

Appendix 1

The instructions below are an English translation of the original German-language experimental protocol used in the study (programmed in z-Tree; Fischbacher, 2007). The screenshots included are part of the original instructions, shown to participants as illustrative examples of the task screens they would encounter. The translation follows the original wording as closely as possible; minor stylistic deviations were avoided so as not to misrepresent the instructions actually given to participants.

„Bank Account Details“

Some of the payments in today’s experiment will be transferred to your bank account. Please enter your bank account details now. Your data will be stored securely. Under no circumstances will your data be used for advertising or marketing purposes or disclosed to third parties. The data you provide will be used only to execute the payments in this experiment. Data analysis, as well as the publication of the results, will be anonymous.

Bank transfers will be executed by the administration of the Max Planck Institute for Research on Collective Goods. On your table, you will find an information sheet with the contact details of the responsible persons from the Institute. Please take this information sheet with you. Do not hesitate to contact us if you have any questions regarding the payments.

Please enter your data carefully. Before you click on “Continue”, make sure you have entered the data correctly.

General instructions for participants

You are about to take part in an economic experiment. In this experiment, you can earn a significant amount of money depending on your decisions. For this reason, it is essential to read the instructions carefully. The instructions you have received are for your private use only. Please note that you are not allowed to communicate with other participants during this experiment. Should you have any questions, please ask us for assistance. If you do not comply with the rules, we will have to exclude you from the experiment and from all payments.

Today’s experiment consists of several parts. The instructions will be displayed on the computer screen immediately before each part of the experiment. Payments in this experiment depend on your decisions. All decisions will be made individually – this means that you can let us know as soon as you have completed all parts of the experiment and then leave the laboratory.

Part I – Word encryption task

In the first part of the experiment, you are asked to complete several blocks of a task. In each block, you need to translate a combination of letters into a number code. For each letter, you will need to find the appropriate code. A table with letters and

assigned number codes will be displayed on the screen in each block. The task will appear on the screen in the following way:

Anzahl der bereits gelösten Aufgaben: 1

BUCHSTABEN:

Y

G

F

ZAHLENCODE:

G	C	P	D	G	K	O	T	S	U	F	W	J	Y	X	I	N	A	M	V	H	R	E	Z	L	B
108	704	458	218	313	325	546	886	148	969	122	801	621	128	292	709	539	828	510	547	801	154	361	121	572	174

OK

At the top of the screen, you will see how many blocks you have already completed. In this example, one task has already been solved. In the current task, three letters “Y”, “G”, and “F” need to be translated into three-number codes. The solution to this task can be found in the table below. “Y” is assigned the code 128, “G” the code 313, and “F” the code 122. Once all three codes are entered, please click on “OK”. The program will check whether the codes were entered correctly. Only in this case will the task be counted as solved. Different letters, as well as different code assignments, will be generated in each task. Please note that the table includes all 26 letters of the alphabet and the position of each letter can change in each task.

Once a new combination of letters is displayed on the screen, you need to click in the first blank field to enable number entry. You can proceed to the next task only after you have correctly solved the current one. If at least one of the codes is entered incorrectly, all numbers you have entered will be deleted and you will be asked to enter them again. The table does not change in this case.

Your task is to solve 20 blocks with three letters each. As payment for completing the task, you will receive 10€. Should you have any questions, please raise your hand.

Part II – Intertemporal decision

You can either receive the money you earned for completing the task (EUR 10) today in cash or decide to invest it for one month. You can also split this amount – receiving some of it today and investing the rest. Should you decide to invest all or part of the money, you will receive an additional 25 cents for each invested euro. The total amount will be transferred to your account in one month. In the table

below, you can find the respective amounts that will be transferred to your account depending on how much money you decide to receive today.

Should you have any questions, please raise your hand.

Heute	0€	1€	2€	3€	4€	5€	6€	7€	8€	9€	10€
In einem Monat	12.50€	11.25€	10€	8.75€	7.50€	6.25€	5.00€	3.75€	2.50€	1.25€	0€

OK-BUTTON treatment :

Please make your decision now. Enter the amount you would like to receive in cash today in the blank field below. You can enter any number from 0 to 10. To confirm your entry, please click on OK.

TYPED NAME treatment:

Please make your decision now. Enter the amount you would like to receive in cash today in the blank field below. You can enter any number from 0 to 10. To confirm your entry, please type in your first and last name in the respective field below. Then click on OK.

PIN CODE treatment

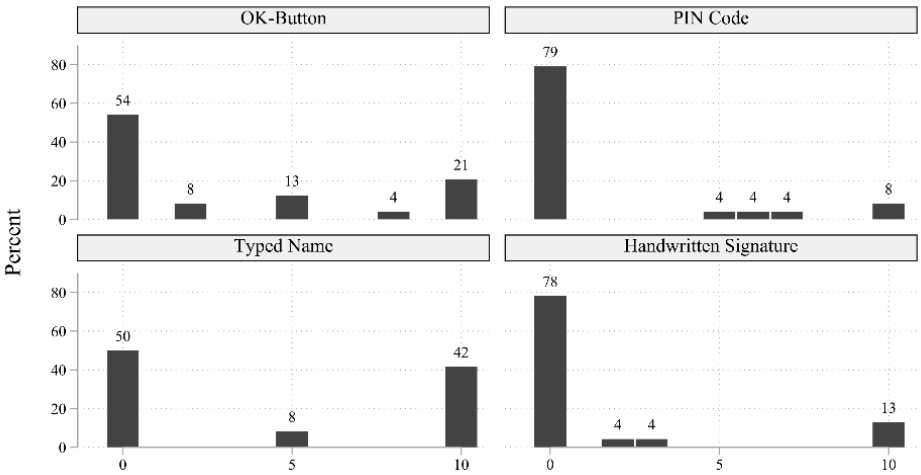
Please make your decision now. Enter the amount you would like to receive in cash today in the blank field below. You can enter any number from 0 to 10. To confirm your entry, please enter the PIN code on the plastic card in the envelope you have just received. Then click on OK.

HANDWRITTEN SIGNATURE treatment

Please make your decision now. Enter the amount you would like to receive in cash today in the form. Please sign the form. Then click on OK.

Appendix 2

Figure A1.
Histogram of the amounts of money participants decided to receive on the day of the experiment



Source: Figure created by the author.

Note: Distribution of the amount (in EUR) participants chose to receive immediately in cash, shown separately for each mode of confirmation. The horizontal axis runs from EUR 0 (the full amount deferred) to EUR 10 (the full amount taken immediately); bars show the percentage of participants in each mode choosing a given amount. Within each mode, percentages sum to 100 (subject to rounding).

Appendix 3

Table A1.

Ordered probit and multinomial logit — Three-category outcome (0 = all later, 1 = split, 2 = all now)

	Ordered probit		Multinomial logit — basic (3)		Multinomial logit — full controls (4)	
	(1) Basic	(2) + Controls	Split	All now	Split	All now
Treatment (ref: Handwritten Signature)						
OK-Button	0.551 (0.370)	0.118 (0.418)	1.424 (0.899)	0.836 (0.820)	1.786 (1.108)	0.329 (0.919)
Typed Name	0.865** (0.395)	0.419 (0.455)	0.405 (1.073)	1.609** (0.760)	−0.068 (1.270)	0.339 (1.012)
PIN Code	−0.087 (0.402)	−0.551 (0.472)	0.351 (0.975)	−0.460 (0.975)	0.319 (1.188)	−2.146 (1.559)
Time preferences (higher = more patient)						
Quantitative index	—	−0.116** (0.048)	—	—	−0.147 (0.124)	−0.303** (0.153)
Qualitative (self-assessment)	—	−0.279*** (0.087)	—	—	−0.604*** (0.177)	−0.580*** (0.208)
Controls						
Age	—	−0.074* (0.044)	—	—	−0.127 (0.082)	−0.230* (0.136)
Male	—	0.417 (0.305)	—	—	0.614 (0.734)	0.486 (0.796)
Short of money (Q2)	—	−0.040 (0.087)	—	—	—	—
Debts (Q3)	—	−0.187 (0.176)	—	—	—	—
Need cash (Q4)	—	−0.201** (0.093)	—	—	—	—
Model-specific parameters						
Cut point 1 / Constant (Split)	0.754** (0.293)	−6.432*** (1.577)	−2.197*** (0.749)	—	7.612** (3.416)	—
Cut point 2 / Constant (All now)	1.199*** (0.309)	−5.683*** (1.515)	—	−1.792*** (0.627)	—	13.433*** (5.037)
N	95	93	95	95	93	93

*Note: Reference category: Handwritten Signature. Multinomial logit base outcome: all later (0). Ordered probit reports cut points; multinomial logit reports equation-specific constants. Both time preference variables coded higher = more patient. Financial situation items (Q2–Q4) included in ordered probit full model only. Robust standard errors in parentheses. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$*

Source: Table created by the author.

Table A2.*Amount taken immediately (0–10 EUR) — Tobit and OLS estimates*

	Tobit			OLS (robust SEs)		
	(1) Basic	(2) + Time prefs	(3) + Full controls	(4) Basic	(5) + Time prefs	(6) + Full controls
Treatment (ref: Handwritten Signature)						
OK-Button	12.489 (8.745)	6.631 (6.377)	1.725 (5.910)	1.687 (1.112)	1.202 (0.911)	0.708 (0.823)
Typed Name	19.581** (9.419)	4.813 (6.488)	5.723 (5.683)	3.062** (1.226)	1.318 (1.099)	1.348 (1.107)
PIN Code	−1.265 (8.888)	−7.826 (7.486)	−6.184 (6.959)	0.062 (0.983)	−0.394 (0.836)	−0.331 (0.783)
Time preferences (higher = more patient)						
Quantitative index	—	−1.974*** (0.641)	−1.462*** (0.531)	—	−0.335*** (0.097)	−0.261** (0.101)
Qualitative (self-assessment)	—	−3.972*** (1.433)	−3.625*** (1.314)	—	−0.638*** (0.207)	−0.632*** (0.226)
Controls						
Age	—	—	−0.976 (0.648)	—	—	−0.171** (0.085)
Male	—	—	5.433 (4.481)	—	—	0.873 (0.634)
Short of money (Q2)	—	—	−0.584 (1.197)	—	—	−0.088 (0.200)
Debts (Q3)	—	—	−2.506 (2.820)	—	—	−0.557 (0.394)
Need cash (Q4)	—	—	−2.570** (1.280)	—	—	−0.463** (0.210)
Model parameters						
Constant	−17.055** (8.063)	57.898*** (17.565)	83.053*** (25.429)	1.522** (0.716)	13.309*** (2.124)	18.570*** (2.951)
σ (Tobit only)	22.214*** (5.720)	15.207*** (3.817)	12.647*** (3.130)	—	—	—
R ² (OLS only)	—	—	—	0.095	0.390	0.493
N	95	93	93	95	93	93

*Note: Tobit models estimated with lower limit 0 and upper limit 10. OLS estimated with heteroskedasticity-robust standard errors. Standard errors in parentheses. Reference category: Handwritten Signature. Both time preference variables coded higher = more patient. OLS is reported for transparency; Tobit is the theoretically appropriate model given the high proportion of corner solutions (65% of observations at zero). The direction and pattern of treatment coefficients is consistent across both estimators. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$*

Source: Table created by the author.

Table A3.

Heterogeneity analysis — Tobit models with interaction terms

	(1) × Time preference	(2) × Liquidity constraint
Treatment main effects (ref: Handwritten Signature)		
OK-Button	−194.764** (85.827)	5.669 (11.228)
Typed Name	−166.546* (84.190)	17.332 (11.221)
PIN Code	−182.082** (84.936)	6.389 (11.197)
Time preference (higher = more patient)		
Time preference (quantitative)	−11.375** (4.522)	—
Treatment × Time preference interactions		
OK-Button × Time preference	10.179** (4.432)	—
Typed Name × Time preference	8.758** (4.358)	—
PIN Code × Time preference	8.711** (4.324)	—
Liquidity constraint		
Above-median liquidity constraint	—	8.397 (12.608)
Treatment × Liquidity constraint interactions		
OK-Button × Liquidity	—	8.113 (16.474)
Typed Name × Liquidity	—	1.006 (16.243)
PIN Code × Liquidity	—	−18.131 (17.818)
Model parameters		
Constant	214.982** (86.650)	−19.249** (9.400)
σ	15.554*** (3.911)	21.238*** (5.456)
N	93	95

*Note: Tobit regression, lower limit 0, upper limit 10. Standard errors in parentheses. Reference category: Handwritten Signature. Quantitative time preference coded higher = more patient. Liquidity constraint = 1 if below-median score on 'short of money' item (higher constraint). These analyses are exploratory; N = 24 per cell provides limited power for interaction tests. Joint F-tests: time preference interactions $F(3, 86) = 2.04$, $p = .114$; liquidity interactions $F(3, 88) = 0.82$, $p = .488$. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$*

Source: Table created by the author.

Appendix 4

Overview

Two follow-up studies were conducted in 2019 to explore whether the difference observed between the OK-BUTTON and PIN CODE situations in the main study could be replicated. The first study was conducted at Maastricht University in February 2019 ($N = 111$); the second at the BonnEconLab, University of Bonn — the same laboratory as the main study — in April 2019 ($N = 117$). In both replication studies, payments were administered by Maastricht University. Both studies included only the OK-BUTTON and PIN CODE conditions. The HANDWRITTEN SIGNATURE condition — which is the central focus of the main hypothesis — was not included in either replication. Accordingly, these studies cannot replicate the primary finding of the main study. The results reported here are therefore best understood as exploratory evidence on the relationship between two specific digital confirmation methods, not as a replication of the main hypothesis.

An important caveat is that the replication studies differ from the main study in several respects. Both replication studies included additional measures of decision-making style (need for cognition and faith in intuition) that were not collected in the main study — a deliberate design extension aimed at exploring potential mechanisms. The Maastricht study was conducted at a different institution from the main study. Three years elapsed between the main study and the replications, during which digital contracting practices became considerably more widespread and familiar. These contextual differences should be borne in mind when interpreting the results.

Results

Table A4 provides the main results for both sites. Neither site shows a significant difference between the OK-BUTTON and PIN CODE conditions. In Maastricht, the direction is consistent with the main study — OK-BUTTON participants took more money today on average than PIN CODE participants ($M = 3.35$ vs. $M = 2.34$) — but the difference is not significant (Wilcoxon $z = 0.969$, $p = .333$; Cliff's $\delta = 0.088$, 95% CI $[-0.087, 0.262]$). In Bonn, the direction of the effect is opposite to the main study: PIN CODE participants took slightly more money today on average than OK-BUTTON participants ($M = 3.32$ vs. $M = 2.89$), and the difference is again negligible (Wilcoxon $z = -0.691$, $p = .489$; Cliff's $\delta = -0.062$, 95% CI $[-0.239, 0.115]$). Simulation-based permutation tests (5,000 replications) confirmed the asymptotic Wilcoxon results at both sites.

The two sites are not consistent with each other: Bonn shows a small negative effect (PIN Code participants slightly more impatient) while Maastricht shows a small positive effect (OK-Button participants slightly more impatient), and both confidence intervals span zero and overlap substantially. The overall pattern across both sites is therefore one of null results with small, inconsistent effect sizes.

Table A4.
Main results: descriptive statistics and inferential tests by site.

	Bonn		Maastricht	
	OK-Button	PIN Code	OK-Button	PIN Code
N	57	60	55	56
Mean amount taken today (EUR)	2.89	3.32	3.35	2.34
SD	4.53	4.48	4.58	4.12
% choosing all later (EUR 12.50)	70.2%	61.7%	63.6%	71.4%
% split	1.8%	10.0%	7.3%	7.1%
% choosing all now (EUR 10)	28.1%	28.3%	29.1%	21.4%
Wilcoxon z	−0.691		0.969	
p (asymptotic)	.489		.333	
p (permutation, 5,000 reps)	.485		.324	
Cliff's δ	−0.062		0.088	
95% CI	[−0.239, 0.115]		[−0.087, 0.262]	

Note: Wilcoxon z, permutation p, and Cliff's δ refer to the comparison OK-BUTTON vs. PIN CODE. Positive z and positive δ indicate that OK-BUTTON took more money today. The HANDWRITTEN SIGNATURE condition was not included in either replication study.

Source: Table created by the author.

Interpretation

The absence of a significant difference between OK-BUTTON and PIN CODE at either site is difficult to interpret for three reasons. First, because the HANDWRITTEN SIGNATURE condition was not included, these results speak only to the relative comparison between two digital confirmation methods, not to the cautionary function of handwritten signatures that is the central claim of the paper. Second, several contextual factors changed between the main study and the replications — including the institutional setting, the subject pool composition, and the broader digital contracting environment — making it difficult to attribute the null results to any specific cause.

These results are therefore best characterized as inconclusive rather than contradictory with respect to the main study. The central hypothesis of the paper — that handwritten signatures induce more patience than less formal digital confirmation methods — remains untested in these follow-up studies.