	Trial 5	Trial 6	Trials 4-6	Trial 4	Trial 5	Trial 6	Trials 4-6
Receive robo and follow	25.6%	21.6%	20.5%	22.5%	23.0%	19.8%	18.5%	20.4%	24.3%	20.7%	19.5%	21.5%
Receive robo, do not follow	1.3%	1.1%	1.0%	1.1%	3.1%	0.8%	0.8%	1.6%	2.2%	1.0%	0.9%	1.4%
Demand robo, do not receive	58.8%	32.7%	26.7%	39.4%	54.9%	32.5%	25.7%	37.7%	56.9%	32.6%	26.2%	38.6%
Do not demand robo	14.3%	44.6%	51.9%	36.9%	19.0%	46.9%	55.1%	40.3%	16.6%	45.7%	53.4%	38.6%

This table reports the fraction of subjects who: (a) receive and follow robo-advice, (b) receive but do not follow robo-advice, (c) demand but do not receive robo-advice, and (d) do not demand robo-advice. The percentages in the four categories sum to 100%. We report the fractions separately for the four treatment arms, and separately for trials 4, 5, and 6. The sample is limited to those subjects for whom we are able to estimate the regressions in columns (5) and (6) of Table 1. We plot these values in Figure A.3. We also report statistics that combine the treatments with and without education.

Table A.5. 2SLS Estimates: TOT Effects of Free Robo-Advising

	Second Stage		First Stage	
Dependent variable: <i>% Savings Forgone</i>	(1)	(2)	(3)	(4)
Robo-Advice	-18.16*** (-18.24)	-18.67*** (-18.28)		
Education Treatment	0.49 (0.87)	0.57 (0.98)	-0.11*** (-6.06)	-0.10*** (-5.91)
Exposed Treatment			0.80*** (65.03)	0.78*** (59.10)
Problem FE	✓	✓	✓	✓
Education Category FE	✓	✓	✓	✓
Age Category FE	✓	✓	✓	✓
Controls from Table 1		✓		✓
F-statistic			4,228.3	3492.2
N	6,231	5,841	6,231	5,841

Table A.5 reports the estimated coefficients in the following 2SLS specification:

$$Treatment_{i,p} = \alpha_p + \beta_1 Exposed\ Treatment_{i,p} + X_i\gamma + \epsilon_{i,p},$$

$$\% Savings\ Forgone_{i,p} = \alpha_p + \beta_2 \widehat{Treatment}_{i,p} + X_i\gamma + \epsilon_{i,p},$$

where $\% Savings\ Forgone_{i,p}$ is defined in Section 2.2, X_i includes the set of individual-level characteristics indicated in Table 1 of the main paper in columns (2) and (4), α_p is a set of fixed effects for each problem by difficulty level. $Robo-Advice_{i,p}$ is a dummy that equals one if subject i obtained robo-advising in trial p , and zero otherwise (TOT). $Exposed-Treatment_{i,p}$ is a dummy that equals 1 if subject i was randomly exposed to the possibility of obtaining robo-advising, and zero otherwise. All columns include observations from trials 4-6, when robo-advising was administered, for subjects in the free robo-advising condition. We report t-statistics below estimated coefficients. Standard errors are clustered at the subject level.

Table A.6. WTP in Trial 4 versus Pre-Intervention Performance

Panel A.

WTP Range	N	Average WTP	Average Savings Forgone Pre-Intervention
0	159	0	15.12
(0,5]	72	2.57	22.71
(5,10]	113	7.45	22.74
(10,15]	85	11.99	22.54
(15,20]	119	17.44	22.13
(20,30]	93	25.17	24.27
(30,40]	108	34.95	25.07
(40,50]	83	45.94	27.03
(50,65]	54	56.44	29.05
(65,100]	142	90.40	29.44
All	1,028	29.12	23.46

Panel B.

Financial Literacy	N	Average WTP	Average Savings Forgone Pre-Intervention
Lowest Tercile	531	34.15	28.20
Middle Tercile	356	26.29	19.96
Highest Tercile	141	17.31	14.42
All	1,028	29.12	23.46

This table includes two panels. The sample is limited to subjects who seek paid robo-advice in trial 4. Panel A reports average WTP and the average percent savings forgone during trials 1-3 for each of the financial literacy terciles. The spread in WTP is 16.84 percentage points and the spread in average percent savings forgone is 13.78. However, WTP is always above average percent savings forgone. Panel B reports average WTP and the average percent savings forgone during trials 1-3 for different ranges of WTP. The correlation between WTP and percent savings forgone in trials 1-3 is positive (0.1830), but the spread in WTP greatly exceeds the spread in average past performance.