EKONOMISTA | **ARTYKUŁY**

2026, 3, 332–347
DOI: 10.52335/ekon/221207

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Think Twice Before You Sign! An Experiment on a Cautionary Function of Contractual Formalities

Zastanów się, zanim podpiszesz! Eksperyment nad ostrzegawczą funkcją formalności umownych

Abstract

Contractual formalities, such as handwritten signatures, have long been viewed as serving a cautionary function that protects individuals from entering ill-considered agreements. With the rise of digital contracting, it is uncertain whether online forms of assent can play the same role. In an incentivized laboratory experiment, four modes of contract confirmation were compared: clicking "OK," typing one's name, entering a PIN code (analogous to a qualified e-signature), and handwritten signing. The study examined how these methods affect choices between smaller–sooner and larger–later rewards. Results show that participants were more impulsive when confirming by clicking "OK" or typing their name than when signing by hand, while no significant difference was found between handwritten signatures and entering a PIN. These findings suggest that common digital confirmations fail to reproduce the cautionary effect of handwritten signatures, highlighting the need for more effective online mechanisms.

Keywords: Signature, Contract Law, Intertemporal Decision Making, Cautionary Function, Behavioral Experiment.

JEL: D91, K12

Streszczenie

Formalności umowne, takie jak podpis własnoręczny, od dawna postrzegane są jako mechanizmy ostrzegawcze, chroniące przed pochopnym zawieraniem umów. W dobie kontraktowania cyfrowego pojawia się jednak pytanie, czy internetowe formy zgody mogą pełnić tę funkcję. W eksperymencie laboratoryjnym porównano cztery sposoby potwierdzania umowy: kliknięcie „OK", wpisanie imienia i nazwiska, wprowadzenie kodu PIN oraz podpis własnoręczny. Analizowano ich wpływ na wybory między mniejszymi, wcześniejszymi a większymi, późniejszymi nagrodami. Wyniki pokazują, że uczestnicy byli bardziej impulsywni, gdy potwierdzali zgodę kliknięciem lub wpisaniem imienia niż przy podpisie własnoręcznym. Nie wykazano istotnych różnic między podpisem a kodem PIN. Oznacza to, że najczęstsze formy potwierdzeń cyfrowych nie odtwarzają ostrzegawczego efektu podpisu własnoręcznego, co wskazuje na potrzebę tworzenia skuteczniejszych mechanizmów online.

Słowa kluczowe: podpis, prawo zobowiązań, podejmowanie decyzji intertemporalnych, funkcja ostrzegawcza, eksperyment behawioralny.

JEL: D91, K12

1. Introduction

Every day, individuals consent to numerous online agreements. The Internet has not only expanded access to existing goods and services but also created entirely new forms of digital exchange—a shift that raises novel challenges for consumers and legal scholars alike. Firms operating online can exploit consumer inattention or impatience, heightening the risk of ill-considered commitments (Tasker & Pakcyk, 2008). This raises the central question of whether digital forms of assent replicate the cautionary function of traditional contractual formalities.

The cautionary function, classically described by Fuller (1941) as a check against *inconsiderate action*, has historically been associated with formal requirements such as written documents and handwritten signatures. These formalities were assumed to force individuals to deliberate before committing (Fuller, 1941; Hoffman & Eigen, 2015; Einsele, Münchener Kommentar § 126 BGB). In the digital age, however, scholars increasingly doubt whether online gestures such as clicking *I agree* or entering credentials can induce comparable reflection. For example, German commentators have argued that a mouse click or card reader *does not create a psychological barrier equivalent to … a signature* (Einsele, 2015 § 126a). US scholars likewise stress the symbolic power of handwritten signatures as a signal of importance (Moringiello, 2005; Hillman & Rachlinski, 2002).

Behavioral law and economics provides a theoretical foundation for this intuition. Hermalin, Katz, and Craswell (2007) suggest that formalities can mitigate bounded rationality by triggering deliberative cognitive processes, thereby deterring myopic or impulsive choices. Yet most legal arguments focus on process—the expectation that formalities induce more careful thought—without examining the outcomes of decisions under different contractual forms.

This study addresses that gap by exploring how contractual formalities influence intertemporal decision-making—our choices between smaller–sooner and larger–later rewards, which are ubiquitous in daily life (e.g., credit use, savings, retirement planning). While early economic models often portrayed intertemporal preferences as stable and context-independent (reflecting an exponential discounting view), a wealth of evidence now shows that this assumption fails empirically. For instance, Loewenstein (1989) demonstrated that discount rates vary with reward magnitude, framing, delay, and valence—highlighting the prevalence of anomalies in intertemporal choice. Moreover, Frederick, Loewenstein, and O'Donoghue (2002) offer a comprehensive review of how psychological context factors—such as framing and cognitive load—modify discounting behavior.

Recent research reinforces the idea that contract form shapes how obligations are perceived. Wilkinson-Ryan and Hoffman (2015) found that individuals identify the act of signing as the decisive moment of contract formation, whereas informal electronic communication lacks this symbolic weight. Other studies show that people ascribe greater importance to signed agreements than to oral or purely digital ones (Wilkinson-Ryan, 2015; Hoffman, 2016). More recently, scholars have argued that Fuller's classic functions of formalities—evidentiary, cautionary, and channeling—require re-evaluation in light of digital contracting practices (Dagan &

Gergen, 2024). Consumer research also suggests that while remote e-signatures are valued for usability, hardware-based or token-based signatures inspire more trust, indicating that different digital forms vary in their psychological impact (Ege et al., 2025). Meanwhile, ongoing work on digital identity systems highlights both the promise and the challenges of designing secure but user-friendly alternatives (Last et al., 2024).

Against this backdrop, the present study provides an experimental test of how different contractual formalities affect impulsive decision-making. In a controlled laboratory setting, participants were asked to choose between EUR 10 immediately or EUR 12.50 in one month, with their decision confirmed through one of four methods: clicking "OK," typing their name, entering a PIN code, or signing by hand. The findings reveal that handwritten signatures—and, to some extent, PIN codes—encourage more patient decisions, while clicking or typing one's name do not. These results call into question the adequacy of common digital practices for replicating the cautionary effect of traditional signatures.

The remainder of this paper is structured as follows. Section 2 develops the theoretical background and presents the experimental hypothesis. Section 3 describes the experimental design, participants, and procedures. Section 4 presents the results, including the main outcome analysis, model-based analyses, satisfaction measures, balance checks, and the follow-up studies. Section 5 discusses the findings and outlines directions for future research.

2. Theoretical background and hypothesis

Behavioral regularities in intertemporal choices have often been explained through dual-process models of judgment and decision-making (Evans, 2008; Evans & Stanovich, 2013; Alós-Ferrer & Strack, 2014). These theories posit that people rely on two interacting modes of thought: a fast, intuitive, and impulsive *Type 1* system, and a slower, reflective, and deliberative *Type 2* system. Decision-making is rarely a matter of one system alone; rather, the two operate jointly, with their relative influence depending on individual traits and situational features.

Applied to intertemporal choice, *Type 1* is typically associated with selecting an immediate reward, whereas *Type 2* considers both immediate and delayed payoffs more evenly, opting to wait when the implied interest rate is sufficiently attractive (Thaler & Shefrin, 1981; Strack & Deutsch, 2004; Loewenstein et al., 2015). Accordingly, choices between, for example, EUR 10 today and EUR 12.50 in one month can be interpreted as a contest between impulsive preference for immediacy and deliberative evaluation of future benefits.

Research suggests that certain features of a decision—such as its importance, finality, or perceived accountability—increase the likelihood of *Type 2* engagement, leading to more patient choices (Strack et al., 2006). In the legal domain, contract formalities are designed precisely to convey such features: they signal that a decision is serious, binding, and irreversible. Empirical studies further indicate that handwritten signatures carry a symbolic weight not matched by digital confirmations,

marking the act of *signing on the dotted line* as a psychologically distinctive moment of commitment (Moringiello, 2005; Hillman & Rachlinski, 2002; Wilkinson-Ryan & Hoffman, 2015).

Building on this, I test whether different modes of confirming a contract alter the balance between impulsive and deliberative processes in intertemporal choice. In my experiment, participants confirmed their decision by a handwritten signature, typing their name, entering a PIN code, or clicking an "OK" button. If formalities indeed act as psychological cues that trigger deliberation, then handwritten signatures should foster more patient choices compared to simpler digital actions. PIN codes, which resemble qualified e-signatures, might also share some of this effect, though perhaps to a lesser degree.

Hypothesis:

Participants asked to confirm their decision with a handwritten signature will be more likely to choose the delayed, larger reward compared to those confirming by clicking an "OK" button or typing their name. Outcomes regarding use of the PIN code condition are expected to lie between these two extremes, potentially resembling those of the handwritten signature treatment if participants perceive it as similarly formal and binding.

3. Methods

3.1. Design and participants

Ninety-six participants (mean age = 21.9 years, SD = 3.8; 59% female) were randomly assigned to one of four conditions in a between-subjects design (24 participants per condition). Recruitment took place via the BonnEconLab subject pool, which consists of students from a wide range of academic disciplines.[1] Each session lasted approximately 45 minutes.[2] Total payments in the main part of the experiment ranged from EUR 10 to EUR 12.50. The experiment was programmed in z-Tree (Fischbacher, 2007).

In each condition, participants first completed a real-effort task, for which they earned EUR 10. They were then asked to make an intertemporal choice: receiving EUR 10 in cash immediately or up to EUR 12.50 via bank transfer one month later. Crucially, the method of confirming this decision varied by condition. The four modes of confirmation were designed to mirror common ways of concluding a contract: clicking an "OK" button, typing one's name, entering a PIN code, or providing a handwritten signature.

[1] Participants were recruited using an online recruitment tool hroot (Bock et al., 2012).

[2] After the main experiment, an additional independent experiment was conducted. The main experiment lasted about 25 minutes. At the beginning of the experimental session, participants were informed that the whole experiment consisted of a few parts which were independent from each other.

3.2. Materials and procedures

The experiment consisted of two parts. Separate instructions were displayed on participants' computer screens immediately before each part. Prior to starting, participants were asked to complete a form with their names and bank account details. They had been notified in advance, in the invitation to the experiment, that such data would be required. Participants were informed that some or all payments would be made via bank transfer, processed by the administration of the Max Planck Institute for Research on Collective Goods[3] in Bonn, and that their personal data would be stored exclusively for the purpose of the experiment.[4] They also received an information sheet with contact details for both the researcher and the person responsible for processing payments.

This procedure served three purposes. First, it ensured that participants trusted the promise of later payments when making their intertemporal choice.[5] Second, it prevented participants from selecting immediate cash simply to avoid disclosing bank account information. Third, because anonymity was inherently excluded in three of the four conditions (typed name, PIN code, handwritten signature), this step guaranteed that all participants revealed their identity at the outset, thus ensuring consistency across treatments.

Part I: Real-Effort Task

In the first part of the experiment, participants completed a word encryption task (Benndorf et al., 2014; Erkal et al., 2011), for which they earned EUR 10. Previous research has shown that individuals display different risk and time preferences depending on whether money is earned or received as a windfall: they tend to be more patient with hard-earned money (Hvide & Lee, 2015). To enhance external validity, the intertemporal decision in this experiment was therefore based on money earned in the real-effort task.

In this task, participants saw on their screen a randomized table of the 26 letters of the alphabet, each paired with a three-digit number (Figure 1). They were then shown three randomly selected letters and asked to encode them by entering the corresponding three-digit numbers into blank fields. If any code was entered incorrectly, an error message appeared and participants were prompted to re-enter all three codes. Each participant received EUR 10 for correctly completing 20 blocks of the task. In every block, the order of letters, assigned codes, and letters to be encoded changed.

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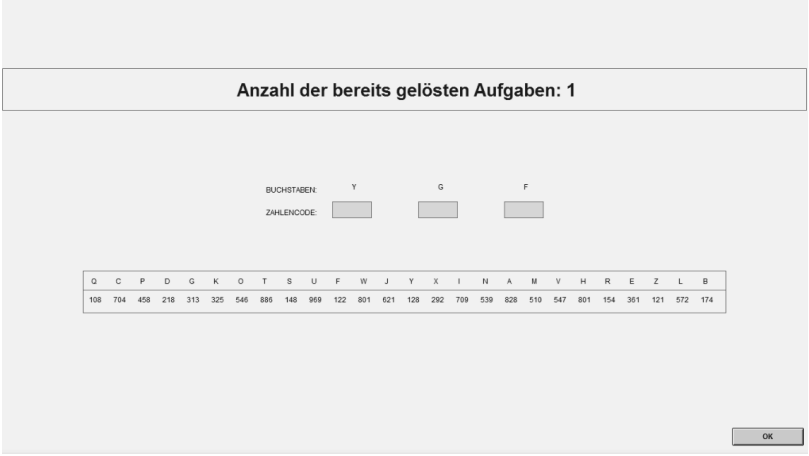
[3] The Max Planck Society is one of Germany's most prestigious publicly funded research organizations. Its institutional standing is relevant here because participants in intertemporal choice experiments must trust that promised future payments will actually be made — distrust would confound the results.

[4] Please see the experimental instructions (appendix 1) for the exact wording.

[5] A similar procedure was introduced by Kuhn et al. (2014). Although it cannot be fully excluded, it is rather unlikely that participants would be distrustful about later payments.

Figure 1.
A screenshot of the experiment depicting the word encryption task



Source: Author's own screenshot.

Part II: Intertemporal Decision

In the second part, participants decided how much of the EUR 10 they had earned they wished to receive immediately in cash, and how much to postpone for later payment.[6] They could choose any integer amount from EUR 0 to EUR 10. The amount deferred was automatically increased by 25% and transferred to their bank account after one month (up to a maximum of EUR 12.50). To facilitate decision-making, participants were provided with a table (Table 1) showing the relationship between the amount taken immediately and the corresponding delayed payment.

Table 1.
A table from the experiment displaying amounts received in cash on the day of the experiment and respective payments in a month

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€

Source: Author's own experimental material.

[6] Importantly, none of the options were presented as a default. The participants' choice was described in the following way: *You can either receive the money you earned for performing the task (10 Euro) today in cash or decide to invest it for a month. You can also split this amount - receive some of it today and invest the remaining amoun*t. For the exact wording of the instructions, see appendix 1.

Participants recorded their choice by completing the declaration: *"I declare that I would like to receive … € today in cash."*[7]

Once the declaration was filled in, participants received a short paper-and-pencil questionnaire. In treatments involving a handwritten signature, the researcher collected the signed forms at this point. The first question required participants to rate how satisfied they were with their decision, using a seven-point Likert scale (higher scores = greater satisfaction). The remainder of the questionnaire gathered information on participants' financial situation[8] and elicited their time preferences.

Time preferences were measured using items adapted from Falk et al. (2016), who demonstrated the predictive validity of combining qualitative and quantitative measures. The qualitative part consisted of a single self-assessment question: *Compared to others, are you generally a person who is willing to give up something today in order to benefit in the future?* Responses were given on a 10-point Likert scale (1 = completely unwilling; 10 = very willing). The quantitative part consisted of 25 hypothetical binary choices between EUR 100 today or a larger amount in 12 months, with the delayed amount increasing across items. These measures ensured that participants did not differ systematically across treatments in their financial circumstances or baseline time preferences.

3.3. Treatments

The method of confirming participants' decisions on how much money to receive immediately varied across treatments:

- **OK-BUTTON**: Participants entered a number and confirmed their choice by clicking an "OK" button.
- **TYPED NAME**: Participants entered a number, typed their name, and then clicked an "OK" button.
- **PIN CODE**: Participants entered a number, typed a personal PIN code, and clicked an "OK" button. Each participant received their PIN on a plastic card enclosed in a sealed envelope marked with their name. The envelopes were distributed immediately before the second part of the experiment.
- **HANDWRITTEN SIGNATURE**: Participants recorded their chosen amount on a paper form and confirmed the decision with a handwritten signature. The paper forms were distributed immediately before the second part of the experiment.

[7] For the English translation of the German instructions please see appendix 1.

[8] Participants where asked three questions: (1) *Would you say, that you are at the moment short of money?* (1-7 scale, 1 – rather yes, 7 – rather no), (2) *Do you have debts?* (no, very little, to a manageable degree, a lot), (3) *Do you need cash at the moment?* (1-7 scale, 1 – rather yes, 7 – rather no).

4. Results

4.1. Intertemporal choice

The main dependent variable was the amount of money participants chose to receive immediately in cash on the day of the experiment. Participants could select any integer value between EUR 0 and EUR 10. The larger the immediate withdrawal, the lower the eventual payoff. Participants who chose EUR 0 received EUR 12.50 after one month, while those who withdrew EUR 10 immediately received nothing later.

Overall, 62% of participants opted to wait and receive the full payment (EUR 12.50).[9] The second most common choice, made by 20%, was to withdraw the entire EUR 10 immediately. The remaining 18% split their payoff between present and future payments. Figure 2 shows the distribution of these three options across treatments. Notably, only 54.3% of participants in the OK-BUTTON condition and 50% in the TYPED NAME condition selected the delayed payment option, compared with 79.2% in the case of the PIN CODE condition and 78.3% in the case of the HANDWRITTEN SIGNATURE condition.[10]

To test whether participants in each condition behaved more impulsively than in the HANDWRITTEN SIGNATURE condition, I conducted Wilcoxon rank-sum tests on the amounts withdrawn immediately. These three comparisons reflect a single pre-specified hypothesis with directional predictions for each condition: OK-BUTTON and TYPED NAME participants were expected to show more impulsive choices than HANDWRITTEN SIGNATURE participants, while PIN CODE outcomes were expected to lie between these extremes, potentially resembling HANDWRITTEN SIGNATURE if participants perceived the PIN as similarly formal and binding. The HANDWRITTEN SIGNATURE therefore serves as the theoretically motivated reference category throughout.

Results showed that participants in the TYPED NAME condition chose significantly more cash on the day of the experiment (M = 4.58, SD = 4.87) than those in the HANDWRITTEN SIGNATURE condition (M = 1.52, SD = 3.43), z = 2.183, p = .029, Cliff's δ = 0.315, 95% CI [0.050, 0.580]. In the OK-BUTTON condition, participants also withdrew more (M = 3.20, SD = 4.17), though the difference was only marginally significant compared to the HANDWRITTEN SIGNATURE condition, z = 1.657, p = .098, Cliff's δ = 0.237, 95% CI [−0.032, 0.507]. Finally, as anticipated by the hypothesis, choices in the PIN CODE condition (M = 1.58, SD = 3.29) did not differ significantly from those in the HANDWRITTEN SIGNATURE condition (z = −0.060, p = .953). The effect size for this comparison was negligible (Cliff's δ = −0.007, 95% CI [−0.247, 0.233]), with the confidence interval centered on zero and spanning only a narrow range, consistent with the predicted similarity between PIN CODE and HANDWRITTEN SIGNATURE. I note that a non-significant p-value cannot confirm equivalence in the strict statistical sense,

[9] One participant was excluded from all analyses since he did not have a European bank account and was not able to provide all the details necessary for a bank transfer outside of the European Union.

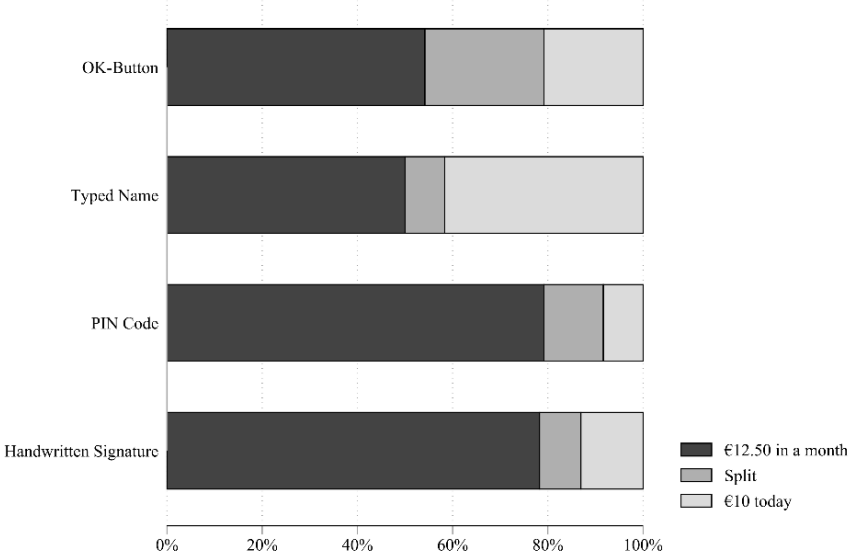
[10] The exact distribution of decisions is displayed in figure A1 in appendix 2.

but the near-zero effect size and the tightly bounded confidence interval provide evidence that any difference between these two conditions is at most small (see Figure 3).

To verify that these results are not an artefact of the normal approximation underlying the Wilcoxon test — which may be imprecise given the many corner solutions and small cell sizes (n = 24) — I conducted simulation-based permutation tests (5,000 repetitions) that make no distributional assumptions. The permutation p-values were closely consistent with the asymptotic results: OK-BUTTON vs. HANDWRITTEN SIGNATURE, p_perm = .096; TYPED NAME vs. HANDWRITTEN SIGNATURE, p_perm = .025; PIN CODE vs. HANDWRITTEN SIGNATURE, p_perm = .929. This agreement confirms that the Wilcoxon findings are not sensitive to distributional assumptions.

Figure 2.

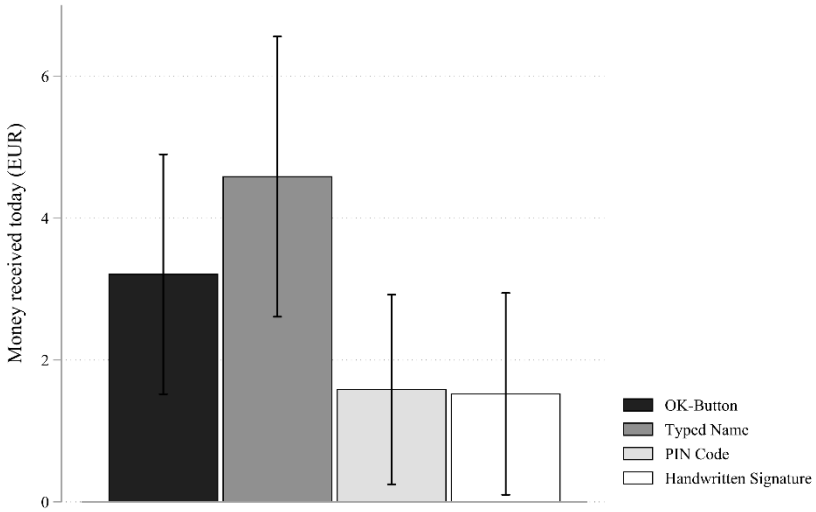
Percentage of participants deciding either to receive EUR 12.50 in a month, EUR 10 on the day of the experiment or to split the amount in each treatment



Note: Bars show the proportion of participants choosing each option by treatment condition. 'Split' indicates participants who chose an intermediate amount (€1–€9). N = 24 per condition.

Source: Figure created by the author.

Figure 3.
Money received on the day of the experiment by participants in each treatment



Note: Average amounts of money received by participants on the day of the experiment in cash separately in each treatment. The spikes represent 95% confidence intervals.

Source: Figure created by the author.

4.2. Model-based analysis of intertemporal choices

Given the distributional features of the outcome—a bounded discrete variable with 65% of observations censored at zero—the Wilcoxon rank-sum test and its distribution-free companions (permutation tests and Cliff's δ) constitute the primary analysis. Model-based results are reported as additional analyses, with the following considerations. The three-category outcome (all later / split / all now) most directly captures the theoretical construct: the cautionary function of formalities is specifically about whether a participant makes any impulsive choice at all, rather than the precise magnitude of that choice. Ordered probit and multinomial logit models on this outcome therefore serve as the primary model-based analysis. The Tobit model (lower limit 0, upper limit 10) and OLS with robust standard errors are also reported for completeness and transparency. HANDWRITTEN SIGNATURE is the reference category throughout all specifications.

In the basic ordered probit without covariates, the coefficient on TYPED NAME was positive and significant ($\beta = 0.865$, $p = .029$), consistent with the Wilcoxon result. The coefficients on OK-BUTTON ($\beta = 0.551$, $p = .136$) and PIN CODE ($\beta = -0.087$, $p = .828$) did not reach conventional significance, with OK-BUTTON positive in the expected direction and PIN CODE negligible — again consistent with the nonparametric results. The multinomial logit confirmed the same pattern: TYPED NAME predicted significantly higher probability of choosing the "all now"

(β = 1.609, p = .034), while PIN CODE did not differ from HANDWRITTEN SIGNATURE in any specification. In the Tobit specification, the coefficient on TYPED NAME was positive and significant in the basic model (β = 19.58, p = .040) and the direction of all treatment coefficients was preserved across all specifications, though parametric models lose conventional significance when covariates are added.[11] Full results are reported in tables A1-A2 in appendix 3.

4.3. Heterogeneity analysis

To address whether the treatment effect varies with participants' baseline time preferences or liquidity constraints, I estimated Tobit models with interaction terms and conducted subgroup Wilcoxon tests. These analyses are exploratory given the limited statistical power available with n = 24 per cell.

The joint F-test of the three treatment × time-preference interaction terms did not reach conventional significance (F(3, 86) = 2.04, p = .114), reflecting limited power with N = 24 per cell and three parameters tested simultaneously. However, all three individual interaction terms were positive and significant (OK-BUTTON × time preference: β = 10.18, p = .024; TYPED NAME × time preference: β = 8.76, p = .048; PIN CODE × time preference: β = 8.71, p = .047), and all point consistently in the same direction. Computing the net treatment effect as the sum of the treatment main effect and the interaction term multiplied by the participant's time preference score reveals that the treatment effect on amount taken today is positive — meaning the treatment group takes more money than HANDWRITTEN SIGNATURE — only for sufficiently patient participants. For strongly impatient participants, the net effect approaches zero.

This pattern is confirmed by the subgroup Wilcoxon tests. Among the more patient half of participants (below-median impatience), treatment effects were visible — OK-BUTTON vs. HANDWRITTEN SIGNATURE, z = 1.871, p = .061; TYPED NAME vs. HANDWRITTEN SIGNATURE, z = 2.002, p = .045 — whereas among the more impatient half, all effects disappeared (all p > .49). Together, the Tobit interaction model and the subgroup tests tell the same story: the cautionary effect of the handwritten signature operates among participants who are already somewhat patient, nudging them toward waiting when they might otherwise act impulsively. Among strongly impatient participants, behavior is dominated by the impulse to take money immediately regardless of confirmation method, and no treatment effect emerges. This is consistent with the dual-process account: the

[11] The attenuation of treatment coefficients in covariate-adjusted specifications is expected in a randomized experiment with N = 24 per cell. Random assignment ensures that baseline time preferences are orthogonal to treatment — confirmed by balance checks (all p > .22) — so the unadjusted nonparametric tests provide the unbiased primary estimates. The two time preference measures jointly explain a large share of outcome variance (pseudo-R^2 increases from 0.040 to 0.195 on their addition), and simultaneously estimating their effects alongside treatment dummies in a sample of 95 observations substantially reduces the residual degrees of freedom available for the treatment contrasts. The preserved direction of all coefficients is the relevant consistency check.

signature activates deliberative Type 2 thinking among those on the margin between patience and impulsiveness, but cannot override a strong Type 1 impulse.

The joint test of treatment × liquidity interactions was clearly not significant ($F(3, 88) = 0.82$, $p = .488$), ruling out a financial explanation for the treatment differences. Full results are reported in table A3 in appendix 3.

4.4. Satisfaction

After making their intertemporal choice, participants rated how satisfied they were with their decision on a 7-point scale (1 = not satisfied, 7 = very satisfied). No significant differences in satisfaction were found between the TYPED NAME and HANDWRITTEN SIGNATURE conditions ($z = -0.561$, $p = .574$) or between the PIN CODE and HANDWRITTEN SIGNATURE conditions ($z = -0.299$, $p = .764$). However, participants in the OK-BUTTON condition reported lower satisfaction compared to those in the HANDWRITTEN SIGNATURE condition, a difference that approached significance ($z = -1.824$, $p = .068$), suggesting that not only behavior but also subjective evaluation of choices may be shaped by the form of contractual confirmation (see figure 4).

4.5. Balance checks

Kruskal–Wallis tests confirmed that participants did not differ systematically across treatments on any pre-treatment variable: age ($\chi^2(3) = 1.800$, $p = .615$), gender ($\chi^2(3) = 4.389$, $p = .222$), quantitative time preference ($\chi^2(3) = 2.480$, $p = .479$), qualitative time preference ($\chi^2(3) = 2.172$, $p = .538$), shortage of money ($\chi^2(3) = 3.366$, $p = .339$), debts ($\chi^2(3) = 0.562$, $p = .905$), and need for cash ($\chi^2(3) = 2.683$, $p = .443$). Successful randomization is confirmed.

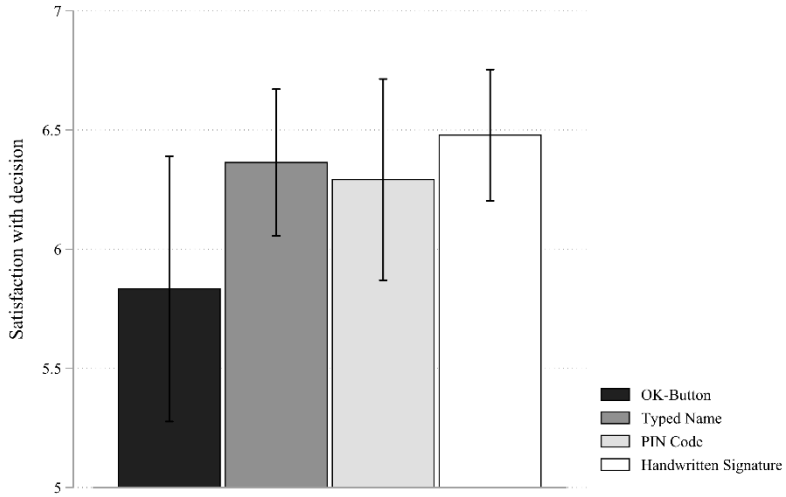
4.6. Follow-up studies

Two follow-up studies comparing the OK-BUTTON and PIN CODE conditions were conducted in 2019: the first at Maastricht University in February 2019 (N = 111), the second at the BonnEconLab, University of Bonn, in April 2019 (N = 117). Neither study found a significant difference between the two conditions. In Maastricht, the direction was consistent with the main study — OK-BUTTON participants took more money today on average than PIN CODE participants — but the difference was not significant (Wilcoxon $z = 0.969$, $p = .333$; Cliff's $\delta = 0.088$, 95% CI [−0.087, 0.262]). In Bonn, the direction was opposite to the main study, with a negligible effect size ($z = -0.691$, $p = .489$; Cliff's $\delta = -0.062$, 95% CI [−0.239, 0.115]). Permutation tests confirmed the asymptotic results at both sites.

These results are inconclusive rather than contradictory with respect to the main hypothesis for two reasons. First, neither replication included the HANDWRITTEN SIGNATURE condition, which is the central focus of the hypothesis; the comparison between two digital confirmation methods cannot replicate a finding regarding handwritten signatures. Second, the two sites produced directionally inconsistent

results, suggesting that the small effects reflect sample variability rather than a stable pattern. Full documentation of both studies — sample characteristics, protocol differences, balance checks, and complete results — is provided in appendix 4.

Figure 4.
Satisfaction with the decision in each treatment



Note: Average responses to the question about satisfaction with the intertemporal decision separately in each treatment. The spikes represent 95% confidence intervals.

Source: Figure created by the author.

5. Discussion and future directions

One of the central rationales for contractual formalities—such as legal requirements that certain contracts be concluded in writing or with a qualified e-signature—is to protect individuals from entering into ill-considered agreements. Paper contracts, confirmed with handwritten signatures, are traditionally assumed to deter impulsive or myopic decisions by encouraging individuals to reflect before choosing an immediate but smaller gain over a delayed, larger payoff. Increasingly, however, scholars have questioned whether digital contract formation fulfills this cautionary function as effectively as paper-based forms.

The present study provides an empirical test of these propositions. Four modes of concluding a contract were compared: two relatively "simple" forms (clicking an OK button and typing one's name) and two more "formal" forms (entering a PIN code, intended to approximate a qualified e-signature, and providing a handwritten signature). The results show that handwritten signatures led participants to choose more patiently than when confirming decisions with an OK-button click or a typed name. In contrast, no differences were found between handwritten signatures and

PIN codes. Interestingly, participants reported being less satisfied with decisions made via the OK-button compared to handwritten signatures, suggesting that not only behavior but also subjective evaluation of choices may be shaped by contractual form.

Although the experiment cannot identify the precise mechanisms driving more patient decisions in the HANDWRITTEN SIGNATURE and PIN CODE treatments, it does allow one alternative explanation to be discounted. Specifically, one might argue that signatures activate self-identity, which in turn promotes choices aligned with a positive self-image (e.g., patience). Past work has shown that handwritten signatures, compared to printed names, can prime self-identity and influence consumer behavior (Kettle & Häubl, 2011), and promote stronger self-presence and perceived contractual bindingness relative to e-signatures (Chou, 2015a, 2015b). However, the self-identity prime account is unlikely to explain the present results for three reasons. First, participants first made their choice and only then confirmed it by signing, typing, or entering a PIN — this sequence makes it unlikely that signatures operated as a self-identity prime. Second, more patient choices were observed not only in the HANDWRITTEN SIGNATURE condition but also in the PIN CODE condition, where no signature was required, which is inconsistent with a signature-specific priming account. Third, typing one's name — a confirmation method that could plausibly activate some degree of self-identity, even if less strongly than a handwritten signature — was associated with the most impulsive choices in the data, the opposite of what a self-identity prime account would predict.

From a law and economics perspective, scholars have argued that the transaction costs associated with written contracts are justified if they prevent impulsive or short-sighted decisions. The findings here support this claim: handwritten contracts appear more effective in fostering deliberation than minimal digital confirmations such as clicking an OK button or typing one's name. At the same time, the equivalence between handwritten signatures and PIN codes suggests that some digital forms may replicate the cautionary function of traditional formalities.

Two follow-up studies comparing the OK-BUTTON and PIN CODE conditions are reported in the Results section and documented in full in appendix 4; because neither included the HANDWRITTEN SIGNATURE condition, they do not speak to the central hypothesis of the paper. Future research should investigate the mechanisms more directly. For example, measuring response times could help determine whether the signature and PIN conditions indeed induce slower, more deliberative decision-making. Additional survey measures could clarify whether participants perceive such decisions as more important or irreversible when confirmed by a signature or personalized code. A deeper understanding of how contractual form shapes decision context would provide information for both legal design and technological innovation, helping to develop digital formalities that are as effective as traditional ones in safeguarding individuals against impulsive contracting.

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Data availability

The data, experimental software (z-Tree), and analysis code that support the findings of this study are openly available on the Open Science Framework at https://doi.org/10.17605/OSF.IO/AF63S.

Appendix

Additional materials related to this article are available in the online supplementary appendix at the journal's website.