Discounted Dreams: Aspirations and Time Preferences[*]

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Abstract

This paper explores the connection between *income aspirations* and *time preferences* among smallholder cocoa farmers in Ecuador. Drawing on a lab-in-the-field experiment that elicits discounting behavior under exponential, hyperbolic, and quasi-hyperbolic models, we document a robust negative correlation between farmers' aspirations and the degree to which they discount future earnings. Farmers with higher self-stated income targets tend to wait more patiently for delayed payoffs, whereas those with stronger near-term focus are prone to setting lower goals. While we cannot fully resolve the causal direction, our findings suggest that policy interventions aimed at *both* fostering ambitious yet realistic aspirations *and* mitigating immediate liquidity pressures may spark longer-horizon investments. These results deepen our understanding of how aspirations shape economic behavior in resource-constrained environments, and they highlight the potential for integrated policy approaches that couple aspiration-raising strategies with financial tools promoting patience.

Keywords: time preferences, aspirations, intertemporal choice, cocoa farmers, Ecuador, behavioral development economics.
JEL Codes: D91, O12, Q12, D03

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1 Introduction

How does a smallholder farmer decide between taking a small profit today or investing those precious funds for a future that may never come? Behavioral economists have long grappled with such questions of intertemporal choice, trying to figure out what shapes our capacity to balance present wants against future needs (Harrison, Lau and Williams, 2002; Chabris et al., 2008; Wang, Rieger and Hens, 2016). At the heart of this debate lie time preferences—typically measured by discount rates—that capture how people weigh the now versus the later (Chuang and Schechter, 2015). In resource-constrained settings, these decisions can be critical: Households often face tight budgets, poor credit, and few savings options, making every decision about spending or investing feel urgent (Carvalho, Meier and Wang, 2016; Brune and Kerwin, 2019; Alemayehu, Beuving and Ruben, 2019).[1]

Here, another concept has started to gain attention among development economists: aspirations, especially income aspirations (Bernard and Taffesse, 2014; Fruttero, Muller and Calvo-Gonzalez, 2021). Do farmers invest in modern agricultural technologies because they dream of quadrupling their income? Or do they bow to present pressures and settle for more modest returns? Studies suggest that the gap between a household's current income and its vision for the future (its "aspired" income) can be just as powerful as material limits themselves in shaping behavior (Garcia, Lensink and Voors, 2020; McKenzie, Mohpal and Yang, 2022; Cecchi et al., 2022; Villacis, Bloem and Mishra, 2023). This gap, theoretically, signals how far someone is willing to push beyond a survival-level standard of living toward greater prosperity (Ray, 2006).

Despite a growing body of work mapping what affects discount rates in emerging economies (Beine et al., 2020), development economists have often overlooked how aspirations and discounting might link or even co-evolve in a high-stakes environment like smallholder farming. The consequences, after all, can be profound: Volatile prices, uncertain weather patterns, and slim margins for error force farmers to make swift, life-altering calls about saving, investing, and risk-taking (Villacis et al., 2022). If large aspirations encourage patience (lower discount rates), then raising aspirations might trigger better long-term planning and could spur transformational growth. Conversely, if impatience (higher discount rates) crushes aspirations, one might see a vicious cycle wherein smallholders perpetually underinvest in the future.

These hints of a two-way relationship between aspirations and time preferences loom

[1] For a comprehensive discussion of the psychological and economic foundations of time discounting, see Frederick, Loewenstein and O'donoghue (2002), whose survey underscores the many ways experimental designs can capture present-biased preferences.

large. Yet as compelling as they are, we still lack rigorous evidence on whether (and how) this relationship unfolds in reality. In practice, short-term liquidity constraints can also suppress aspirations: if a farmer urgently needs cash for family expenses, pest control, or other crises, this near-term pressure effectively raises the farmer's discount rate and makes "dreaming bigger" seem unrealistic. Thus, in addition to high aspirations fueling patience, it is equally plausible that strong present-bias or immediate financial demands might hold aspirations down. Instead of trying to pinpoint a unidirectional cause-and-effect pathway, in this paper we aim to take a close look at the empirical relationship between these two constructs and investigate whether aspirations and time preferences are indeed linked. In doing so, we hope to show how aspirations might complement, amplify, or counteract classic explanations of intertemporal choice (Charness and Genicot, 2009; Genicot and Ray, 2017).

Our research centers on cocoa farmers in Ecuador, a group whose day-to-day decisions are shaped by uncertain earnings, limited market access, and environmental constraints. We measure both the income aspirations gap (how far one's aspired income is from one's current income) and time preferences across three established discounting frameworks: exponential, hyperbolic, and quasi-hyperbolic (Laibson, 1997; Benhabib, Bisin and Schotter, 2010; Bonan, LeMay-Boucher and Scott, 2022; Ihli et al., 2022). To investigate whether there is any meaningful link, we use two complementary empirical approaches. First, we examine how population-level discount rates vary with income aspirations. Second, we look within individuals, checking whether each person's own aspirations match their measured discount rates.

Why take this two-pronged approach? Because the relationship—if it exists—should show up no matter how we look at the data. If we find that farmers with higher aspirations consistently display lower discount rates (and vice versa), that suggests a real phenomenon, not just a random finding. Our results reveal precisely that: a negative correlation between discount rates and income aspirations. Farmers who dream bigger (aim for a much higher income than what they currently earn) demonstrate a greater willingness to wait for future gains; those who focus narrowly on near-term benefits (those with higher discount rates) appear less willing to bet on a bigger, better tomorrow.

Of course, we are cautious about any claims of causality. Does a higher aspiration nudge an individual to be more patient, or does a naturally patient outlook inspire bigger aspirations? We do not claim to decisively settle this question. Instead, we offer rigorous evidence showing that aspirations and time preferences are intertwined—a finding that carries helpful implications for anyone seeking to foster economic development. If, for

instance, a financial literacy program both raises aspirations and nudges farmers toward more future-oriented choices, it may lead to bigger changes in how farmers plan and invest and foster community-wide trajectories of growth.

It bears mentioning that this study shares some experimental components and data with Villacis, Bloem and Mishra (2023), yet its focus is distinct. While Villacis, Bloem and Mishra (2023) investigates whether aspirations and risk preferences predict investments in agricultural technology, our innovation here is to spotlight the relationship between income aspirations and time preferences. Although we can't pin down which direction the influence goes, we make a strong case that the two are connected.

Here's how the paper is organized. Next, we outline the conceptual frameworks around aspirations and discounting, referencing the major specifications that guide our empirical work. Section 3 introduces the context of cocoa farming in Ecuador, including our lab-in-the-field experiment and the protocols used to measure time preferences. Section 4 presents our empirical approaches, detailing the estimation strategies. Section 5 elaborates on the findings, interpreting their potential significance and discussing robustness checks. Finally, section 6 concludes by synthesizing the core insights, noting the study's limitations—particularly around questions of causality—and suggesting next steps for both research and policy.

2 Conceptual Framework

A growing body of literature suggests that something as seemingly intangible as an aspiration can act as a powerful driver of economic decisions in low- and middle-income settings (Ray, 2006; Genicot and Ray, 2017; Bernard and Taffesse, 2014; Dalton, Ghosal and Mani, 2016; McKenzie, Mohpal and Yang, 2022; Villacis, Bloem and Mishra, 2023). In the context of agriculture, farmers often picture a future income that is greater than what they currently earn. This income aspiration serves as a mental compass—one that can nudge them toward adopting new technologies or scaling their operations. Indeed, the gap between current and aspired income, sometimes termed the *income aspirations gap*, can motivate careful longer-term planning. However, these aspirations must strike a delicate balance. If the gap is too small, it may be dismissed as trivial; if it's too large, it risks being demotivating, crushing hope rather than fueling ambition (Bernard and Taffesse, 2014). Under realistic aspirations, farmers may pursue potentially high-return but more uncertain opportunities—for instance, investing in newer seed varieties or adopting labor-intensive but revenue-enhancing practices (Villacis, Bloem and Mishra, 2023). If, however, aspira-

tions are perceived as unattainable, frustration may prompt farmers to prioritize short-run economic stability over ambitious projects.

Yet aspirations are only part of the puzzle. Another key influence on decision-making is an individual's time preferences, which reflect how heavily they value present gains over future rewards (Wuepper et al., 2023). By focusing on how people discount future benefits, we can understand why some farmers set money aside or invest in slow-blooming technologies, while others seize every coin at once. Formally, and following the discussion presented in Benhabib, Bisin and Schotter (2010), one can represent these choices through pairs (y, t), meaning that a person is promised y dollars at time t. If we define a discount function $D(y, t)$, capturing how tomorrow's payout is converted to a present-day equivalent, then $yD(y, t)$ stands for the "now-value" of a delayed reward y, potentially varying with both y and t.

Three frameworks have emerged as classics in this field. The first, *exponential discounting*, states that the present value of a future reward depends on a constant discount rate r, according to

$$D(y, t) \;=\; \exp\{-rt\}, \quad r > 0. \tag{1}$$

Second, *hyperbolic discounting* proposes that people's patience (r) can shift over time:

$$D(y, t) \;=\; \frac{1}{1 + rt}, \quad r > 0. \tag{2}$$

Here, the "effective" discount rate changes as t grows, typically making individuals less impatient about rewards that lie further in the future. Both equations, 1 and 2, treat $D(y, t)$ as independent of the reward amount y, but hyperbolic discounting uniquely exhibits a declining subjective discount rate. More precisely, one can define the subjective discount rate by

$$\left| \frac{\partial D(y, t)/\partial t}{D(y, t)} \right|. \tag{3}$$

In the exponential model, this rate remains constant at r, while in the hyperbolic model it equals $\frac{r}{1+rt}$, which decreases with t.

A third specification, known as *quasi-hyperbolic discounting*, introduces a distinctive "present bias" for all future rewards $(t > 0)$ captured by a parameter β. Formally,

$$D(y, t) \;=\; \begin{cases} 1 & \text{if } t = 0, \\ \beta \exp\{-rt\} & \text{if } t > 0, \end{cases} \tag{4}$$

where $\beta < 1$ indicates a discontinuity between current versus delayed payoffs.[2] Here, any wait at all (even a very short one) is treated quite differently from an immediate payoff. A future reward y is thus valued at most $\beta y = y - (1-\beta)y$, implying a variable cost $(1-\beta)y$ proportional to y.

In the resource-constrained world of smallholder agriculture—where cash constraints and environmental uncertainty are routine—both aspirations and discounting play critical roles (Villacis, Bloem and Mishra, 2023; Liebenehm and Waibel, 2014; Brune and Kerwin, 2019; Alemayehu, Beuving and Ruben, 2019). Picture a small-scale cocoa grower who is deciding whether to allocate funds into a new agricultural technology with the promise of larger harvests a year from now. A sizable aspirations gap might give them the extra push they need, encouraging them to think beyond next week's expenses and focus on hitting a higher income target. But a large discount rate (or a strong present bias) could undo that ambition, leaving immediate needs prioritized over long-term gains. Alternatively, modest but realistic aspirations paired with gentler discounting might encourage farmers to adopt higher-risk, higher-return innovations (Villacis, Bloem and Mishra, 2023).

To measure the *income aspirations gap*, we follow a procedure adapted from Bernard and Taffesse (2014) and Ray (2006), also employed in Villacis, Bloem and Mishra (2023). First, participants report their current monthly income from farming activities. Next, they indicate the monthly income level they would like to achieve in their lifetime. The income aspirations gap is then defined as

$$\text{Income aspirations gap} \;=\; \frac{(\text{desired monthly income}) - (\text{current monthly income})}{\text{desired monthly income}}, \quad (5)$$

which, by construction, is positive and bounded between zero and one (Janzen et al., 2017). This normalization facilitates comparisons across heterogeneous individuals, and reveals the relative distance between a farmer's present situation and their chosen financial target—essentially showing how big a leap they feel they must take. Note that equation 5 implicitly assumes that each respondent's current income is lower than their desired income. In our sample, all respondents indeed reported current incomes below their desired incomes, so no observations had to be dropped for having actual > desired. If future data included such cases, one could set those aspiration-gap values to zero or exclude them, depending on the research design.

[2] In principle, the quasi-hyperbolic parameter β lies in $(0, 1]$. In our estimation routine at the individual level, we impose $\beta < 1$ as an upper bound to rule out implausible results. If an individual's best-fit estimate for β exceeded 1 or was negative, we classified those estimates as out-of-bounds and excluded them from the estimation.

This framework raises a compelling question: how do aspirations and time preferences interact? Do farmers with bolder visions of future income simultaneously show more patience, because they sense that growth requires waiting? Or does an impatient outlook crush any inclination to plan big, limiting them to smaller, short-term gains? As we proceed, we apply these discounting models together with our measure of the aspirations gap to see whether—and how—these two constructs align. Ultimately, this sets the stage for our empirical work, where we examine if farmers dreaming bigger are also those most willing to delay immediate returns and vice-versa—hopefully for a shot at a better tomorrow.

3 Data and Experiment

To investigate the link between time preferences and aspirations, we carried out a lab-in-the-field experiment in 2021. Our sample includes 523 smallholder cocoa farmers from Ecuador's five coastal provinces — Esmeraldas, Guayas, Los Ríos, Manabí, and Santo Domingo de los Tsáchilas — which together account for roughly 80 percent of the nation's total cocoa area. This study design brings together two distinctive features that allow us to explore this time–aspiration relationship: first, an experimental game that allows us to estimate individuals' time preference parameters using different discounting models; and second, a comprehensive survey capturing data on aspirations, risk behavior, and socio-demographic information.

We partnered with the Ecuadorian Institute of Agricultural Research (INIAP) — an agency that has been championing a cocoa extension program aimed at boosting the productivity of aging plantations. Before each session, INIAP reached out to local leaders by phone to request their support in recruiting participants. Farmers who chose to take part arrived for a session with about 10 to 20 other community members. At the outset, they answered a short questionnaire covering basic demographics and risk-taking behavior. They then took part in a brief presentation on cocoa production, followed by a structured game designed to elicit time preference parameters.

Data from certain aspects of our survey also appear in Villacis, Bloem and Mishra (2023). However, they focus on a lottery game to estimate risk preference parameters related to prospect theory, and subsequently test whether there is an inverted U-shape relationship between income aspirations and investments (as proposed by Genicot and Ray (2017)). The time preference game we employ here, though, is not used in Villacis, Bloem and Mishra (2023), however, the farmers in our sample also played the risk-preference

TABLE 1: Summary Statistics

Key Variables	Mean	Std. Dev.	Min	Max	N
Female	0.27	0.44	0.00	1.00	523
Age	49.47	15.63	17.00	87.00	523
Household size	4.08	1.72	1.00	10.00	523
Number of children	0.57	0.50	0.00	1.00	523
Member of association	0.67	0.47	0.00	1.00	523
Years of education	10.37	4.13	0.00	17.00	523
Cacao area (hectare)	2.56	2.58	0.10	30.00	523
Experience as cacao producer (years)	19.87	15.52	1.00	70.00	523
Annual income (USD)	8915.68	9133.60	800.00	72000.00	523
Composite DOSPERT Risk Index	89.85	28.66	30	210	523
Income aspiration gap	0.54	0.12	0.15	0.84	523

Notes: These descriptive statistics summarize the main variables used in our analysis, alongside additional relevant factors that characterize the composition of our sampled cacao farmers. The aspiration gap is defined as the difference between each individual's desired and actual income, divided by their desired income.

game from Villacis, Bloem and Mishra (2023).

Table 1 offers a broad overview of aspirations and farmer-level characteristics in our sample, offering a picture of the cocoa growers and the factors that might shape their investment horizons. The income aspiration gap indicates that most individuals have not yet achieved their desired income levels; however, this gap remains relatively consistent across respondents, suggesting a common set of economic aspirations.

Our time preference elicitation follows Tanaka, Camerer and Nguyen (2010), where each farmer makes 75 choices between a smaller reward delivered immediately and a larger one scheduled for a future date.[3] The options look like this: "Option A: get x dollars today; or Option B: get y dollars in t days." Here, x ranges from 20 to 250 dollars, y from 30 to 300 dollars, and the time delay t spans from 3 days to 90 days.[4] Before the game began, we explained that an INIAP extension agent — trusted by farmers and already working in the village — would securely hold the funds and deliver them to the participants on their chosen future date, minimizing the usual transaction costs between receiving money now versus later. Participants were already familiar with this extension agent from prior community work, so they generally viewed the agent as trustworthy. We emphasized that the agent would securely hold and disburse funds, ensuring that the delayed payments were credible rather than hypothetical, and participants confirmed that this arrangement

[3]Other popular approach include the use of convex budgets to estimate discount functions (Andreoni and Sprenger, 2012*a*).

[4]See Supplemental Appendix for a complete illustration of the experimental design.

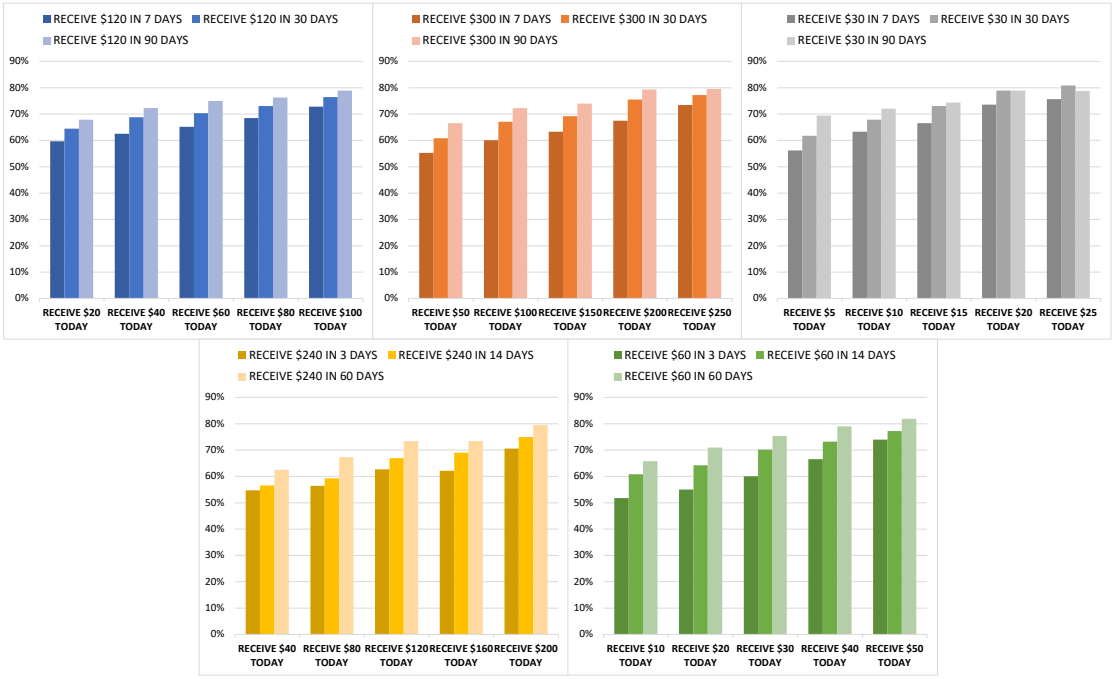


FIGURE 1: Percentages of individuals preferring immediate rewards over future rewards

Note: This figure illustrates the percentage of people who prefer immediate rewards compared to future rewards across the 75 different scenarios presented in Tanaka, Camerer and Nguyen (2010).

was acceptable. After each participant completed all 75 decision rounds, we placed 75 numbered balls into a bingo cage and randomly drew one. Whichever round was selected determined the final payout (Option A or B), including the total amount and the delivery date. Figure 1 illustrates the percentage of farmers who chose the immediate reward over the delayed one across different experimental scenarios. In every scenario, a majority (52 to 82 percent) opted for the immediate payout, though the precise percentages fluctuate.[5]

4 Empirical Framework

How exactly do we capture whether a farmer will take an immediate cash payout or hold out for a bigger future reward? Our approach starts by describing the probability of selecting the "now" option x instead of a postponed payoff (y, t) via a logistic model. Formally, we write $P(x > (y, t))$ to indicate the chance that a subject picks x today over y dollars in t days. For exponential discounting, the probability is:

[5]Empirical work in non-farm contexts, such as Della Vigna and Malmendier (2006), finds strong present bias, akin to farmers' reluctance to wait for higher payoffs if they feel the immediate cost is too high.

$$P(x > (y,t)) = \frac{1}{1+\exp(-\mu(x - y\exp[-rt]))}. \tag{6}$$

while hyperbolic discounting looks like:

$$P(x > (y,t)) = \frac{1}{1+\exp(-\mu(x - y \times \frac{1}{1+rt}))}. \tag{7}$$

and quasi-hyperbolic discounting—which includes a "present bias" parameter β—is given by[6]:

$$P(x > (y,t)) = \frac{1}{1+\exp(-\mu(x - y\beta\exp[-rt]))}. \tag{8}$$

We follow Tanaka, Camerer and Nguyen (2010) in estimating (via maximum likelihood) each of these three models — Equations 6, 7, and 8 — using data from our entire sample. This provides population-level discount rate estimates. Next, we investigate whether certain farmers systematically differ in those discounting parameters (i.e., whether an especially ambitious farmer also happens to be especially patient). To do this, we augment the discounting functions so that the discount rate r and (if relevant) the present-bias coefficient β depend on the income aspirations gap g_i and other individual characteristics. Specifically:

$$r = r_0 + r_1 g_i + \mathbf{X_i'\Gamma}, \tag{9}$$

and

$$\beta = \beta_0 + \beta_1 g_i + \mathbf{X_i'\Gamma}. \tag{10}$$

Here, g_i measures the farmer's income aspirations gap, while $\mathbf{X_i}$ represents demographic factors including age, household size, education, farm size, years of cocoa-farming experience, membership in a farmers' association, gender, whether the farmer has children, self-reported risk-taking behavior (using the composite DOSPERT risk index[7]), and current income.

Incorporating 9 and/or 10 into the original logistic functions yields:

[6]The variable μ is a response sensitivity or noise parameter.

[7]The DOSPERT scale assesses risk-taking in six domains: gambling, investing, ethical choices, and behaviors relating to health/safety, social interaction, and recreation. The DOSPERT questions prompt participants to rate the risk associated with activities in these domains and the scale in each question ranges from one (not at all risky) to seven (extremely risky) (Blais and Weber, 2006; Weber, Blais and Betz, 2002)

$$P(x > (y,t)) = \frac{1}{1 + \exp(-\mu(x - y\exp[-(r_0 + r_1 g_i + \mathbf{X_i'\Gamma})t]))}. \tag{11}$$

$$P(x > (y,t)) = \frac{1}{1 + \exp\left(-\mu\left(x - y \times \frac{1}{1+(r_0+r_1 g_i+\mathbf{X_i'\Gamma})t}\right)\right)}. \tag{12}$$

$$P(x > (y,t)) = \frac{1}{1 + \exp(-\mu(x - y(\beta_0 + \beta_1 g_i + \mathbf{X_i'\Gamma})\exp[-(r_0 + r_1 g_i + \mathbf{X_i'\Gamma})t]))}. \tag{13}$$

We estimate Equations 11, 12, and 13 for the entire sample, looking closely at the coefficient on g_i. These results tell us how time preferences vary at the population level in relation to aspirations. Because risk-taking and current income could shape both discount rates and aspirations, for robustness, we show results with and without those controls.

These expansions assume that aspirations shape time preferences. But it's plausible the direction of causality can run the other way: maybe a strong bias for immediate rewards stunts how big people dare to dream, or vice versa. To account for this possibility, we also compute individual-level estimates of discounting parameters — that is, we estimate equations 6, 7, and 8 for each subject separately. This process gives us personalized r_i and β_i values. Equipped with these, we next treat income aspirations as the dependent variable, capturing how time preferences could (negatively or positively) influence a farmer's ambitions. Hence, we estimate:

$$g_i = \gamma_0 + \gamma_1 r_i + \gamma_2 b_i + \gamma_3 p_i + \gamma_4 m_i + \mathbf{X_i'\Gamma} + \theta + \epsilon_i \tag{14}$$

Here, g_i is our income aspirations gap for farmer i, r_i and b_i capture the individual's discount rate and present bias, respectively (from whichever model applies: exponential, hyperbolic, or quasi-hyperbolic). We also include p_i (the farmer's risk preferences, again from the DOSPERT index) and m_i (the farmer's income). The vector $\mathbf{X_i}$ includes the rest of the demographic and farm-level controls, θ are canton fixed effects, and ϵ_i is the error term. Standard errors are clustered at the canton level. As before, for robustness we report different versions of these results: controlling and not for risk and income.

In the population-level models estimated via logistic regression, we use robust standard errors that adjust for within-subject correlation, reflecting the fact that each participant makes multiple choices (up to 75) in the time preference game. By contrast, when we estimate the OLS regressions linking individual-specific time preference parameters to

each farmer's aspiration gap, there is only one observation per farmer. In those regressions, we cluster standard errors at the canton level to account for shared local shocks or region-specific unobservables that might correlate individuals within the same canton. This approach ensures that inferences are robust for both our within-subject (logistic) and between-subject (OLS) analyses.

In sum, this twofold approach lets us examine whether bigger dreams align with greater willingness to wait, or whether that extra patience is shaped by the dream itself. While this approach help illustrate correlations from both directions, we acknowledge that neither approach fully solves the endogeneity problem. Without a randomized shock to aspirations or time preferences, we cannot decisively claim causality. Nevertheless, seeing consistent negative correlations from both modeling angles supports the idea that aspirations and discount rates are intertwined in practice.

5 Results

Our analysis proceeds in three main steps. First, we estimate population-level time preference parameters under each of the discounting frameworks (exponential, hyperbolic, quasi-hyperbolic). Second, we investigate how these parameters correlate with farmers' income aspirations. Third, we also examine whether the *aspiration gap* might itself be shaped by farmers' discount rates — an idea motivated by the possibility that impatience might constrain how far individuals dare to project their financial goals.

5.1 Baseline Estimates of Discounting

Table 2 presents the most basic versions of our discounting models (Equations 6, 7, and 8). Column (1) shows an exponential specification, Column (2) shows a hyperbolic specification, and Column (3) shows the quasi-hyperbolic specification that introduces a term for present bias. Across all three forms, the estimated discount rate r is both statistically significant, suggesting that farmers in our sample strongly value the present compared to future rewards. In particular, the quasi-hyperbolic model (Column 3) also shows a statistically significant, positive present-bias parameter β, indicating that subjects attach an extra penalty — or "impatience premium" — to any delay beyond the immediate moment (Kaur, Kremer and Mullainathan, 2015).

In practical terms, these findings support what we observed in figure 1 and echo Brown, Chua and Camerer (2009), suggesting that farmers' immediate temptations (e.g., short-

term liquidity needs) compete against more measured saving or investment strategies. Even so, the differences among exponential, hyperbolic, and quasi-hyperbolic forms suggest that incorporating non-constant discount rates and present bias can explain farmers' choices slightly better, as evidenced by a marginally higher R^2 in Column (3). These results set the stage for understanding how aspirations may come into play.

TABLE 2: Baseline Estimates of Discounting

	(1) Exponential	(2) Hyperbolic	(3) Quasi-Hyperbolic
Discount Rate (r)	0.204***	0.327***	0.272***
	(0.009)	(0.023)	(0.014)
Present Bias (β)	-	-	0.004***
	-	-	(0.000)
Observations	15,690	15,690	15,690
R-squared	0.515	0.518	0.522

Notes: This table reports the population-level time preference parameters for each discounting model. Standard errors are adjusted for within-subject correlations. *** p<0.01, ** p<0.05, * p<0.1

5.2 The Link between Aspirations and Discounting Parameters

Next, we allow the discount rate r (and in the quasi-hyperbolic case, β as well) to depend on the income aspirations gap. Tables 3 and 4 present these expanded models.

5.2.1 Exponential and Hyperbolic Models

Panel A of Table 3 focuses on the exponential model. We see that the aspiration gap enters negatively and significantly ($p < 0.01$) in all columns, even after controlling for risk preferences and income. The magnitude is sizable and suggests that farmers who set higher aspirations also tend to discount future rewards at a lower rate, implying greater patience.

Panel B for the hyperbolic specification reveals a similar pattern — the coefficient on the aspiration gap is negative and significant ($p < 0.01$). Interestingly, the coefficient sizes are even larger under hyperbolic discounting; farmers with larger aspirations appear especially likely to counterbalance their impatience in later time horizons. This finding echos the intuition that real-world discounting may not be constant, and that *both* a dynamic sense of the future and a strong aspiration for higher incomes push farmers to be more forward-looking.

TABLE 3: Exponential and Hyperbolic discounting models allowing discount rate (r) to depend on income aspirations - Population Estimates

	(1)	(2)	(3)
Panel A: Exponential Discounting Model			
Constant (r_0)	0.679***	0.680***	0.698***
	(0.042)	(0.049)	(0.042)
Aspiration Gap	-29.355***	-29.355***	-39.933***
	(5.121)	(5.136)	(4.877)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	15,690	15,690	15,690
R-squared	0.515	0.516	0.516
Panel B: Hyperbolic Discounting Model			
Constant (r_0)	1.186***	1.189***	1.241***
	(0.108)	(0.125)	(0.109)
Aspiration Gap	-52.921***	-53.002***	-72.837***
	(12.537)	(12.521)	(12.428)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	15,690	15,690	15,690
R-squared	0.518	0.518	0.518

Notes: This table present estimates of the *augmented* exponential and hyperbolic discounting functions so that the discount rate r depend on the income aspirations gap g_i and other individual characteristics. The aspiration gap is defined as the difference between each individual's desired and actual income, divided by their desired income. Additional controls include household size, number of children, involvement in associations, years of education, size of cacao-growing area, experience as a cacao grower, risk preferences, and income. Standard errors are adjusted for within-subject correlations. *** p<0.01, ** p<0.05, * p<0.1

5.2.2 Quasi-Hyperbolic Model and Present Bias

Table 4 shows how both conventional discounting (r) and present bias (β) might shift with aspirations. Consistent with the previous results, Panel A shows that higher aspirations significantly reduce the conventional discount rate. By contrast, Panel B provides a different story for β: although the coefficients on the aspiration gap are positive, they are not statistically different from zero at conventional levels. This suggests that the link between aspirations and general future orientation (captured by r) is more robust than any link with *present bias* specifically. One interpretation is that while large aspirations may encourage a willingness to wait over intermediate or longer windows, they do not necessarily erase the jump between "today" and "tomorrow." Farmers may still dislike any delay *at all*, even if they are prepared to wait longer once they decide to invest in the future.

TABLE 4: Quasi-Hyperbolic discounting model allowing discount rate (r) and present bias (β) to depend on income aspirations - Population Estimates

	(1)	(2)	(3)
Panel A: Conventional Time Discounting (r)			
Constant (r_0)	0.014***	0.012**	0.012**
	(0.005)	(0.005)	(0.006)
Aspiration Gap	-1.353***	-1.300**	-1.450***
	(0.506)	(0.506)	(0.533)
Panel B: Present Bias (β)			
Constant (β)	0.056	0.011	0.007
	(0.098)	(0.105)	(0.106)
Aspiration Gap	0.068	0.075	0.075
	(0.101)	(0.101)	(0.105)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	15,690	15,690	15,690
R-squared	0.522	0.522	0.523

Notes: This table present estimates of the *augmented* quasi-hyperbolic discounting function so that the discount rate r and the present-bias coefficient β depend on the income aspirations gap g_i and other individual characteristics. The aspiration gap is defined as the difference between each individual's desired and actual income, divided by their desired income. Additional controls include household size, number of children, involvement in associations, years of education, size of cacao-growing area, experience as a cacao grower, risk preferences, and income. Standard errors are adjusted for within-subject correlations. *** p<0.01, ** p<0.05, * p<0.1

5.3 Distributions of Individual Coefficients

Figure 2 illustrates the distribution of estimated time preference coefficients (discount rates and, where relevant, present-bias parameters) at the individual level. Despite some dispersion, the histograms confirm that a majority of farmers display relatively high discount rates — consistent with the idea of strong near-term preferences in resource-constrained environments. The bottom-right panel shows the distribution of the quasi-hyperbolic present-bias term, which again indicates that many farmers place a premium on *immediate* payoffs.[8]

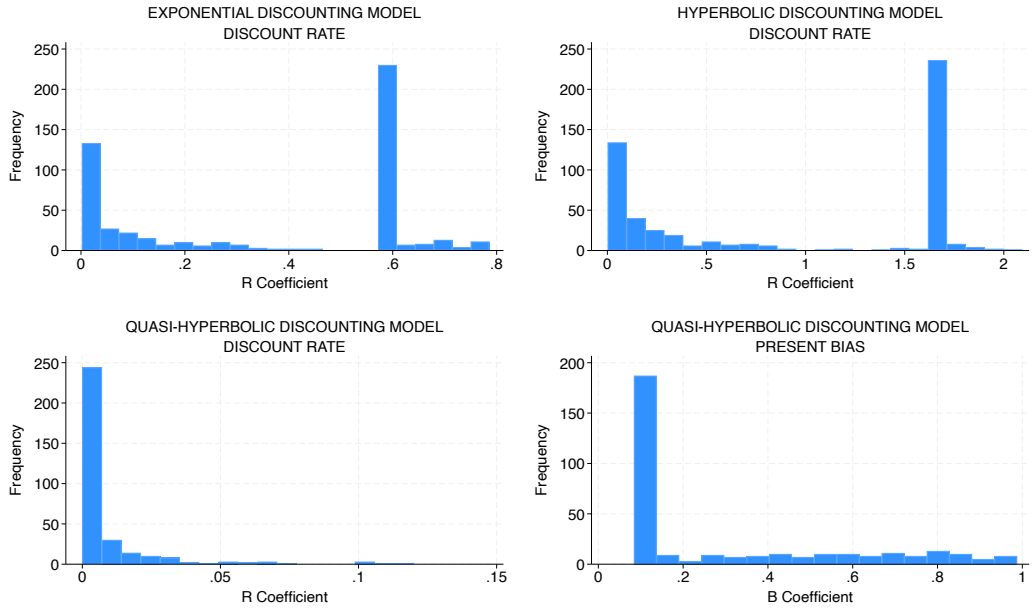


FIGURE 2: Distribution of Individual Time Preference Parameters

5.4 Does Impatience Limit Aspirations?

To investigate a possible *reverse* causal flow — i.e., does impatience itself curb how far farmers aspire? — Table 5 regresses the aspirations gap on individual-level estimates of r and β. We follow a simple linear regression approach, with the gap as the dependent variable and controlling for demographic variables, risk preferences, and (in some specifications) income.

In Panels A and B, the discount rate from both the exponential and hyperbolic models

[8] See Supplemental Appendix for detailed summary statistics of the individual-level estimates of time preferences.

TABLE 5: Correlations between income aspirations and time preferences (OLS)

	(1)	(2)	(3)
Panel A: Discount Rate - Exponential Model			
Discount rate	-0.032**	-0.032**	-0.028*
	(0.013)	(0.013)	(0.016)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	519	519	519
R-squared	0.104	0.104	0.225
Panel B: Discount Rate - Hyperbolic Model			
Discount rate	-0.012**	-0.012**	-0.009**
	(0.004)	(0.004)	(0.004)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	518	518	518
R-squared	0.103	0.103	0.225
Panel C: Discount Rate and Present Bias - Quasi-Hyperbolic Model			
Discount rate	-0.700*	-0.700*	-0.688*
	(0.342)	(0.343)	(0.335)
Present bias	0.034*	0.034*	0.029
	(0.018)	(0.019)	(0.019)
Additional Controls	Yes	Yes	Yes
Risk Preferences	No	Yes	Yes
Income	No	No	Yes
Observations	323	323	323
R-squared	0.174	0.174	0.271

Notes: This table reports ordinary least squares (OLS) regression estimates of the relationship between time preferences and income aspirations. The dependent variable is the income aspirations gap, while the independent variables are individual-level time preference parameters. The aspiration gap is defined as the difference between each individual's desired and actual income, divided by their desired income. Additional controls include household size, number of children, involvement in associations, years of education, size of cacao-growing area, experience as a cacao grower, risk preferences, income, and canton-fixed effects. Standard errors clustered at the canton level are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1

enters *negatively* and significantly, reinforcing the story that impatient farmers tend to set lower aspirations, all else equal. This correlation is robust even when we account for risk preferences and income (Andreoni and Sprenger, 2012*b*). By contrast, Panel C highlights the quasi-hyperbolic model. The sign on the discount rate is still negative, but it remains borderline (significant at the 10% level), suggesting a weaker connection than in the purely exponential or hyperbolic contexts. Finally, the present bias β coefficient is *positive* and marginally significant in certain columns, implying that farmers with a weaker present bias (a higher β) show a slightly higher aspirations gap.

It is important to note that, for the quasi-hyperbolic specification, we lose a significant number of observations (200 out of 523 farmers). The complexity of fitting a non-linear logistic model with two parameters (r and β) simultaneously meant that for several individuals, estimation did not converge or yielded implausible parameter values.[9] This reduced sample size may partly explain why the quasi-hyperbolic results of the discount rate are only significant at the 10% level. While the directional evidence is consistent with our broader story, we urge caution in interpreting these estimates, given that non-trivial attrition in sample size can distort parameter inferences.

Taken together, these reverse regressions imply that *both* directions — from aspirations to patience, and from patience to aspirations — may be at play. While our study design does not definitively resolve the causal arrow, the evidence points to a consistent linkage: individuals with larger aspirations tend to display more patience, and those who see themselves as highly impatient correspondingly report lower aspirations.

5.5 Summary of Key Findings

In sum, the results present a consistent message: *farmers who aspire to higher incomes appear more patient and less prone to discount future earnings heavily.* This pattern holds across multiple discounting frameworks (exponential, hyperbolic, and quasi-hyperbolic) and remains robust to the inclusion of various controls. Additionally, the individual-level regressions suggest that discount rates, in turn, help predict how far farmers set their financial targets.

One can interpret this relationship in a few ways. From a behavioral standpoint, big ambitions may reinforce or "finance" an individual's willingness to wait for longer-term returns. Alternatively, a naturally lower discount rate might empower someone to aim higher since they are already comfortable pushing payoff horizons further out. It is also plausible that both channels apply, creating a feedback loop. Regardless of the underlying

[9] Observations with $r < 0$, $\beta > 1$, and/or cases where the model did not converge were excluded from our analysis.

causal structure, these results imply that conventional development prescriptions might benefit from taking *both* aspirations and time preferences into account — for example, by offering programs that inspire bigger goals alongside mechanisms (like savings or credit schemes) that promote more patient decision-making.

As a final note, we acknowledge that risk preferences and current income may themselves mediate how closely aspirations and time preferences align. While our robustness checks suggest that including or excluding these controls does not radically change the main results, future research should look deeper into how exactly each factor shapes the broader interplay among aspirations, discount rates, and farming decisions.

6 Discussion and Policy Implications

This paper's core insight is that farmers with higher income aspirations tend to discount future rewards less, suggesting that how people imagine their financial future can work hand in hand with their willingness to invest in it. The precise causal direction remains inconclusive, since heightened aspirations could inspire patience, or a naturally patient disposition could enable farmers to dream bigger. Indeed, both channels may interact in self-reinforcing ways.

One limitation of our study is that we cannot fully disentangle these effects without a randomized intervention to manipulate aspirations or discount rates. Moreover, the complexity of estimating nonlinear models — particularly quasi-hyperbolic discounting — reduced our effective sample for certain analyses. Though our findings are robust to controlling for income and risk attitudes, capturing every aspect of real-world decision-making in environments as uncertain as smallholder agriculture is always an econometric challenge. Still, the clear and consistent negative correlation between impatience and aspirations suggests that a farmer's vision for the future is intimately tied to intertemporal trade-offs. In line with these limitations, McKenzie, Mohpal and Yang (2022) tested interventions aimed at raising aspirations and financial knowledge, yet found that only 13% of participants displayed present bias and that none of their treatments shifted it. While our study does not involve an intervention, we rely on a more comprehensive elicitation procedure covering multiple time windows and non-linear discounting, which captures a broader range of behaviors than simpler "preference reversal" designs. Taken together, these findings highlight how embedded present bias can be, particularly when financial and psychological constraints run deep.

From a policy perspective, such a link highlights the power of fostering meaningful

goals within households as a way to spark more future-oriented economic choices. Similar to Duflo, Kremer and Robinson (2011) demonstrating that timely interventions can mitigate present bias in fertilizer use, our findings imply that policymakers could combine aspiration-raising components with minor liquidity supports to sustain long-horizon decisions. If farmers can be guided toward setting realistic yet ambitious targets, they may find it easier to endure the costs of waiting for a larger payoff. Offering tangible financial tools, such as subsidized savings accounts or credit schemes with manageable interest rates, can reinforce these higher aspirations by making it more feasible to invest. Simple messaging strategies, including frequent reminders of personal income goals or success stories from similar communities, may also help ease present bias in practice. Reducing farmers' exposure to severe shocks — for instance through insurance-like safety nets — could further bolster the viability of long-horizon investments, since farmers often discount steeply out of fear that unforeseen events will undercut delayed rewards.

Looking ahead, future research might use experimental interventions to directly raise aspirations, perhaps by hosting visits to "model" farms or conducting group exercises on goal setting. Such a design would help disentangle whether a boost in aspirations leads to lower discount rates or if only those with inherently lower discount rates are receptive. Further studies could also refine how we measure present bias in field settings, since the sharp distinction between immediate and delayed payoffs may shift under different economic, cultural, or catastrophic contexts (Callen, 2015). It is also crucial to note that unobserved shocks (e.g., pest outbreaks, extreme weather, or health emergencies) can overshadow even well-formed aspirations or patient orientations. In seasons where shocks are acute, high discount rates may reflect rational responses to risk rather than mere impatience. Future research might incorporate shock measures to tease out this dimension more explicitly. Exploring how social norms, gender, and local institutions interact with aspirations and time preferences (Bauer and Chytilová, 2010) would also offer deeper insights into the complexity of real-world decision-making . Likewise, individual heterogeneity in discounting—particularly regarding patience—can be partially explained by cognitive ability (Dohmen et al., 2010), suggesting yet another angle for how farmers' aspirations might develop.

In sum, the findings presented here highlight that we cannot fully understand how farmers weigh present versus future gains without considering the ambitions that drive them. Tying together economic constraints, psychosocial factors, and institutional support can open new avenues for development practitioners. By integrating aspiration-raising strategies with interventions that soften credit constraints or mitigate risk, policymakers

may simultaneously encourage both bigger dreams and the patience needed to achieve them.

Ultimately, recognizing that aspirations and time preferences can shape and reinforce one another opens new horizons for rural development policy. By crafting interventions that both expand farmers' ambitions and equip them to manage near-term liquidity constraints, practitioners can encourage investments with longer payback periods. This dual emphasis—on fostering "bigger dreams" and providing the financial scaffolding to act on them—may yield durable improvements in farmers' livelihoods, particularly in resource-constrained environments.

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Supplemental Appendix to "Discounted Dreams: Aspirations and Time Preferences"

TABLE A1: Summary Statistics - Individual Time Preferences

Variables	Mean	Std. Dev.	Min	Max	N
Discount rate - exponential	0.36	0.28	0.00	0.79	519
Discount rate - hyperbolic	0.94	0.78	0.00	2.09	518
Discount rate - quasi-hyperbolic	0.01	0.02	0.00	0.12	323
Present bias - quasi-hyperbolic	0.29	0.29	0.08	0.99	323

Notes: Time preference estimates in the table are based on individual-level estimations of equations 6, 7, and 8. Observations with $r < 0$, $\beta > 1$, and/or cases where the model did not converge were excluded.

Time Preferences - Experimental Design based on Tanaka, Camerer and Nguyen (2010)

	PLAN A				PLAN B			
1	A:	receive	120	USD in 1 week	B:	receive	20	USD today
2	A:	receive	120	USD in 1 week	B:	receive	40	USD today
3	A:	receive	120	USD in 1 week	B:	receive	60	USD today
4	A:	receive	120	USD in 1 week	B:	receive	80	USD today
5	A:	receive	120	USD in 1 week	B:	receive	100	USD today

I choose A for 1–☐ I choose B for ☐–5

	PLAN A				PLAN B			
6	A:	receive	120	USD in 1 month	B:	receive	20	USD today
7	A:	receive	120	USD in 1 month	B:	receive	40	USD today
8	A:	receive	120	USD in 1 month	B:	receive	60	USD today
9	A:	receive	120	USD in 1 month	B:	receive	80	USD today
10	A:	receive	120	USD in 1 month	B:	receive	100	USD today

I choose A for 6–☐ I choose B for ☐–10

	PLAN A				PLAN B			
11	A:	receive	120	USD in 3 months	B:	receive	20	USD today
12	A:	receive	120	USD in 3 months	B:	receive	40	USD today
13	A:	receive	120	USD in 3 months	B:	receive	60	USD today
14	A:	receive	120	USD in 3 months	B:	receive	80	USD today
15	A:	receive	120	USD in 3 months	B:	receive	100	USD today

I choose A for 11–☐ I choose B for ☐–15

	PLAN A	PLAN B
16	A: receive 300 USD in 1 week	B: receive 50 USD today
17	A: receive 300 USD in 1 week	B: receive 100 USD today
18	A: receive 300 USD in 1 week	B: receive 150 USD today
19	A: receive 300 USD in 1 week	B: receive 200 USD today
20	A: receive 300 USD in 1 week	B: receive 250 USD today

I choose A for 16– ☐ I choose B for ☐ –20

	PLAN A	PLAN B
21	A: receive 300 USD in 1 month	B: receive 50 USD today
22	A: receive 300 USD in 1 month	B: receive 100 USD today
23	A: receive 300 USD in 1 month	B: receive 150 USD today
24	A: receive 300 USD in 1 month	B: receive 200 USD today
25	A: receive 300 USD in 1 month	B: receive 250 USD today

I choose A for 21– ☐ I choose B for ☐ –25

	PLAN A	PLAN B
26	A: receive 300 USD in 3 months	B: receive 50 USD today
27	A: receive 300 USD in 3 months	B: receive 100 USD today
28	A: receive 300 USD in 3 months	B: receive 150 USD today
29	A: receive 300 USD in 3 months	B: receive 200 USD today
30	A: receive 300 USD in 3 months	B: receive 250 USD today

I choose A for 26– ☐ I choose B for ☐ –30

	PLAN A	PLAN B
31	A: receive 30 USD in 1 week	B: receive 5 USD today
32	A: receive 30 USD in 1 week	B: receive 10 USD today
33	A: receive 30 USD in 1 week	B: receive 15 USD today
34	A: receive 30 USD in 1 week	B: receive 20 USD today
35	A: receive 30 USD in 1 week	B: receive 25 USD today

I choose A for 31– ☐ I choose B for ☐ –35

	PLAN A	PLAN B
36	A: receive 30 USD in 1 month	B: receive 5 USD today
37	A: receive 30 USD in 1 month	B: receive 10 USD today
38	A: receive 30 USD in 1 month	B: receive 15 USD today
39	A: receive 30 USD in 1 month	B: receive 20 USD today
40	A: receive 30 USD in 1 month	B: receive 25 USD today

I choose A for 36– ☐ I choose B for ☐ –40

	PLAN A	PLAN B
41	A: receive 30 USD in 3 months	B: receive 5 USD today
42	A: receive 30 USD in 3 months	B: receive 10 USD today
43	A: receive 30 USD in 3 months	B: receive 15 USD today
44	A: receive 30 USD in 3 months	B: receive 20 USD today
45	A: receive 30 USD in 3 months	B: receive 25 USD today

I choose A for 41– ☐ I choose B for ☐ –45

	PLAN A	PLAN B
46	A: receive 240 USD in 3 days	B: receive 40 USD today
47	A: receive 240 USD in 3 days	B: receive 80 USD today
48	A: receive 240 USD in 3 days	B: receive 120 USD today
49	A: receive 240 USD in 3 days	B: receive 160 USD today
50	A: receive 240 USD in 3 days	B: receive 200 USD today

I choose A for 46–☐ I choose B for ☐–50

	PLAN A	PLAN B
51	A: receive 240 USD in 2 weeks	B: receive 40 USD today
52	A: receive 240 USD in 2 weeks	B: receive 80 USD today
53	A: receive 240 USD in 2 weeks	B: receive 120 USD today
54	A: receive 240 USD in 2 weeks	B: receive 160 USD today
55	A: receive 240 USD in 2 weeks	B: receive 200 USD today

I choose A for 51–☐ I choose B for ☐–55

	PLAN A	PLAN B
56	A: receive 240 USD in 2 months	B: receive 40 USD today
57	A: receive 240 USD in 2 months	B: receive 80 USD today
58	A: receive 240 USD in 2 months	B: receive 120 USD today
59	A: receive 240 USD in 2 months	B: receive 160 USD today
60	A: receive 240 USD in 2 months	B: receive 200 USD today

I choose A for 56–☐ I choose B for ☐–60

	PLAN A	PLAN B
61	A: receive 60 USD in 3 days	B: receive 10 USD today
62	A: receive 60 USD in 3 days	B: receive 20 USD today
63	A: receive 60 USD in 3 days	B: receive 30 USD today
64	A: receive 60 USD in 3 days	B: receive 40 USD today
65	A: receive 60 USD in 3 days	B: receive 50 USD today

I choose A for 61–☐ I choose B for ☐–65

	PLAN A	PLAN B
66	A: receive 60 USD in 2 weeks	B: receive 10 USD today
67	A: receive 60 USD in 2 weeks	B: receive 20 USD today
68	A: receive 60 USD in 2 weeks	B: receive 30 USD today
69	A: receive 60 USD in 2 weeks	B: receive 40 USD today
70	A: receive 60 USD in 2 weeks	B: receive 50 USD today

I choose A for 66–☐ I choose B for ☐–70

	PLAN A	PLAN B
71	A: receive 60 USD in 2 months	B: receive 10 USD today
72	A: receive 60 USD in 2 months	B: receive 20 USD today
73	A: receive 60 USD in 2 months	B: receive 30 USD today
74	A: receive 60 USD in 2 months	B: receive 40 USD today
75	A: receive 60 USD in 2 months	B: receive 50 USD today

I choose A for 71–☐ I choose B for ☐–75

Note: This experimental design to elicit time preference parameters is based on Tanaka, Camerer and Nguyen (2010).