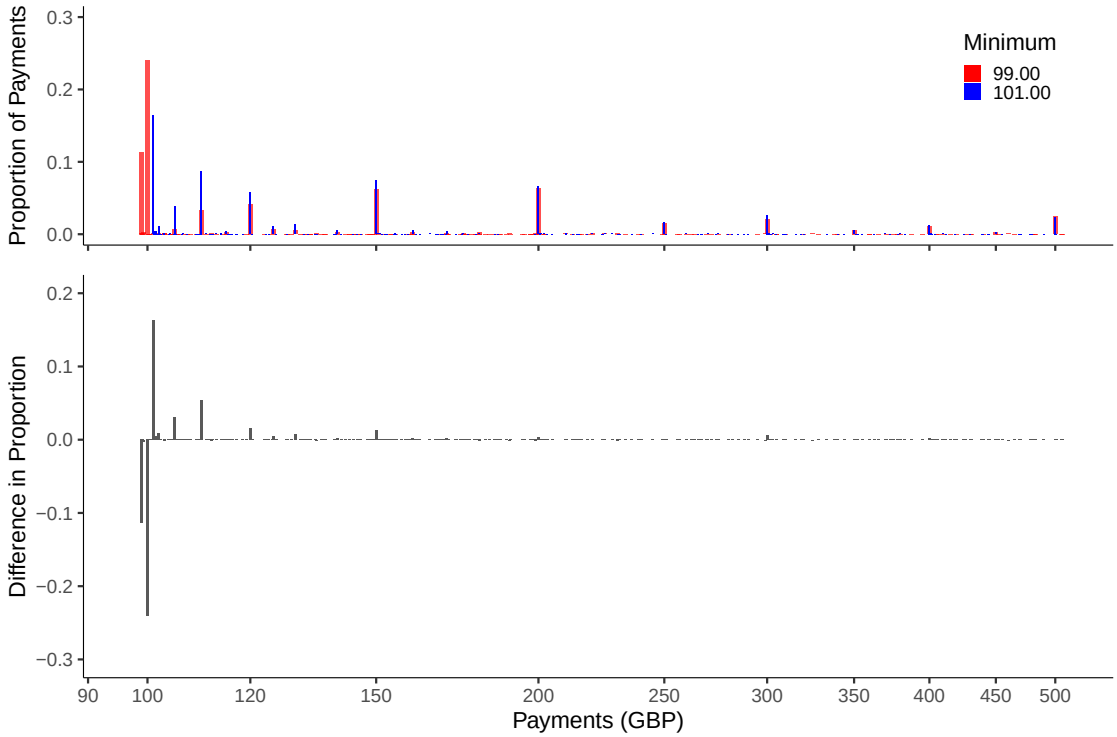
Online Only Appendix accompanying:

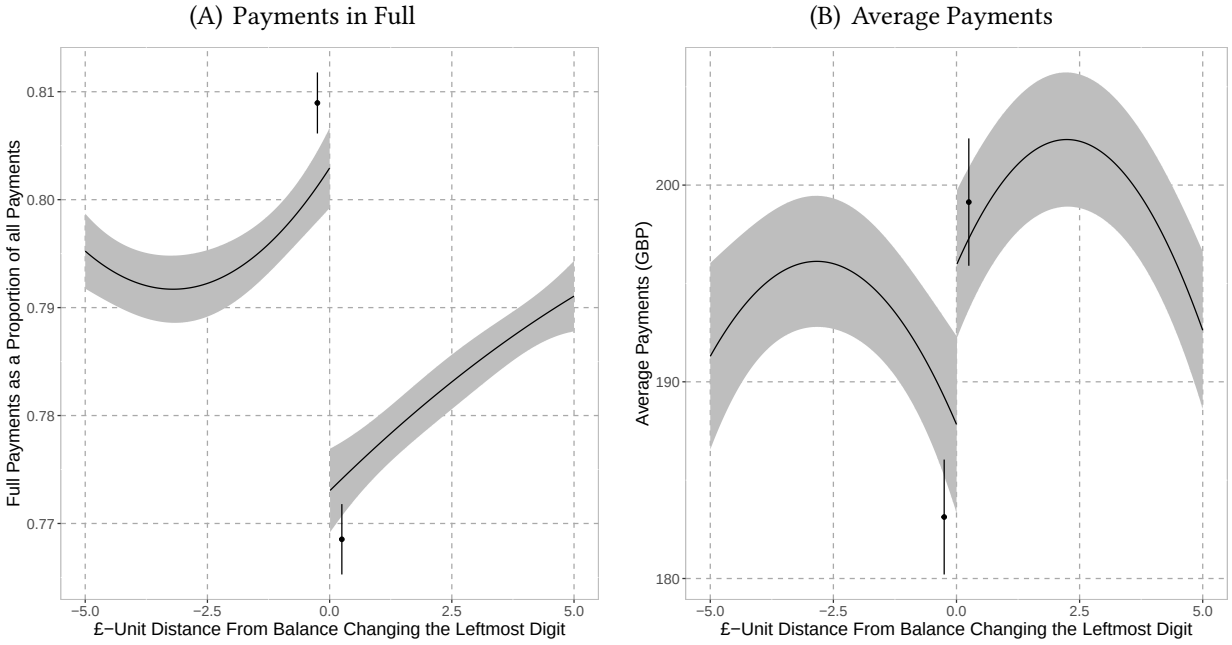
Sakaguchi, H., Gathergood, J. and N. Stewart (2025) "Round number preferences and left-digit bias: Evidence from credit card repayments", forthcoming *Management Science*

Figure A1: Comparison of Payment Distributions for Minimums at £99 and £101



Note: Figure illustrates the distribution of payments for card-months with minimum payments of exactly £99 and card months with minimum payments of exactly £101. In the top panel, the red lines represent the distribution of payments when a minimum is £99.00 while the blue lines represent the distribution of payments when a minimum is £101.00. The red lines are slightly wider than the blue lines just for making a comparison visually easier. The bottom panel shows the difference between the red and the blue lines at a given payment amount (i.e., the height of a blue line minus the height of a red line). For illustration purpose, the x-axis is truncated at 500 (the 85th percentile value). The figure illustrates how a minimum payment crossing £100 influences payment behavior. In the top panel, the red lines represent the distribution of payments when a minimum is £99 (thus a payment at £100 is still available) while the blue lines represent the distribution of payments when a minimum is £101 (thus a payment at £100 is no longer available). The bottom panel shows the difference between the red and the blue lines in the top panel (i.e., the height of a blue line minus that of a red line at each payment amount on the x-axis). As seen in the figure, when a minimum is £99 (red lines), about 13% of payments are £99 (i.e., exactly at the minimum) and about 28% of payments cluster at £100. However, when a minimum is £101 and the option to pay £100 is out of reach, about 20% of payments move to £101 (i.e., exactly at the minimum), and payments at £105 and £110 also increase approximately by absolute 4-6%. The baseline sample restricted to minimums due of £99 or £101.

Figure A2: Changes in Balance Left-Digits



Note: Panel A illustrates the proportion of full payments by distance from a balance changing the leftmost digit. Panel B illustrates the average payment by distance from distance from a balance changing the leftmost digit. Both plots show fits from a model with a discontinuity at zero and quadratic functions either side (Table 3 and Table 4), together with simple means for the small £0.5 bins immediately above and below zero.

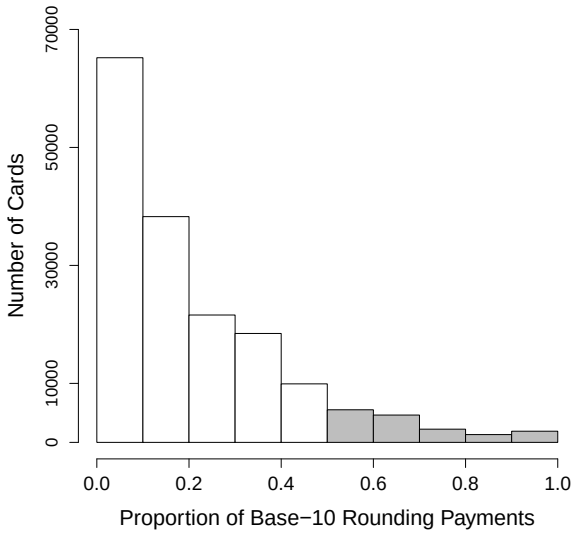


Figure A3: Distribution of Cards by Proportion of Base-10 Rounding Payments (Baseline Sample)

Note: Figure illustrates a binned frequency scatterplot of the proportion of payments made on a card that are at minimum payments rounded-up to the nearest base-10 value. Bin width is 0.1. Grey shaded bars represent cards that round-up payments to the nearest base-10 value in half of more repayments.

Table A1: Sample Selection

Criterion	Cards		Card Months		Payment	
	N	%	N	%	Total in GBP	%
Unrestricted Sample	1,159,480	100	23,524,898	100	8,233,866,394	100
(A) Baseline Sample						
Drop if						
No Balance	1,058,275	91.3	17,313,117	73.6	8,129,251,781	98.7
Pays via Automatic Payment	821,641	70.9	11,133,293	47.3	5,311,554,219	64.5
Pays below Minimum	795,189	68.6	10,434,416	44.4	5,298,509,169	64.4
(B) Additional Two-Card Sample						
Retain if						
Having Two Cards in the Month	89,906	7.8	909,168	3.9	364,202,302	4.4
(C) Additional Three-Card Sample						
Retain if						
Having Three Cards in the Month	11,826	1	94,902	0.4	31,654,120	0.4

Note: Table describes sample restrictions that generate samples used in analysis. The unrestricted sample is the cleaned sample as received from Argus. Sample restrictions are applied at the card-month level. Sample A Baseline Sample is the main sample used in analysis. Samples B and C restrict the baseline sample to observations for which two card-months, or three card-months can be joined to the same card holder in the same month. Cards column shows the number of cards retained at each step. Card Months column shows the number of card-months retained at each step. Payment Total in GBP column shows the total value of payments made in the sample retained at each step.

Table A2: Baseline Sample Summary Statistics

	Mean	S.D.	25th	Median	75th
Minimum	37.43	55.28	8.88	21.56	42.58
Balance	1,715.02	2,308.26	297.32	852.97	2,163.74
Credit limit	5,709.77	3,909.18	2,750.00	4,850.00	7,850.00
Utilization	0.35	0.34	0.07	0.21	0.61
Merchant APR	0.17	0.07	0.16	0.18	0.2
Cash APR	0.24	0.05	0.21	0.25	0.28
Monthly purchase	436.88	841.78	0.00	139.05	534.62
Payment	507.79	987.53	65.00	180.00	529.43

Note: Table reports summary statistics for the baseline sample. The unit of observation is an card-month. Minimum is the minimum payment due in the card-month. Utilization is balance divided by credit limit. APR denotes Annualized Percentage Rate. Payment is the payment amount made in the card-month.

Table A3: Minimum Payment Thresholds and Proportion of Payments at Next Round Number: OLS Regression Discontinuity Estimates (Baseline Sample)

IV	Payment=20 around 10	Payment=30 around 20	Payment=40 around 30
Intercept	0.046 ***	0.038 ***	0.04 ***
	(57.65)	(46.22)	(48.42)
Dummy($x > 0$)	-0.006 ***	0.004 ***	0.006 ***
	(-6.28)	(3.65)	(5.77)
$x(x < 0)$	0.004 ***	0.002 ***	0.002 ***
	(17.36)	(8.22)	(9.55)
$x(x > 0)$	0.002 ***	0.003 ***	0.005 ***
	(8.83)	(9.11)	(14.18)
IV	Payment=50 around 40	Payment=60 around 50	Payment=70 around 60
Intercept	0.12 ***	0.06 ***	0.048 ***
	(71.95)	(41.55)	(35.55)
Dummy($x > 0$)	0.005 **	0.024 ***	0.014 ***
	(2.14)	(11.76)	(7.53)
$x(x < 0)$	0.002 ***	0.005 ***	0.004 ***
	(4.08)	(14.38)	(11.2)
$x(x > 0)$	0.006 ***	0.007 ***	0.007 ***
	(8.52)	(11.81)	(9.37)
IV	Payment=80 around 70	Payment=90 around 80	Payment=100 around 90
Intercept	0.053 ***	0.028 ***	0.233 ***
	(32.91)	(17.71)	(56.2)
Dummy($x > 0$)	0.016 ***	0.014 ***	0.012 **
	(6.91)	(6.06)	(2.54)
$x(x < 0)$	0.002 ***	0.002 ***	0.003 **
	(5.04)	(5.1)	(2.47)
$x(x > 0)$	0.006 ***	0.005 ***	0.004 ***
	(8.25)	(9.31)	(3.46)

Note: Table reports Ordinary Least Squares (OLS) regression estimates. Dependent variable is a dummy variable denoting payment amount at the next round number (base-10). Independent variable x is the difference between the minimum payment due and the nearest base-10 round number. Model includes a constant term. Card-months where a minimum is exactly the threshold were excluded from the regressions. The standard errors were corrected for clustering by cards and calendar months. *p<0.1; **p<0.05; ***p<0.01

Table A4: Minimum Payment Thresholds and Payment Amounts:
OLS Regression Discontinuity Estimates (Baseline Sample)

IV	Payment=20 around 10	Payment=30 around 20	Payment=40 around 30
Intercept	5.171 ***	5.371 ***	5.404 ***
	(690.12)	(786.63)	(663.18)
Dummy($x > 0$)	0.138 ***	0.067 ***	0.017 **
	(19.03)	(8.94)	(2.34)
$x(x < 0)$	0.012 ***	-0.012 ***	0.002
	(6.91)	(-6.37)	(0.96)
$x(x > 0)$	0.009 ***	-0.002	-0.007 ***
	(5.07)	(-1)	(-3.13)
IV	Payment=50 around 40	Payment=60 around 50	Payment=70 around 60
Intercept	5.363 ***	5.379 ***	5.412 ***
	(481.84)	(449.37)	(454.73)
Dummy($x > 0$)	0.045 ***	0.043 ***	0.037 ***
	(4.64)	(3.91)	(2.83)
$x(x < 0)$	-0.006 **	-0.002	-0.001
	(-2.52)	(-1.01)	(-0.51)
$x(x > 0)$	-0.005 **	0.002	-0.002
	(-1.98)	(1.02)	(-0.71)
IV	Payment=80 around 70	Payment=90 around 80	Payment=100 around 90
Intercept	5.462 ***	5.458 ***	5.5 ***
	(433.08)	(532.62)	(521.62)
Dummy($x > 0$)	0.017	0.044 ***	0.017
	(1.39)	(3.9)	(1.24)
$x(x < 0)$	0.006 **	-0.005	0
	(2.03)	(-1.63)	(-0.13)
$x(x > 0)$	-0.002	-0.003	0.001
	(-0.8)	(-0.74)	(0.3)

Note: Table reports Ordinary Least Squares (OLS) regression estimates. Independent variable x is the difference between the minimum payment due and the nearest base-10 round number. Model includes a constant term. Card-months where a minimum is exactly the threshold were excluded from the regressions. *p<0.1; **p<0.05; ***p<0.01

Table A5: Change in Left Digit and Minimum Payments

IV	Linear	Quadratic	Cubic
Intercept	0.022 ***	0.023 ***	0.020 ***
	(42.79)	(33.41)	(27.74)
Dummy($x > 0$)	0.000	0.000	0.004 ***
	(0.58)	(0.21)	(4.16)
$x^3(x < 0)$			0.000 ***
			(-5.87)
$x^2(x < 0)$		0.000	-0.003 ***
		(1.37)	(-5.97)
$x(x < 0)$	0.000 ***	0.000	-0.006 ***
	(-2.58)	(0.76)	(-6.11)
$x^3(x > 0)$			0.000 ***
			(-3.46)
$x^2(x > 0)$		0.000	0.002 ***
		(0.94)	(3.64)
$x(x > 0)$	0.000 **	-0.001	-0.004 ***
	(-2.46)	(-1.51)	(-3.83)

Note: Table reports Ordinary Least Squares (OLS) regression estimates. Dependent variable is a dummy variable denoting minimum payment. Independent variable x is the difference between the minimum payment due and the nearest base-10 round number. Model includes a constant term. Card-months where a balance is exactly the threshold were excluded from the regressions. The standard errors were corrected for clustering by cards and calendar months. *p<0.1; **p<0.05; ***p<0.01

Table A6: Payment Discontinuity Estimates on Rounding Payers Sample

IV	(1)	(2)	(3)
$Dummy(Min > 10)$	5.239	4.886	−4.995
	(8.366)	(8.366)	(10.766)
$Dummy(Min > 20)$	6.118	5.361	21.992**
	(7.463)	(7.463)	(9.350)
$Dummy(Min > 30)$	23.668***	23.122***	39.258***
	(7.054)	(7.054)	(8.593)
$Dummy(Min > 40)$	11.303*	11.037*	−6.542
	(6.665)	(6.665)	(7.747)
$Dummy(Min > 50)$	16.756**	16.380**	28.824***
	(7.334)	(7.334)	(8.238)
$Dummy(Min > 60)$	34.664***	34.130***	39.577***
	(8.280)	(8.280)	(9.391)
$Dummy(Min > 70)$	20.297**	20.095**	20.430**
	(9.103)	(9.102)	(10.216)
$Dummy(Min > 80)$	60.429***	60.237***	55.333***
	(10.328)	(10.327)	(11.449)
$Dummy(Min > 90)$	12.774	13.231	−8.162
	(10.417)	(10.416)	(11.374)
$Dummy(Min > 100)$	47.614***	47.807***	39.529***
	(10.802)	(10.801)	(11.745)
$Dummy(Min > 110)$	6.847	6.593	−1.076
	(11.702)	(11.701)	(12.795)
$Dummy(Min > 120)$	43.771***	43.381***	53.522***
	(13.257)	(13.256)	(14.306)
$Dummy(Min > 130)$	21.212	20.570	9.316
	(14.848)	(14.847)	(15.851)
$Dummy(Min > 140)$	31.991**	31.550**	33.723**
	(15.695)	(15.694)	(16.707)
$Dummy(Min > 150)$	61.764***	62.065***	41.627**
	(16.385)	(16.384)	(17.503)
$Dummy(Min > 160)$	51.083***	50.826***	45.845**
	(19.534)	(19.532)	(20.665)
$Dummy(Min > 170)$	89.738***	90.293***	117.265***
	(23.799)	(23.797)	(24.830)
$Dummy(Min > 180)$	87.611***	88.547***	66.592**
	(26.882)	(26.880)	(28.009)
$Dummy(Min > 190)$	−30.622	−29.912	−68.850**
	(27.079)	(27.077)	(28.809)
7th degree minimum polynomial	Y	Y	Y
Card characteristics controls	Y	Y	Y
Calendar month FE		Y	Y
Card FE			Y
Observations	261,540	261,540	261,540
R^2	0.031	0.031	0.138
Adjusted R^2	0.031	0.031	0.076
Residual Std. Error	464.171 (df = 261509)	464.119 (df = 261487)	453.231 (df = 244009)
F Statistic	278.660*** (df = 30; 261509)		

Note: Regressions were conducted on card-months where the minimum is less than £200 (the 95th percentile) in the rounding payers sample. The negative coefficient estimate for $Dummy(Min > 190)$ is due to payments at £200 sharply increasing after the threshold of £190, decreasing the proportion of larger payments. *p<0.1; **p<0.05; ***p<0.01

Table A7: Payment Discontinuity Estimates on Rounding Payers Sample (Quintic Form)

IV	(1)	(2)	(3)
$Dummy(Min > 10)$	3.271	2.914	8.631
	(7.624)	(7.624)	(9.801)
$Dummy(Min > 20)$	7.077	6.221	12.897
	(6.354)	(6.355)	(8.451)
$Dummy(Min > 30)$	26.280***	25.749***	26.298***
	(5.806)	(5.806)	(7.359)
$Dummy(Min > 40)$	13.260**	13.104**	−12.055*
	(5.999)	(5.998)	(7.121)
$Dummy(Min > 50)$	16.813**	16.549**	31.369***
	(6.527)	(6.527)	(7.522)
$Dummy(Min > 60)$	32.306***	31.787***	47.744***
	(7.343)	(7.343)	(8.521)
$Dummy(Min > 70)$	16.189**	15.865**	30.069***
	(7.984)	(7.983)	(9.213)
$Dummy(Min > 80)$	55.834***	55.412***	63.446***
	(8.782)	(8.782)	(10.065)
$Dummy(Min > 90)$	9.668	9.891	−3.724
	(8.707)	(8.707)	(9.824)
$Dummy(Min > 100)$	47.146***	47.196***	41.100***
	(9.266)	(9.265)	(10.285)
$Dummy(Min > 110)$	9.725	9.506	−1.278
	(10.547)	(10.546)	(11.673)
$Dummy(Min > 120)$	49.839***	49.702***	52.476***
	(11.878)	(11.877)	(13.052)
$Dummy(Min > 130)$	28.546**	28.305**	7.342
	(12.921)	(12.920)	(14.043)
$Dummy(Min > 140)$	37.958***	37.914***	29.537**
	(13.364)	(13.363)	(14.498)
$Dummy(Min > 150)$	63.318***	63.805***	32.705**
	(14.004)	(14.003)	(15.185)
$Dummy(Min > 160)$	45.707***	45.228***	29.715*
	(16.073)	(16.072)	(17.437)
$Dummy(Min > 170)$	77.652***	77.522***	95.955***
	(18.512)	(18.511)	(19.902)
$Dummy(Min > 180)$	73.652***	73.707***	50.280**
	(22.025)	(22.023)	(23.659)
$Dummy(Min > 190)$	−32.614	−32.073	−54.883**
	(25.745)	(25.743)	(27.377)
7th degree minimum polynomial	Y	Y	Y
Card characteristics controls	Y	Y	Y
Calendar month FE		Y	Y
Card FE			Y
Observations	261,540	261,540	261,540
R^2	0.031	0.031	0.138
Adjusted R^2	0.031	0.031	0.076
Residual Std. Error	464.170 (df = 261512)	464.118 (df = 261490)	453.238 (df = 244012)
F Statistic	309.581*** (df = 27; 261512)		

Note: Regressions were conducted on card-months where the minimum is less than £200 (the 95th percentile) in the rounding payers sample. The negative coefficient estimate for $Dummy(Min > 190)$ is due to payments at £200 sharply increasing after the threshold of £190, decreasing the proportion of larger payments. *p<0.1; **p<0.05; ***p<0.01

Table A8: Payment Discontinuity Estimates on Rounding Payers Sample (Cubic Form)

IV	(1)	(2)	(3)
$Dummy(Min > 10)$	6.247	5.902	18.523**
	(6.825)	(6.825)	(8.912)
$Dummy(Min > 20)$	7.838	6.984	16.784**
	(6.295)	(6.295)	(8.297)
$Dummy(Min > 30)$	24.950***	24.413***	23.469***
	(5.604)	(5.604)	(7.266)
$Dummy(Min > 40)$	11.005**	10.840**	−18.037***
	(5.418)	(5.417)	(6.680)
$Dummy(Min > 50)$	14.223**	13.948**	24.012***
	(5.819)	(5.818)	(6.883)
$Dummy(Min > 60)$	30.043***	29.514***	40.733***
	(6.873)	(6.873)	(8.016)
$Dummy(Min > 70)$	14.776*	14.445*	25.273***
	(7.819)	(7.818)	(8.999)
$Dummy(Min > 80)$	55.585***	55.163***	61.990***
	(8.778)	(8.777)	(10.047)
$Dummy(Min > 90)$	10.715	10.942	−1.436
	(8.625)	(8.624)	(9.779)
$Dummy(Min > 100)$	49.529***	49.589***	47.174***
	(8.857)	(8.856)	(9.975)
$Dummy(Min > 110)$	13.271	13.067	8.492
	(9.738)	(9.737)	(10.956)
$Dummy(Min > 120)$	54.414***	54.296***	65.272***
	(10.668)	(10.667)	(11.938)
$Dummy(Min > 130)$	33.494***	33.273***	21.468*
	(11.620)	(11.619)	(12.778)
$Dummy(Min > 140)$	42.751***	42.727***	43.035***
	(12.192)	(12.190)	(13.388)
$Dummy(Min > 150)$	67.159***	67.662***	43.595***
	(13.300)	(13.299)	(14.506)
$Dummy(Min > 160)$	47.861***	47.391***	35.650**
	(15.884)	(15.882)	(17.265)
$Dummy(Min > 170)$	76.893***	76.760***	93.354***
	(18.492)	(18.490)	(19.873)
$Dummy(Min > 180)$	68.765***	68.800***	35.336
	(21.306)	(21.304)	(22.842)
$Dummy(Min > 190)$	−43.165*	−42.666*	−84.787***
	(22.751)	(22.750)	(24.444)
7th degree minimum polynomial	Y	Y	Y
Card characteristics controls	Y	Y	Y
Calendar month FE		Y	Y
Card FE			Y
Observations	261,540	261,540	261,540
R^2	0.031	0.031	0.138
Adjusted R^2	0.031	0.031	0.076
Residual Std. Error	464.169 (df = 261513)	464.117 (df = 261491)	453.242 (df = 244013)
F Statistic	321.459*** (df = 26; 261513)		

Note: Regressions were conducted on card-months where the minimum is less than £200 (the 95th percentile) in the rounding payers sample. The negative coefficient estimate for $Dummy(Min > 190)$ is due to payments at £200 sharply increasing after the threshold of £190, decreasing the proportion of larger payments. *p<0.1; **p<0.05; ***p<0.01

Table A9: Comparison between Rounding Payers and Other Payers

	Persistent Rounding Payers	Other Payers
Prop. Missed Payments	0.03	0.06
Mean Charge-off Rate	0.02	0.01
Mean Minimum	64.83	40.90
Mean Balance	3177.92	1705.56
Mean Credit Limit	5097.87	5637.75
Mean Utilization	0.67	0.36
Mean Merchant APR	0.20	0.17
Mean Cash APR	0.25	0.24
Mean Monthly Purchase	53.50	428.20
Mean Payment	129.23	486.18

Note: Table reports summary statistics for persistent rounding payers and other payers. The unit of observation is an card-month. Minimum is the minimum payment due in the card-month. Utilization is balance divided by credit limit. APR denotes Annualized Percentage Rate. Payment is the payment amount made in the card-month. The sample includes missed payments in addition to the baseline sample.

Table A10: Example Interest Costs Under Different Rounding Bases

(A) Mean Balance	Exact-Min	Base-1	Base-5	Base-10	Base-50	Base-100
Interests Charged	1,847.30	1,718.91	1,398.86	1,107.50	386.23	154.98
Months to Clear Balance	254	236	191	134	36	16

(B) Median Balance	Exact-Min	Base-1	Base-5	Base-10	Base-50	Base-100
Interests Charged	509.31	455.56	326.98	241.79	32.80	13.81
Months to Clear Balance	147	135	106	67	11	5

Note: Starting Balance and merchant APR are in (A) the mean balance of £1,413.56 and 17.46%, in (B) the median balance of £474 and 17.95%. We calculate the minimum payment due according the the formula, $Max(\$5, Balance \times 1\% + Interest)$. We assume no cash advance being used. The balance less than £5 is treated as clearing the balance.

Table A11: Example Interest and Costs with 50% Rounding

(A) Mean Balance	Exact-Min	73 Min:26 Base10	50 Min:50 Base10
Interests Charged	1,847.30	1,538.24	1,364.34
	[1,847.30, 1,847.30]	[1,472.34, 1,604.99]	[1,306.34, 1,424.36]
Months to Clear Balance	254	200	172
	[254, 254]	[189, 210]	[163, 180]

(B) Median Balance	Exact-Min	73 Min:26 Base10	50 Min:50 Base10
Interests Charged	509.31	378.77	315.81
	[509.31, 509.31]	[343.48, 414.35]	[288.65, 346.58]
Months to Clear Balance	147	108	89
	[147, 147]	[99, 117]	[82, 97]

Note: Starting Balance and merchant APR are in (A) the mean balance of £1,413.56 and 17.46%, in (B) the median balance of £474 and 17.95%. We calculate the minimum payment due according the the formula, $Max(\$5, Balance \times 1\% + Interest)$. We assume no cash advance being used. The balance less than £5 is treated as clearing the balance.

Table A12: Example Interest and Costs Under Different Rounding Bases Incorporating Missed Payments

(A) Mean Balance	Exact-Min	Base-1	Base-5
Interests Charged	2,015.04	1,874.71	1,513.35
	[1,896.11, 2,183.68]	[1,761.91, 2,033.65]	[1,417.21, 1,653.95]
Fees Charged	60.60	56.15	45.17
	[30.00, 100.00]	[25.00, 95.00]	[15.00, 80.00]
Interests + Fees	2,075.64	1,930.86	1,558.52
	[1,931.18, 2,274.26]	[1,791.71, 2,121.49]	[1,438.88, 1,727.19]
Prop. of Missed Payments	0.045	0.045	0.045
	[0.023, 0.071]	[0.021, 0.072]	[0.016, 0.076]
Months to Clear Balance	270	250	200
	[261, 283]	[241, 262]	[193, 210]
	Base-10	Base-50	Base-100
Interests Charged	1,196.85	419.37	166.29
	[1,114.58, 1,313.96]	[386.23, 490.71]	[154.98, 203.63]
Fees Charged	32.58	9.48	4.10
	[10.00, 60.00]	[0.00, 25.00]	[0.00, 15.00]
Interests + Fees	1,229.44	428.84	170.39
	[1,128.84, 1,368.60]	[386.23, 515.03]	[154.98, 218.46]
Prop. of Missed Payments	0.046	0.047	0.045
	[0.015, 0.082]	[0.000, 0.116]	[0.000, 0.158]
Months to Clear Balance	142	39	17
	[135, 150]	[36, 44]	[16, 20]

(B) Median Balance	Exact-Min	Base-1	Base-5
Interests Charged	529.07	472.32	338.54
	[511.41, 558.51]	[456.73, 498.60]	[327.08, 361.30]
Fees Charged	30.73	28.25	22.05
	[10.00, 55.12]	[10.00, 55.00]	[5.00, 45.00]
Interests + Fees	559.80	500.57	360.59
	[521.56, 612.30]	[466.62, 548.55]	[332.08, 401.85]
Prop. of Missed Payments	0.040	0.041	0.041
	[0.013, 0.072]	[0.015, 0.077]	[0.009, 0.082]
Months to Clear Balance	151	139	108
	[148, 157]	[135, 144]	[106, 112]
	Base-10	Base-50	Base-100
Interests Charged	246.13	34.72	14.74
	[241.79, 263.59]	[32.80, 44.22]	[13.81, 21.34]
Fees Charged	13.97	2.31	1.05
	[0.00, 35.00]	[0.00, 10.00]	[0.00, 5.00]
Interests + Fees	260.10	37.03	15.79
	[241.79, 291.02]	[32.80, 55.09]	[13.81, 26.34]
Prop. of Missed Payments	0.041	0.037	0.034
	[0.000, 0.096]	[0.000, 0.154]	[0.000, 0.167]
Months to Clear Balance	68	11	5
	[67, 72]	[11, 13]	[5, 6]

Note: Starting Balance and merchant APR are in (A) the mean balance of £1,413.56 and 17.46%, in (B) the median balance of £474 and 17.95%. We calculate the minimum payment due according the the formula, $Max(\$5, Balance \times 1\% + Interest)$. We assume no cash advance being used. The balance less than £5 is treated as clearing the balance. At each time point, the probability of missed payment is a function of the minimum payment due, with a base rate of 3.6% plus 0.06% per £1 of the minimum payment. 95% confidence intervals shown in square brackets.

Table A13: Example Interest and Costs for Two-Cards Under Different Rounding Bases Incorporating Missed Payments

(A) Mean Balance	Exact-Min	Base-1	Base-5
Interests Charged	7,324.12	6,949.28	5,893.26
	[6,921.88, 7,868.22]	[6,558.72, 7,453.86]	[5,541.34, 6,355.52]
Fees Charged	129.44	121.66	101.05
	[75.00, 195.00]	[65.00, 185.00]	[50.00, 160.00]
Interests + Fees	7,453.56	7,070.94	5,994.31
	[7,006.30, 8,049.06]	[6,635.67, 7,625.99]	[5,602.04, 6,506.06]
Prop. of Missed Payments	0.064	0.064	0.065
	[0.038, 0.091]	[0.037, 0.092]	[0.036, 0.096]
Months to Clear Balance	330	308	252
	[318, 343]	[297, 321]	[243, 263]
Payment Type2	Base-10	Base-50	Base-100
Interests Charged	4,993.52	2,573.51	1,124.13
	[4,696.14, 5,409.86]	[2,407.73, 2,824.26]	[1,039.29, 1,289.60]
Fees Charged	78.50	33.76	14.74
	[35.00, 130.00]	[5.00, 70.00]	[0.00, 40.00]
Interests + Fees	5,072.03	2,607.27	1,138.87
	[4,739.25, 5,530.43]	[2,418.58, 2,888.34]	[1,039.29, 1,324.62]
Prop. of Missed Payments	0.067	0.075	0.073
	[0.033, 0.105]	[0.015, 0.141]	[0.000, 0.171]
Months to Clear Balance	189	72	32
	[181, 199]	[67, 79]	[29, 36]

(B) Median Balance	Exact-Min	Base-1	Base-5
Interests Charged	3,628.65	3,365.80	2,673.88
	[3,473.21, 3,839.36]	[3,217.40, 3,569.32]	[2,552.25, 2,841.51]
Fees Charged	90.66	84.30	67.07
	[45.00, 145.00]	[40.00, 135.00]	[30.00, 115.00]
Interests + Fees	3,719.31	3,450.10	2,740.96
	[3,526.85, 3,972.24]	[3,265.93, 3,694.85]	[2,587.64, 2,944.94]
Prop. of Missed Payments	0.057	0.057	0.057
	[0.031, 0.086]	[0.030, 0.088]	[0.027, 0.092]
Months to Clear Balance	259	239	191
	[251, 268]	[232, 249]	[185, 198]
Payment Type	Base-10	Base-50	Base-100
Interests Charged	2,133.09	665.61	268.55
	[2,032.72, 2,282.54]	[625.32, 751.88]	[254.24, 317.51]
Fees Charged	48.39	13.05	5.81
	[15.00, 90.00]	[0.00, 35.00]	[0.00, 20.00]
Interests + Fees	2,181.48	678.66	274.36
	[2,054.02, 2,360.14]	[625.32, 785.50]	[254.24, 338.10]
Prop. of Missed Payments	0.058	0.060	0.057
	[0.023, 0.100]	[0.000, 0.139]	[0.000, 0.176]
Months to Clear Balance	135	35	16
	[130, 141]	[32, 38]	[15, 18]

Note: Starting balances are the mean and median balances summed over both cards in the two-card sample. We calculate the minimum payment due according the the formula, $Max(\$5, Balance \times 1\% + Interest)$. We assume no cash advance being used. The balance less than £5 is treated as clearing the balance. At each time point, the probability of missed payment is a function of the minimum payment due, with a base rate of 3.6% plus 0.06% per £1 of the minimum payment. If a card misses a payment, a 26% probability is applied to the other card held in the same month missing a payment. 95% confidence intervals shown in square brackets.

B1 Additional Analysis of Round Number Payments

B1.1 Payment Patterns Over Time and Across Cards

We extend the analysis to consider payment patterns over time and across multiple cards held by an individual. Results indicate that the propensity to choose round number payment amounts is persistent within-person over time and within-person across cards.

B1.1.1 Payment Patterns Over Time

If the choices of round number values are an individual trait, we would expect to see persistence in round number value choices at the card level. To explore this, Table B3 illustrates the persistence of round number payments at the card level over time. The sample is restricted to observations in which the card is retained in the baseline sample in at least two consecutive months. Table B3 tabulates in rows the percentage of observations where the partial payment takes a last-digit £ value of zero at time t (where t is a month in the data period) and in columns the percentage of observations where the partial payment takes a last-digit £ value of zero at $t + 1$ (where $t + 1$ is the next calendar month in the data period). Results show that round number payments are highly persistent: approximately 87% of cards making a round number payment continue to make a round number payment in the next month; approximately 65% of cards making a non-round number payment continue to make a non-round number payment in the next month.

Table B4 extends this analysis by showing the top-10 patterns of six consecutive payments. To do so, the sample was restricted to cards-months where the card holder made six or more consecutive partial payments.[29] The "support" column reports the percentage of cards showing each pattern in six consecutive payments.[30] Results show that the top-10 patterns of six consecutive payments are dominated by round number payments. All payment sequences shown in the table are a combination of round numbers, except payments at £25 (which is a common floor minimum-payment amount). The most common patterns are fixed payments of £100 (approximately 6% of cards), fixed payments of £50 (approximately 4% of cards), and fixed payments of £200 (approximately 2% of cards). These payment patterns are all the result of repeated, manual monthly choices over repayment amounts (as the sample is restricted to manual repayments).

B1.1.2 Payments Across Multiple Cards

If round number value choices are an individual trait, we would also expect to observe a strong positive correlation in round number payments across multiple cards held by a single individual in a sample of card-months in which the individual has an opportunity to make a round number payment on each card. To explore this, Table B5 shows proportion of card-months in the baseline sample in which individuals make all last-£-digit zero payments and all last-£-digit non-zero payments across two or three cards in the same month. The sample is restricted to card-months for which we can match two or three cards to an individual in the data.

[29] If one card has multiple sequences of six or more consecutive partial payments with a break in the middle, we use the longest sequence provided in the baseline sample.

[30] Note that one card may contribute to more than one six-month payment patterns shown in the table when the run of consecutive partial payments is longer than six months (i.e., we extracted any six consecutive payments from a sequence.)

Among the sample of two-card observations, nearly 74% of observations are for payments that are either all last-£-digit zero payments or all last-£-digit non-zero payments, with individuals making a combination of one last-£-digit zero payment and one last-£-digit non-zero payment in approximately 26% of cases. In the three-card sample, approximately 60% of observations are for payments that are either all last-£-digit zero payments or all last-£-digit non-zero payments, with individuals making a combination of at least one last-£-digit zero payment and at least one last-£-digit non-zero payment in approximately 40% of cases. Table B6 shows the top-20 pairs of partial payments in the two-card sample for individuals making payments to two cards in the same month. The top-20 pairs of payments together account for more than 20% of all pairs of payments in the two-card sample and all of the pairs comprise only round number payments.[31]

B1.2 Robustness and Sensitivity

In this subsection we present robustness and sensitivity analysis. We first examine the distribution of payment amounts in the full payments sample and the automatic payments sample. These samples show no heaping at round number payments, suggesting that round number payments arise as a result of a decision over partial payment amount in our baseline sample. We then explore whether round number payment choices are sensitive to the size of balances due (i.e., the economic magnitude of the payment decision). We also explore whether round number payment choices are sensitive to card tenure, which might arise if round number payment behavior changes as consumers gain experience of managing payments on their credit card.

B1.2.1 Round Number Payments by Balance Due

Round number payments might vary with card balance. If individuals trade-off the convenience of rounding vs. precision in payment amounts, we might expect that round number value payments would increase with card balances. The proportional "cost" of rounding to a base £10 is lower at higher levels of payment. We explore whether round number payment choices vary with card balance in Figure B3 Panel A, which illustrates the proportion of payments with a last-£-digit of zero by the card balance in a binned scatter-plot. The fitted line (which is fitted through the non-binned data) illustrates that the proportion of round number value partial payments is approximately 70% across the full range of payments.[32]

B1.2.2 Round Number Payments by Card Tenure

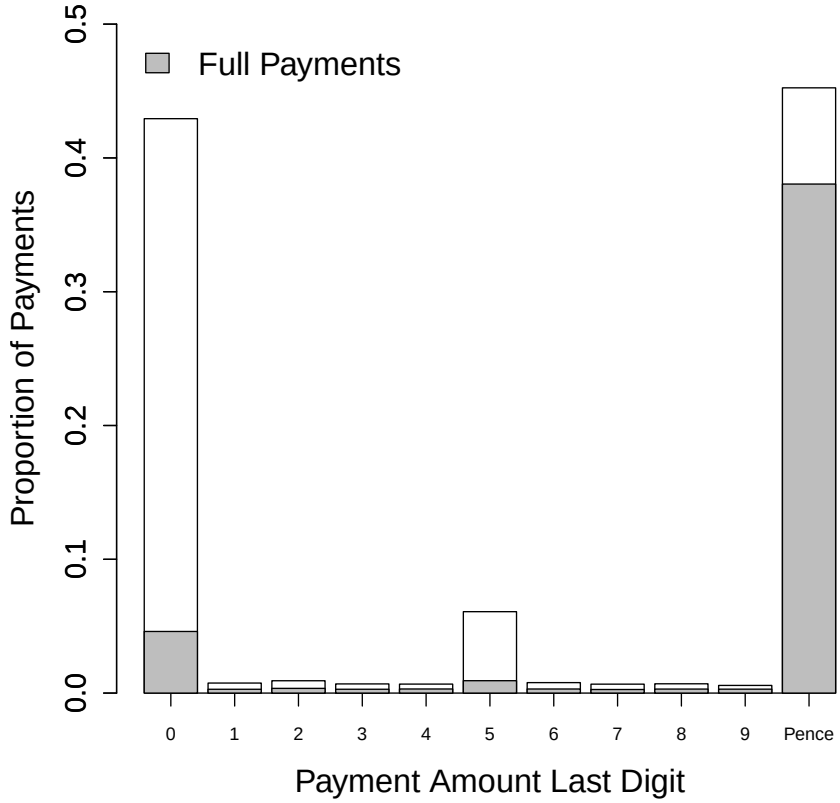
In a final sensitivity test, we explore whether round number value partial payments change with experience. We use the number of months the individual has held the credit card as a proxy measure of experience. Figure B3 Panel C illustrates the proportion of partial payments at round number values by card tenure. The line of best fit slopes slightly upwards, indicating that the likelihood of round number payments slightly increases as card tenure increases.[33]

[31] Table B2 repeats the analysis adding pairs including minimum payments and rounded minimum payments (i.e., payments rounding-up minimum to a nearest integer, or a nearest multiple of 5 or 10).

[32] Panel B of Figure B3 shows different categories of payments across the range of balances. The categories are: payment exactly minimum, multiple of 10, and others. The proportion of each payment category is not sensitive to balances. Figure B2 illustrates different categories of payments on balance using the unrestricted sample from Table A1. Full payments are most common for smaller balances, with round number payments accounting for more than half of all payments in the unrestricted sample when the balance rises above £1,000.

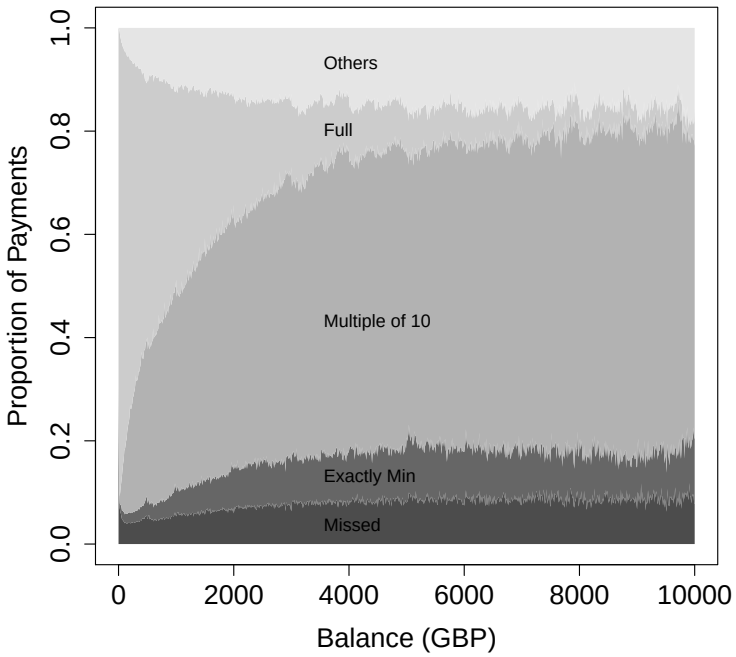
[33] Panel D of Figure B3 plots payment categories across the range of balances, the slight increase of the proportion of round number payments on card tenure is partially due to a decrease of the proportion of minimum payments.

Figure B1: Righttmost £-Digit Payment Amounts in the Baseline Sample



Note: Figure illustrates the distribution of rightmost £-digit integer-value payment amounts in the baseline sample. Grey parts represent full payments. Baseline sample. For sample selection details see Section 2.

Figure B2: Categories of Payment Amounts

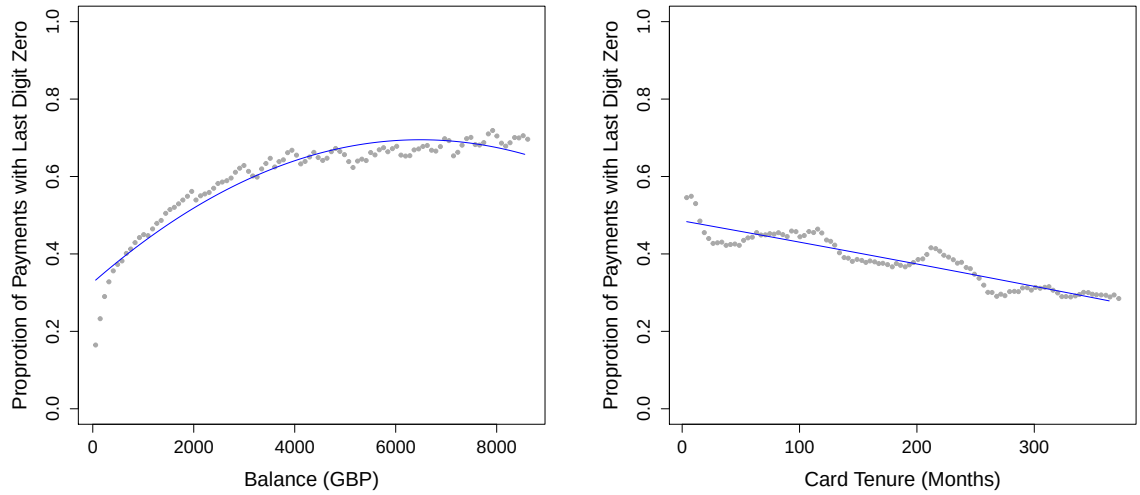


Note: Figure illustrates the proportion of payments in each of five mutually exclusive and exhaustive categories: missed payments (defined as a payment below the minimum payment due), payments at exactly the minimum payment due, payments in multiples of 10 pounds, payments of the full balance, and other payments.

Figure B3: Sensitivity of Round Payments to Balance and Card Tenure

(A) Round Payments on Balance

(B) Round Payments on Card Tenure



Note: Left-side figures illustrate the proportion of payments with a last integer digit amount of zero by card balance and card tenure. Right-side figures illustrate the proportion of payments in each of three mutually exclusive and exhaustive categories: payments at exactly the minimum payment due, payments in multiples of 10 pounds, and other payments. For sample selection details see Section 2.

Table B1: Top 20 Payment Amounts or Categories of Amounts in Baseline Sample

Payment (GBP)	Proportion (%)	Cumulative Proportion (%)
RM	8.34	8.34
100	6.63	14.97
Min	5.24	20.21
50	4.35	24.56
200	3.35	27.91
150	2.08	29.99
300	1.69	31.68
500	1.37	33.05
250	1.13	34.19
40	1.05	35.23
60	0.94	36.18
30	0.93	37.10
400	0.92	38.02
20	0.74	38.76
80	0.72	39.48
1000	0.70	40.18
70	0.58	40.76
120	0.54	41.30
25	0.45	41.75
600	0.44	42.19

Note: Table reports the 20 most frequent payment amounts in the baseline sample. In cases in which the payment amount is at a minimum payment, or a minimum payment rounded to the next base-10 round number, these are denoted RM and Min. "RM" represents rounded minimum payments (i.e., payments rounding-up minimum to a nearest integer, or a nearest multiple of 5 or 10). "Min" represents payments at exactly minimum. Payments at a minimum which itself is an integer are included in "Min".

Table B2: Top 20 Pairs of Payment Amounts or Categories of Amounts in Two Card Sample

Pair of Payments (GBP)	Proportion (%)	Cumulative Proportion (%)
(RM, RM)	6.62	6.62
(Min, Min)	2.79	9.41
(Min, RM)	3.09	12.50
(100, 100)	2.02	14.52
(RM, 100)	1.30	15.82
(100, 50)	1.25	17.07
(50, 50)	1.19	18.26
(RM, 50)	1.14	19.40
(200, 100)	0.99	20.39
(150, 100)	0.69	21.08
(200, 200)	0.66	21.74
(RM, 200)	0.52	22.26
(Min, 100)	0.47	22.73
(RM, 150)	0.45	23.18
(RM, 40)	0.44	23.62
(RM, 30)	0.42	24.04
(200, 150)	0.41	24.45
(Min, 50)	0.41	24.86
(300, 100)	0.38	25.24
(300, 200)	0.38	25.62

Note: Table reports the 20 most frequent pairs of payments in the one card holder two-card sample. In cases in which the payment amount is at a minimum payment, or a minimum payment rounded to the next base-10 round number, these are denoted RM and Min. "RM" represents rounded minimum payments (i.e., payments rounding-up minimum to a nearest integer, or a nearest multiple of 5 or 10). "Min" represents payments at exactly minimum. Payments at a minimum which itself is an integer are included in "Min".

Table B3: Transition Matrix:
Round and Non-Round Number Payments

		t+1	
		Last Digit Zero	Last Digit Non-Zero
t	Last Digit Zero	86.92	13.08
	Last Digit Non-Zero	34.90	65.10

Note: Table reports transition matrix for adjacent months in times in the baseline sample. Unit of observation is a pair of consecutive card-months. Sample consists of 4,628,444 card-months of 415,127 cards with a payment for a least two consecutive months. For sample selection details see Section 2.

Table B4: Top 10 Consecutive 6-Month Payment Sequences

Sequence	Support (%)
100,100,100,100,100,100	3.26
50,50,50,50,50,50	2.22
200,200,200,200,200,200	0.99
25,25,25,25,25,25	0.75
30,30,30,30,30,30	0.62
150,150,150,150,150,150	0.61
20,20,20,20,20,20	0.57
100,50,50,50,50,50	0.51
40,40,40,40,40,40	0.48
200,100,100,100,100,100	0.48

Note: Table reports the 10 most frequent series of six month payment amounts in the baseline sample restricted to spells of card-months extending to at least six sequential months. Sample consists of 3,741,077 card-months of 271,461 cards making a payment for six or more consecutive months and never using automatic payment. For sample selection details see Section 2.

Table B5: Round Number Payments on Multiple Cards

Payments Patterns	Proportion (%)
Two Cards	
Pays All with Last Digit Zero	36.14
Pays All with Last Digit Non-zero	35.88
Other	27.98
Three Cards	
Pays All with Last Digit Zero	34.59
Pays All with Last Digit Non-zero	20.51
Other	44.89

Note: Table reports the proportion of one card holder two-card and three-card months in which the payment on all cards ended with a last integer pound value digit of zero and for which all cards ended with a last integer pound value digit other than zero, and other cases. Sample restricted to the two-card and three-card samples. For sample selection details see Section 2.

Table B6: Top 20 Pairs of Payments in Two Card Account × Month Sample

Pair of Payments (GBP)	Proportion (%)	Cumulative Proportion (%)
(100, 100)	2.24	2.24
(100, 50)	1.52	3.76
(50, 50)	1.51	5.27
(200, 100)	1.09	6.36
(150, 100)	0.78	7.14
(200, 200)	0.69	7.83
(50, 30)	0.46	8.29
(200, 150)	0.46	8.75
(150, 50)	0.43	9.18
(200, 50)	0.43	9.61
(50, 40)	0.40	10.01
(300, 100)	0.40	10.41
(300, 200)	0.40	10.81
(60, 50)	0.40	11.21
(150, 150)	0.38	11.59
(100, 60)	0.34	11.93
(30, 30)	0.34	12.27
(100, 30)	0.32	12.59
(40, 30)	0.31	12.90
(30, 20)	0.30	13.20

Note: Table reports the 20 most frequent pairs of payments in the one card holder two-card sample. Table B2 repeats the analysis adding pairs including minimum payments and rounded minimum payments (i.e., payments rounding-up minimum to a nearest integer, or a nearest multiple of 5 or 10). For sample selection details see Section 2.

C1 Additional Analysis Including Automatic Payments

Table C1: Sample Selection Including Automatic Payments

Criterion	Cards		Card Months		Payment	
	N	%	N	%	Total in GBP	%
Unrestricted Sample	1,159,480	100	23,524,898	100	8,233,866,394	100
Drop if						
No Balance	1,058,275	91.3	17,313,117	73.6	8,129,251,781	98.7
Pays below Minimum	1,054,110	90.9	16,588,565	70.5	8,115,482,247	98.6

Note: Table describes sample restrictions that generate samples used in analysis. The unrestricted sample is the cleaned sample as received from Argus. Sample restrictions are applied at the card-month level. Sample A Baseline Sample is the main sample used in analysis. Samples B and C restrict the baseline sample to observations for which two card-months, or three card-months can be joined to the same card holder in the same month. Cards column shows the number of cards retained at each step. Card Months column shows the number of card-months retained at each step. Payment Total in GBP column shows the total value of payments made in the sample retained at each step.

Table C2: Sample Summary Statistics Including Automatic Payments

	Mean	S.D.	25th	Median	75th
Minimum	43.1	88.64	10	25	47.35
Balance	1,914.30	2,492.88	335.20	974.75	2,487.08
Credit limit	5,934.47	4,093.69	2,950.00	5,000.00	8,100.00
Utilization	0.37	0.34	0.07	0.24	0.66
Merchant APR	0.17	0.07	0.16	0.18	0.2
Cash APR	0.24	0.05	0.22	0.25	0.28
Monthly purchase	426.96	857.35	0.00	106.19	513.59
Payment	489.22	984.42	50.00	150.00	500.00

Note: Table reports summary statistics for the sample including automatic payments, see Table C1. The unit of observation is an card-month. Minimum is the minimum payment due in the card-month. Utilization is balance divided by credit limit. APR denotes Annualized Percentage Rate. Payment is the payment amount made in the card-month.

Table C3: Minimum Payment Thresholds and Proportion of Payments at Next Round Number: OLS Estimates (Sample Including Automatic Payments)

IV	Linear	Quadratic	Cubic
Intercept	0.043 ***	0.043 ***	0.046 ***
	(124.78)	(109.33)	(91.96)
Dummy($x > 0$)	0.006 ***	0.005 ***	0.009 ***
	(13.54)	(7.97)	(10.85)
$x^3(x < 0)$			0.001 ***
			(10.5)
$x^2(x < 0)$		0.000 **	0.005 ***
		(2.09)	(10.76)
$x(x < 0)$	0.003 ***	0.003 ***	0.011 ***
	(31.59)	(10.63)	(13.81)
$x^3(x > 0)$			-0.002 ***
			(-18.21)
$x^2(x > 0)$		0.000 ***	0.010 ***
		(-2.72)	(17.97)
$x(x > 0)$	0.001 ***	0.002 ***	-0.016 ***
	(7.14)	(4.81)	(-15.48)

Note: Table reports Ordinary Least Squares (OLS) regression estimates using sample including automatic payments see Table C1. Dependent variable is a dummy variable denoting payment amount at the next round number (base-10). Independent variables are the distance from the round number threshold, in pounds, above and below the threshold, plus a dummy variable denoting above the threshold. Model includes a constant term. Separate model estimates shown in which the distance from the round number threshold enters linearly, as a quadratic term, and as a cubic term. T-statistics shown in parenthesis. Card-months where a minimum is exactly the threshold were excluded from the regressions. The standard errors were corrected for clustering by cards and calendar months. *p<0.1; **p<0.05; ***p<0.01

Table C4: Minimum Payment Threshold and Payment Amounts: OLS Estimates (Sample Including Automatic Payments)

IV	Linear	Quadratic	Cubic
Intercept	5.574 ***	5.592 ***	5.400 ***
	(1015.02)	(979.4)	(711.6)
Dummy($x > 0$)	0.070 ***	0.059 ***	0.052 ***
	(30.88)	(16.77)	(12.28)
$x^3(x < 0)$			-0.046 ***
			(-47.74)
$x^2(x < 0)$		0.006 ***	-0.287 ***
		(8.61)	(-45.95)
$x(x < 0)$	-0.038 ***	-0.014 ***	-0.517 ***
	(-36.91)	(-4.6)	(-43.43)
$x^3(x > 0)$			0.049 ***
			(57.59)
$x^2(x > 0)$		0.002 ***	-0.305 ***
		(3.28)	(-55)
$x(x > 0)$	0.046 ***	0.036 ***	0.561 ***
	(44.19)	(10.94)	(52.1)

Note: Table reports Ordinary Least Squares (OLS) regression estimates using sample including automatic payments see Table C1. Dependent variable is payment amount. Independent variables are the distance from the round number threshold, in pounds, above and below the threshold, plus a dummy variable denoting above the threshold. Model includes a constant term. Separate model estimates shown in which the distance from the round number threshold enters linearly, as a quadratic term, and as a cubic term. T-statistics shown in parenthesis. Sample is restricted to payments above the minimum. Card-months where a minimum is exactly the threshold were excluded from the regressions. The standard errors were corrected for clustering by cards and calendar months. *p<0.1; **p<0.05; ***p<0.01

Table C5: Change in Left Digit and Proportion of Full Payments: OLS Estimates (Sample Including Automatic Payments)

IV	Linear	Quadratic	Cubic
Intercept	0.769 ***	0.774 ***	0.796 ***
	(457.09)	(453.22)	(416.51)
Dummy($x > 0$)	-0.028 ***	-0.030 ***	-0.066 ***
	(-18.17)	(-13.66)	(-24.23)
$x^3(x < 0)$			0.004 ***
			(25.68)
$x^2(x < 0)$		0.001 ***	0.032 ***
		(5.95)	(26.52)
$x(x < 0)$	0.004 ***	0.011 ***	0.070 ***
	(9.49)	(9.09)	(27.16)
$x^3(x > 0)$			0.002 ***
			(12.17)
$x^2(x > 0)$		0.001 ***	-0.017 ***
		(3.3)	(-11.16)
$x(x > 0)$	0.003 ***	-0.001	0.034 ***
	(8.7)	(-0.94)	(9.85)

Note: Table reports Ordinary Least Squares (OLS) regression estimates using sample including automatic payments see Table C1. Dependent variable is a dummy variable denoting full payment. Independent variables are the distance from the nearest left-digit threshold, in pounds, above and below the threshold, plus a dummy variable denoting above the threshold. Model includes a constant term. Card-months where a balance is exactly the threshold were excluded from the regressions. The standard errors were corrected for clustering by cards and calendar months. *p<0.1; **p<0.05; ***p<0.01