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5 Intertemporal Choice and Income Regularity: Non-Fungibility in the Timing of Income among Kenyan Farmers[1]

5.1 Introduction

Aggregators such as cooperatives and outgrower schemes help improve smallholder farmers´ access to markets. These institutions generate economies of scale by bulking output from many small producers, which can improve prices, stability, and access to inputs (Reardon et al., 2009). However, they typically rely on informal contracts that are difficult to enforce, making side-selling of produce a major challenge (Minot and Sawyer, 2016). Farmers in need of cash may side-sell–even at prices below the contract price–because aggregators tend to defer payments instead of paying upon delivery (Geng et al., 2017). At the same time, farmers with limited access to sound savings devices may prefer deferred payments (Casaburi and Macchiavello, 2019). The optimal design of informal contracts with smallholders will hence depend not only on *how much* farmers are paid but also on *when* they prefer to be paid.

The evidence on when farmers would prefer being paid is ambiguous: economic theory predicts that discounters of future income prefer being paid early, and indeed, time preference experiments reveal a high demand for earlier (and smaller) as opposed to later (but larger) payments. However, discount rates elicited for irregular windfalls through these experiments are often too high to reconcile with observed savings rates (Frederick et al., 2002). Individuals sometimes even prefer deferred payments, for instance through a "13th salary" at the end of the year, or committed savings devices with negative real interest rates (Ashraf et al., 2006; Bryan et al., 2010). Observational studies find higher marginal propensities to consume for irregular income such as tax refunds or dividends (Souleles, 1999; Baker et al., 2007). When optimizing the timing of payments for agricultural produce, it is important to understand how preferences over such income may deviate from time preferences elicited using (irregular) experimenter money.

[1] This chapter is based on Kramer and Kunst (2020).

We hypothesize that individuals are more patient regarding regular income payments than regarding irregular windfalls, resulting in non-fungibility in intertemporal choice, for four reasons. First, individuals may align the timing of regular income payments with bulky expenditures. Second, mental accounts may govern decision-making over regular income (Thaler, 1999), but such accounts will not exist for unusual income. Third, for windfall gains, reference-dependent theories of intertemporal choice predict hand-to-mouth consumption, while individuals will prefer maintaining the status quo for already planned income paths (Kőszegi and Rabin, 2009; Kramer, 2016). Finally, payments from regular income sources may be more visible to other household members, so that individuals may want to set them aside by deferring payments, whereas it is easier to hide a windfall. Each of these mechanisms predicts more patient choices for more regular income types.

We therefore test for non-fungibility across income types by means of a lab-in-the-field experiment with dairy farmers in Kenya. They aggregate output through a dairy cooperative that defers milk payments until the next month. We asked participants to allocate their milk income from the cooperative between this deferred payment date and an earlier date. We also asked the same participants to allocate an irregular type of income, namely a gift for participating in the study, between an earlier and a later date. The vast majority of participants preferred to defer milk payments until the next month. In contrast, the same participants rarely chose to defer the gift, indicating that the high demand for deferred milk payments is specific to that income type. We show that this finding cannot be explained by differences in stakes, front-end delays, trust or transaction costs.

While our experiment does not allow us to identify the specific channel driving these results, our survey data suggests that the non-fungibility arises because of income accounting, a form of mental accounting (Thaler, 1999). Participants self-reported deferring the milk payment in order to save for lump-sum expenditures such as agricultural inputs or school fees, instead of being tempted to spend their dairy income on something else. For participants who planned to spend their milk payment on more frequent, smaller expenditures such as food and other daily needs, the gap in preferences for deferring milk payments versus windfalls was smaller. These findings are consistent with the theory that in order to save for bulky expenditures, participants earmark their regular income (milk payments), but not irregular income (the gift).

This paper relates to three strands of the literature. First, we provide experimental evidence of income accounting. Income accounting means that different types of income are treated differently in consumption-savings decisions (Thaler, 1990, 1999). Empirically, spending decisions often violate fungibility across income types: for instance, Kooreman (2000) finds that child clothing expenditures are more sensitive to changes in child allowances than to changes in other income; Hastings and Shapiro (2013) reject the hypothesis that households treat "gas money" as fungible with other income; and Beatty and Tuttle (2015) and Hastings and Shapiro (2018) find a higher marginal propensity to consume for food stamp income than standard theory would predict.

In developing countries, non-fungibility has been documented in the context of a school nutrition program (Jacoby, 2002); across wage versus agricultural income (Villa et al., 2011) or gift income (Dupas et al., 2016); and for a labeled cash transfer program (Benhassine et al., 2015). Income accounting is also a leading explanation in studies that document a higher propensity to consume out of irregular income sources (Souleles, 1999; Baker et al., 2007). Such source dependence could be related to unobserved differences in attributes of regular versus irregular income types, including for instance the recipient, front-end delays and interest rates. In our experiment, we can control for these potential confounds.

Second, we shed light on the stability of intertemporal allocations of income. Several studies (for example Meier and Sprenger 2015; Chuang and Schechter 2015; Halevy 2015; Janssens et al. 2017) analyze discounting of experimental windfalls for the same individuals at different points in time. Time preferences vary over time, in part due to random noise in decision making and in part due to liquidity constraints. Time preferences also depend on the commodity in which income is paid (Ubfal, 2016) and allocations of money earned through a physical effort task in the lab are more patient than allocations of experimental windfalls (Hvide et al., 2018). We generalize this finding to regular income earned outside of a laboratory environment in a context of recurring earnings from a dairy cooperative, and highlight how elicited preferences depend on whether inference is based on allocations of windfalls versus regular income.

Third, we contribute to the literature on linkages between rural output and financial markets. For a different dairy cooperative in Kenya, (Geng et al., 2017) suggest that deferring payments increases side-selling during periods in which farmers need cash. Neglecting this demand for liquidity puts at risk the farmer´s loyalty to the cooperative and thereby also possible side benefits of collective marketing (Minot and Sawyer, 2016). At the same time, farmers may face savings constraints: Brune et al. (2016) find that channeling crop sale proceeds into personal bank accounts instead of paying in cash facilitates saving for agricultural inputs; Brune et al. (2018) find a high demand for deferred wages at zero interest among agricultural employees in Malawi; and Casaburi and Macchiavello (2019) argue that Kenyan farmers sell to a cooperative, even at below-market prices, because they value deferred payments as a savings device.

The strong preference for deferred milk payments in our experiment corroborates their findings. In addition to replicating the results of –using distinct methods and procedures in a separate context, strengthening the credibility of their experimental results (Duvendack et al., 2017)–, we show that this finding is source-dependent; it does not generalize to irregular windfalls. Hence, it is not driven by a selection into cooperatives of farmers with unusually low discount rates (or an unusually high demand for commitments to save) across income types.

5.2 Methods

5.2.1 Background

The experiment was conducted with dairy farmers who supply milk to Metkei Dairies Ltd., a farmer-owned dairy hub in the Rift Valley region in western Kenya. Metkei collects milk from 1,000 to 1,500 dairy farmers, stores the milk in two cooling centers, and sells it to larger processing companies. Metkei receives milk twice per day: once in the morning and once in the afternoon. In the morning, farmers can either deliver the milk themselves to one of the two cooling plants or deliver via a Metkei transporter who collects milk at the farmgate for a small deduction from the milk price. In the afternoon, no central transport is available, making afternoon delivery feasible only for farmers who live close enough to a cooling plant to deliver the milk themselves. Farmers have no cooling facilities and cannot store milk produced in the afternoon for the next morning´s milk collection. Metkei prices vary from month to month.

Outside Metkei, farmers can sell their milk to other cooperatives that operate similarly as Metkei, serving formal milk markets, and to neighbors and traders who serve local (informal) markets.[2] It is common to send the morning milk to Metkei and keep afternoon milk for consumption or local marketing. Buyers in the local market tend to pay cash on delivery–at prices that can potentially vary from day to day–to any household member selling the milk. In contrast, Metkei (like other cooperatives) pays only the supplier registered with Metkei (often the male household head), and payments are typically deferred until the eleventh of the next month (which is when the monthly payment from the processing company is on the way).

Farmers can purchase veterinary services, animal feed, fertilizers, and other inputs from Metkei. They can choose to pay for these services in kind, meaning that costs are deducted from the next milk payment, free of charge. Prior to our study, 43 percent of participants planned to use their milk account for such services in the next eight weeks. Farmers can also request advance payments for up to 50 percent of the milk delivered in a given month from the 21st of that month onwards. These cash advances are costly: in order be paid three weeks before the regular payment date, farmers are charged a 7.5 percent interest rate.[3] Despite these large fees, 35 percent of all Metkei farmers took out an advance at least once in the nine months before our study, and for those who did, advance payments accounted for more than 30 percent of the total monthly milk payment (or 60 percent of the amount that farmers could take out as an advance). Hence, the demand for liquidity is high.

[2] Most farmers report other cooperatives as their main alternative for selling milk outside their regular Metkei cooperative (44 percent), followed by Metkei collection centers that do not cool milk and were not included in the study (28 percent), as well as neighbors, traders, and other informal milk buyers (28 percent).

[3] Without compounding, this is equivalent to an annual interest rate of 130 percent. Compounding would result in an even higher annual interest rate.

5.2.2 Experimental Tasks

Recognizing the cash constraints faced by their members, and looking for ways to improve its services and attract more milk, Metkei was interested in measuring farmers´ demand for early milk payments. To that end, we elicited study participants´ preferred allocations of milk payments between an earlier and a later date. We also asked farmers to allocate an irregular gift between an earlier and a later date. By eliciting preferences for these two types of income, we experimentally induced within-subject variation in preferences for when to be paid.[4] In total, our sample includes 355 participants (see Appendix 5.B).

5.2.2.1 Allocation of Milk Payments

We asked study participants to make the following decision, for each of the four weeks after the interview:

"For milk delivered between Friday ... [start date] and Thursday ... [end date], which is ... [one, two, three, or four] weeks from now, for how many kilograms of milk do you prefer to be paid at the end of that week?"

Thus, farmers indicated for how much of the milk delivered between Friday and Thursday they preferred to receive a payment on the subsequent Friday. The remainder would be paid on the later, standard payment date, with both early and later payments maintaining the Metkei milk price prevailing at the time of delivery. Appendix Figure 5.A.1 illustrates a timeline for January 30 as an example interview date. In this example, the participant allocated milk delivered in the week of February 1 (and the weeks of February 8, 15, and 22) between an early payment on February 8 (and February 15, 22, and 29) and a later payment on March 11.

Metkei handled both payments. To reduce transaction costs associated with receiving an extra (early) payment, participants could choose to receive this payment via mobile money or at the collection point, whichever was more convenient for the participant. All participants had access to an account with M-Pesa, the largest mobile money provider in Kenya, and the study paid for any fees associated with sending the money into their account. Farmers were used to receiving their monthly (later) payments through the collection point or transporter. We did not deviate from this approach.

In order to ensure that farmers could still take out in-kind advances for other services, Metkei restricted the maximum weekly payment to 50 percent of the total quantity delivered in a given week. This is consistent with the rule for regular cash advances that farmers were familiar with (although we emphasized that the weekly payments were free of charge, as opposed to the advance payments). Hence, our weekly payment to the farmer was either the amount that the farmer had asked to be paid early, or a payment for 50 percent of the milk

[4] Although not randomizing participants into the two treatments (with a participant completing the allocation task for *either* milk payments *or* for the irregular gift), this study is classified as an experiment, since we rely on a within-subject comparison in a highly controlled setting (Charness et al., 2012).

delivered throughout the previous week (whichever was lower, since otherwise the payment would exceed the maximum amount allowed to be paid in advance).[5]

5.2.2.2 Allocation of the Gift

During the same interview, participants were also asked to allocate a gift of KSh 250, approximately US$ 2.50, or a third of the budget in the median farmer´s milk payment allocation, between the Friday after the interview versus three weeks later (see the bottom row labeled "Gift" in the example from Figure 5.A.1). Both payments were made via mobile money. Farmers received an extra KSh 65 on both dates regardless of their choice:

"In addition to the KSh 65 that we are sending you both ... [early date] (this Friday) and ... [later date] (Friday three weeks from now), how much out of KSh 250 do you prefer to receive this Friday?"

Similar to the milk payment allocations, the gift allocation involved a linear budget, without return or penalty on deferred payments. Hence, a standard model with discounting of future income predicts that participants would prefer to receive both types of income on the early date. Further, the number of days between the early and the late payment date was 21 days, comparable to the median delay in the milk payment.[6] As was the case for milk payments, gift allocations were elicited by our enumerators, and payments on the earlier date were done via mobile money. Finally, because preferences were elicited from the same farmers during the same interview, any differences in allocations cannot be driven by differences in participant characteristics, changes in background wealth, liquidity constraints or time-varying preferences.

Choices also differed in a number of dimensions. In Appendix 5.D, we show that our findings are robust to controlling for differences in front-end delays (i.e., the number of days between the moment that a participant decides and the early payment date), the magnitude of experimental stakes, and our definition of the milk budget (i.e., 50 percent of expected milk production in a given week); and that issues related to trust, transaction costs and order effects are unlikely explanations for our findings.

[5] We dropped this restriction for a few farmers who delivered only afternoon milk to Metkei, because they did not use afternoon milk to pay for Metkei services. For them, we maintained 100 percent of expected production as the effective budget in milk payment allocations. Results are robust to the inclusion or exclusion of this sample, and to recoding their effective milk budget to 50 percent of expected production.

[6] The delay of the milk payment, however, ranged from 7 to 35 days, depending on the number of days until the next regular payment date. Because regular payments are made on the eleventh of the next month, payments are delayed more for milk delivered at the beginning than toward the end of the month.

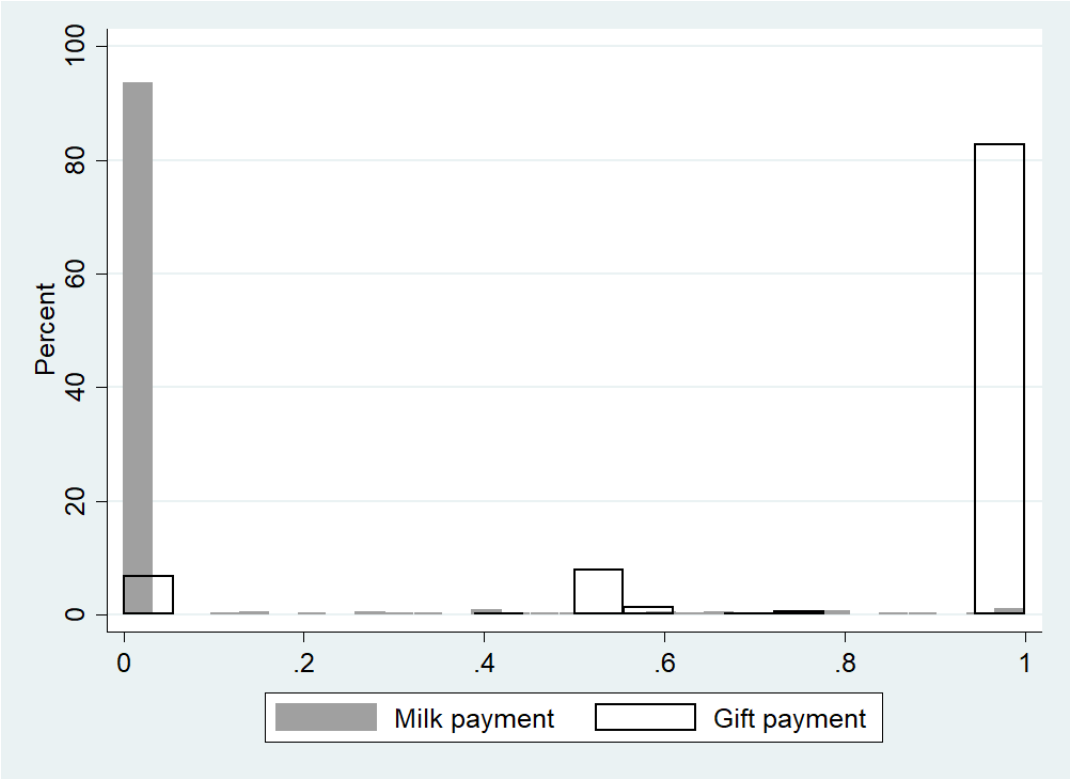

Figure 5.1: Share of Payment Allocated to the Early Date

Histogram of income allocations between an early payment date and a late payment date, treating every choice as one observation (*N=1,770*). The maximum amount of milk income that a participant could allocate to the early date in a given week is calculated as 50% of the participant´s expected milk production for that week, unless the participant is among the few who delivered only afternoon milk to Metkei, in which case we calculate the budget for milk income allocations as 100% of the participant´s expected milk production for that week. One participant allocated more than 50 percent of expected milk production to the early payment date, although her budget was 50 percent of expected milk production. For ease of presentation, we censor her share of income allocated to the early payment date such that this share cannot take on values greater than one.

5.3 Results

5.3.1 Demand for Early Milk and Gift Payments

Figure 5.1 presents the distribution of income allocations, that is, the share of the total payment under consideration (the "budget") allocated to the early payment date. The Figure presents the distribution of these shares separately for all four milk income allocations (in gray) and for the gift allocation (in white). For the milk payment, the budget to be allocated between the two dates is 50 percent of the expected milk production. For the gift, the budget to be allocated between the two dates is KSh 250.

Figure 5.1 reveals a stark difference between the allocations of milk payments and the gift: a large majority of participants chose to receive the entire gift on the early payment date, consistent with standard economic predictions for discounters of future income. In contrast, most participants chose to defer the receipt of the entire milk payment to the regular, later

payment date, allocating none to the early payment date. Only very few allocations fell in the interior of the distribution, where some but not all money was allocated to the early payment date.

Figure 5.1 treats every choice as one observation, meaning that for every participant, the Figure includes four milk payment allocations: one for each week in the four-week period following the interview. Table 5.1 instead summarizes the choices at the participant level, showing that 93 percent of all participants selected no early milk payment for any of the four weeks, whereas only 7 percent chose not to receive an early gift payment. At the same time, less than 1 percent chose to receive the maximum possible milk payment early in every week as opposed to 83 percent who chose to receive the entire gift on the early payment date. Conditional on choosing to receive payments on both the early and the later date (6.5 percent for allocations of milk payments and 10.4 percent for allocations of the gift), participants split the budget equally between the two dates, independent of the income type.

After completing the allocation task for milk payments, the enumerator would ask the participant to state which factors influenced his or her decision (not) to choose a weekly milk payment, and which factor was the most important reason for doing so. Table 5.2 presents self-reported reasons for never selecting the weekly milk payments. Among participants who never selected a weekly payment, nearly all–95 percent–indicated a preference for setting their milk payments aside for lump-sum expenditures or emergencies, instead of facing the temptation to spend the money on something else. This was the most important reason for 78 percent of the participants. Participants thereby self-reported a demand for commitment savings; they intended to save their milk payments for future expenditures, but feared that if paid out in cash at the end of the week, they would be tempted to spend it on something else. This finding is in line with prior evidence of demand for commitment devices (Bryan et al., 2010).

Also the gift could be allocated to the later payment date as a commitment savings device, but very few participants selected this option. Moreover, the correlation between gift and milk payment allocations is very small and statistically insignificant (Table 5.1). Participants deferring (a larger share of) their milk payments were not more likely to also defer (a larger share of) their gift. This raises the question why participants did not also choose to defer the receipt of their gift. The next Section explores potential explanations for this choice gap.

5.3.2 Mechanisms Related to the Regularity of Milk Payments

A key difference between both allocations is that milk payments are a regular type of income, whereas the gift is irregular in the sense of being an unexpected and one-time payment. This difference in income regularity could explain why participants preferred deferring milk payments but not the payment of their gift through the four mechanisms discussed below.

Table 5.1: Allocations of Milk Payments and Gifts

	Percentage
Panel A. Allocations of milk budget between early and late payment date	
Allocates none (zero percent) to early date	93.0
Allocates some but not all to early date	6.5
- *Conditional on 'some but not all to early date':* Average % allocated to early date	50.5
Allocates all (one hundred percent) to early date	0.6
Panel B. Allocations of the gift between early and late payment date	
Allocates none (zero percent) to early date	6.8
Allocates some but not all to early date	10.4
- *Conditional on 'some but not all to early date':* Average % allocated to early date	53.8
Allocates all (one hundred percent) to early date	82.8
Correlation average share of milk budget and share of gift allocated to early date (ρ)	-0.06
Number of observations	355

Overview of income allocations between an early payment date and a late payment date. Every respondent is treated as one observation, and the milk allocation Figures correspond to the average of the four milk income allocations respondents made. The correlation in the second last row is insignificant, with a p-value of 0.29.

Table 5.2: Reasons for Rejecting Weekly Milk Payments

Did the following affect your decision to get none of your milk paid the same week? *Respondents were asked for each item below whether this was a factor in their decision (Column 1) and whether it was the most important factor (Column 2).*	**A factor in decision** *Percentage* (1)	**Most important factor in decision** *Percentage* (2)
If the milk is paid weekly, ...		
... there is a temptation to spend the money instead of saving it	94.9	77.9
... you are unsure whether there is enough left for loans or advances	33.9	5.8
... you may need to share this money with family or friends	36.7	3.6
... the amount is too small to be sent via M-Pesa or picked up from the dairy	21.2	3.3
... the dairy will face higher costs and may reduce prices in the future	9.4	0.3
... there is no current use for the money	21.2	0.9
Other major reason	8.2	8.2
Number of observations	330	330

Responses from the 330 participants who did not select a weekly payment in any of the four weeks. Since participants could select several reasons, only the percentages in the right column add up to 100. Most common among the "other" reasons were references to the use of the regular milk payments in the household budget, with school fees being most frequently mentioned. "Unsure whether enough left for loans or advances" refers to the fact that opting for weekly payments reduced the scope for obtaining loans or advances from the cooperative to deal with unexpected liquidity needs - see Sections 5.2.1 and 5.3.3.

5.3.2.1 Timing of Bulky Expenditures and Preference for Lump-sum Payments

First, participants may have arranged their finances so that bulky expenditures occur around the eleventh of a month, which is when they receive their regular milk payment, giving them more cash on hand. Participants may prefer deferring their milk payments because they need the money to pay for planned expenditures around the eleventh of the month. Deferred gift payments cannot be used in the same way as they do not always occur around the eleventh of the month.

To explore this mechanism, we first analyze when farmers planned to spend money on large and predictable expenditures that occur at most once a month. Participants reported during the survey for each of the four weeks following the interview whether they were expecting any large expenditures in that week. In Appendix Table 5.D.5, we regress this variable–measured at the participant-week level–on a dummy variable for whether that week includes the eleventh of the month. Bulky agricultural expenditures were indeed significantly more often planned for around the eleventh of the month ($p < 0.01$).

In Table 5.3, we analyze whether this could explain participants´ preferences for deferred milk payments. This Table explores heterogeneity in income allocations for different subgroups, indicated in the column headers. Each column presents the coefficients estimated through a regression of the share of income allocated to the early payment date in a given choice on a dummy variable "Milk payment", which indicates whether that choice involves one of the four weekly milk payments (using the allocation of the gift as the choice for the base category), on a dummy variable "Subgroup", which indicates that the participant belongs to the subgroup indicated in the Table header (for instance whether the participant expected bulky expenses around the eleventh of the month in the first column), and on an interaction between these milk payment and subgroup indicators.

Column 1 tests whether the gap in the share of milk payments versus the gift allocated to the earlier payment date is significantly different for participants who expected a bulky expenditure in the week with the eleventh of the next month. If this gap was driven by the timing of bulky expenditures, we would expect a more pronounced gap among this sample of participants. However, the coefficient for the interaction of "Milk payment" and "Subgroup" (a variable indicating that the participant expects bulky expenses around the eleventh of the next month) is small and statistically insignificant, meaning that the choice gap did not differ for such participants.[7] Thus, we do not find stronger differences between milk payment and gift allocations among participants who will have larger cash needs around the eleventh of the month.

For a further check, we can also use the fact that for 81 participants, the late gift payment was scheduled for the eleventh of March, hence coinciding with the day of a regular milk payment. If there was a preference to receive payments around that time due to a preference

[7] The same holds for participants whose expected expenditures in that week exceeded their expected income for that same week (results available upon request).

Table 5.3: Exploring Mechanisms: Heterogeneity in Weekly Payment Choices

	Dependent variable: Share of budget allocated to the early payment date						
	Subgroup:						
	Expects bulky expenses around 11th of month	Late gift scheduled around 11th of month	Payment for daily expenses (vs. lump-sum expsenses)	Supplies p.m. milk (vs. sells only a.m. milk)	Top decile dairy farming experience (vs. other)	Female supplier (vs. male supplier)	Has outside. option (vs. not)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Milk payment	-0.846**	-0.853**	-0.880**	-0.857**	-0.841**	-0.839**	-0.836**
	(0.030)	(0.024)	(0.022)	(0.022)	(0.023)	(0.029)	(0.027)
Subgroup	-0.010	-0.021	-0.071†	-0.022	0.067†	0.023	0.058*
	(0.030)	(0.035)	(0.038)	(0.049)	(0.036)	(0.030)	(0.027)
... × milk payment	-0.013	-0.001	0.099*	0.095	-0.098*	-0.033	-0.058†
	(0.034)	(0.039)	(0.045)	(0.063)	(0.044)	(0.034)	(0.034)
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	1,765	1,770	1,605	1,770	1,770	1,770	1,770
Number of resp.	354	355	321	355	355	355	355
R-squared	0.768	0.768	0.789	0.771	0.769	0.768	0.769
Mean gift early	0.884	0.884	0.884	0.884	0.884	0.884	0.884

Estimated using ordinary least squares with standard errors (in parentheses) clustered at the respondent level. Each column presents the result of a separate regression of the share of the respondent´s budget allocated to the early payment date in a given choice on a dummy variable indicating whether that choice involves a milk payment ("Milk payment"), on a variable indicating the "subgroup", i.e. an indicator variable for the group of respondents defined by the column label, and on an interaction of these two variables. Controls: Budget size, number of days to the early payment, number of days between early and late payments, and self-reported share of milk consumed yesterday. Column 1 excludes one respondent for whom data on expected income and expenditures are missing. Column 3 excludes respondents who stated that they had not delivered milk to the cooperative on the day prior to the interview, as well as three respondents for whom data about the use of milk income are missing. The other columns contain one gift allocation and a maximum of four milk allocations per respondent, resulting in a maximum of 1,775 allocations. Since a few respondents expected their cows to be dry in some of the weeks, they made less than four milk income allocations, decreasing the sample size to 1,770 in the remaining columns. † $p < 0.1$,* $p < 0.05$,** $p < 0.01$.

for lump-sum payments, independent of the source of income, we would expect these participants to allocate a larger share of the gift to the late payment date. Column 2 explores this hypothesis, testing for heterogeneity in the difference between gift and milk payment allocations for these 81 participants versus the remainder of the sample. We find no difference in allocations when focusing on gift allocations with a late payment date on the eleventh, and their milk payment allocations do not differ either.[8]

5.3.2.2 Income Accounting

Regularity also allows farmers to engage in income accounting. To analyze this channel, Table 5.4 presents planned income use for milk sold on the day before the interview, distinguishing between morning versus afternoon milk, and milk sold to Metkei versus another buyer. Table 5.4 summarizes the percentage of participants planning to use their milk income for the main categories that participants listed: food and daily expenditures, school fees, and dairy and crop expenditures. Dairy income from morning milk sold to the cooperative was often used for bulky expenditures such as school fees (62.6 percent) and agricultural inputs (65.2 percent), whereas income from selling afternoon milk to other buyers was generally used for food and other daily expenditures (89.8 percent), and less often for school fees (6.8 percent) or agricultural inputs (12.5 percent). Even afternoon milk income from the cooperative was more likely to be spent on food and other daily expenditures. Columns 5-6 show that this was the case even among the 15 participants who had delivered both morning and afternoon milk to the cooperative on the day before the interview, and for whom morning and afternoon milk income would hence be paid out together.

This suggests that participants earmarked milk income from the cooperative (and in particular, income from selling *morning* milk) to save for bulky expenditures such as school fees, agricultural investments, and emergencies. In the taxonomy of income accounts proposed by Thaler (1990), farmers may assign the cooperative milk payment to a "future income account", while assigning the gift to a "current income account". They may then perceive the offer of more frequent milk payments as an offer to use the future income account for liquidity purposes–and therefore reject it. This is consistent with farmers reporting to reject weekly payments because they have earmarked their morning milk income for savings (Table 5.2). Conversely, spending rules of the current income account, as well as standard discounting, predict a preference for the early payment option in the gift allocation.

To explore this hypothesis, the third column of Table 5.3 estimates the allocation gap separately for participants who were planning to use the income from milk delivered to the cooperative for lump-sum expenditures (the reference category) versus those planning to use it for food and other small purchases. The latter category of participants allocated less to the early payment date in allocations of the gift ($p < 0.10$), and the interaction term for milk

[8] We also find no differences when comparing gift allocations for these 81 participants with only those allocations where the *early* payment falls on the 12th of a month, and for which this mechanism would suggest opposing preferences for the timing of payment (see Appendix Table 5.D.4).

payments and planning to use milk payments for daily expenses is positive and significant ($p < 0.05$). Thus, controlling for gift allocations, these participants were more likely to choose early milk payments, suggesting ceteris paribus a stronger demand for liquidity from the cooperative. Column 4 shows that demand for liquidity is also stronger for participants who deliver afternoon milk to Metkei–albeit not significantly so, suggesting that the morning versus afternoon distinction matters primarily because participants tend to associate morning milk with bulky expenditures, and afternoon milk with smaller and more frequent purchases.

5.3.2.3 Habit Formation, Reference Dependence and Status Quo Bias

Another strand of potential mechanisms relates to habit formation (cf. Duesenberry, 1952), reference dependence and status quo bias (Kahneman et al., 1991). Farmers may prefer to defer milk payments from the cooperative primarily because they are used to this, or because their reference points for consumption are built on the expectation that income arrives around the eleventh of the next month. In theory, when reference points are based on expectations held before consumption, the marginal propensity to consume for windfall gains (e.g., an irregular gift for survey participants) is higher than the propensity to consume for anticipated income (e.g., a milk payment)(Kőszegi and Rabin, 2009). Because the participants were already expecting milk payments on the eleventh of the next month, a reallocation would result in lower future consumption than expected. A loss-averse participant will weigh the associated utility loss more heavily than the corresponding utility gain from consuming more in the present, inducing the participant to maintain the status quo and reject weekly milk payments. By contrast, there is no habit, reference point or status quo for gift payments, and thus, standard time preferences prevail.

To the extent that habits are stronger among older or more experienced dairy farmers, we would expect them to defer milk payments the most. Column 5 of Table 5.3 shows that the allocation gap was indeed somewhat larger for participants with at least 30 years of experience in dairy farming (the top 10 percent). Thus, we cannot formally rule out that our findings are driven by either habit formation or reference dependence. Also mental accounting may however be stronger among more experienced participants and the self-reported reasons for rejecting weekly payments suggest that farmers value deferred milk payments because they facilitate saving for bulky expenditures, including agricultural spending. Such expenditures are durables or investments that do not directly generate consumption utility; their returns are consumed throughout a longer period of time. It is not clear to what extent consumption habits or reference-dependent consumption utility could drive preferences to save for those types of expenditures.

Moreover, in an initial pilot round of the experiment (see Appendix 5.A for details), we created unanticipated changes in milk payments by offering 2 KSh more per liter of milk allocated to the early payment date. Reference-dependent farmers should have reacted to this surprise income shock in their milk payment allocations by allocating more to the early

date. Nonetheless, the elasticity of allocations with respect to an increase in the milk price was very low (Appendix Figure 5.D.1), suggesting that expectations-based reference points may not be as relevant as income accounting in our setting.[9]

5.3.2.4 Visibility of Income

Finally, regularity may matter due to the visibility of such income to others, for instance one´s husband, who may be tempted to spend the money. A dairy farmer may not want to get some of the milk money paid at the end of the week out of concern that her husband, the household member registered with the cooperative and hence likely to collect milk payments from the cooperative, may spend it; by deferring the payment, the money is locked away with the cooperative. Conversely, she can hide irregular income, such as the experimental gift, and keep it with her for an emergency, because her husband will not know she received the money. In our context, we would expect this effect to be strongest for women because in the local Kalenjin culture, men are traditionally perceived to be in charge of household finances.

Column 6 of Table 5.3 therefore assesses whether the gap between milk payment and gift allocations is larger for female than for male dairy farmers.[10] In milk payment allocations, male suppliers allocated a significantly smaller portion to the early payment date than in gift allocations (83.9 percentage points, $p < 0.01$). Among female suppliers, the share of the gift allocated to the early payment date is 2.3 percentage points higher than among male suppliers, but this difference is not significantly different. Men and women are also very comparable in the share of milk payments allocated to the early payment date. To further complement these findings, note that having to share weekly payments with family or friends was the *main* reason for rejecting payments for only 3.6 percent of participants (Table 5.2). Thus, differences in the visibility of milk income and gifts do not appear to drive the gap in income allocations.

In summary, we explored four explanations for why allocations of regular income tend to be more patient than allocations of windfall payments. Although the experiment was not designed to formally distinguish these different mechanisms, income allocations and survey evidence suggest that the observed differences between intertemporal allocations cannot be accounted for by planned expenditures, habit formation, reference dependence or intra-household bargaining motives alone. Rather, our findings are consistent with the view that dairy farmers apply different mental accounts to different sources of income. Income from morning milk delivered to the cooperative is earmarked for lump-sum expenditures, whereas this does not apply to irregular windfalls and to income from selling afternoon milk.

[9] It is worth noting that this elasticity may also have been low because these changes in milk price did not induce substantial variation in prospective milk income. Casaburi and Macchiavello (2019) offered a larger increase in the daily price of milk (16 percent, as compared with our 7 percent increase in the weekly price) and also found their offer rejected by a large majority of farmers.

[10] For similar reasons, we would expect the gap to be smaller among self-identified household heads. Self-identified household heads are however not significantly *more* likely to select weekly payments.

5.3.3 Weekly payments versus Advances

This final Section explores the implications for the design of informal contracts in agricultural value chains, and in particular, whether our findings imply that aggregators should always defer payments. We were surprised by the low demand for weekly milk payments, given the high demand for costly advances described in Section 5.2.1. Partly, this may be because participants can cover at least small liquidity needs by side-selling milk to neighbors or traders; but it could also be that farmers could not predict their liquidity needs at the time of the experiment, and did not want to commit to receiving the payments early.

Consistent with the former conjecture, Column 7 of Table 5.3 shows that controlling for choices regarding the windfall, the demand for weekly milk payments was lower for participants who stated that they had also sold milk to buyers outside Metkei, i.e. participants with access to neighbors or traders who pay cash upon delivery to cover small liquidity needs. These may be the farmers who turn to Metkei mostly to satisfy their demand for commitment savings. In a setting with fewer side-selling opportunities, the demand for more frequent payments by the cooperative would potentially be greater.

But the main distinction between weekly payments and the more popular advances in the eyes of the participants is the lack of flexibility of the former. Table 5.5 shows that 20 percent of participants reported that they actually had taken cash advances during the eight weeks prior to the interview, mostly to pay for school fees and health expenditures or emergencies. More than half said they needed this money urgently and could not have obtained it elsewhere. Moreover, 22 percent of participants who rejected weekly payments expected to take advances within the next four weeks. More than 85 percent of them said they preferred this form of liquidity because the decision to take an advance could be made spontaneously and on any day of the week. These findings suggest that participants value advances as insurance against unexpected liquidity demands. Weekly milk payments do not provide this service, and are moreover perceived as putting at risk the participant´s savings goals.

Even for advances, participants´ views are nuanced. On one hand, 87 percent stated they would be better off if advances were available at a lower fee and 39 percent stated having to side-sell milk in case of an emergency if advances were not available, suggesting a demand for deferred payments as a soft commitment device. On the other hand, less than half of participants thought it would be better for them if advances were available already in the first two weeks of a month, and only 27 percent reported that they would benefit if advances could be taken against all milk delivered to Metkei (instead of allowing advances for up to 50 percent) in a month. A sizeable minority of 24 percent even stated that they would be better off without the possibility of taking advances, and 11 percent indicated they would like the advances to be *more* expensive, suggesting a preference for stronger commitments to save.

Summarizing, although we find limited heterogeneity in farmers´ demand for the weekly milk payments, we find more heterogeneity in the demand for advances. Advances help

farmers meet their liquidity demands without having to commit to early milk payments also in the absence of urgent cash needs. Advances are hence preferred over weekly payments, but there is substantial heterogeneity in the extent to which farmers prefer advances being more accessible–that is, whether they prefer deferred milk payments to be a stronger versus softer commitment savings device.

5.4 Conclusion

We find that dairy farmers of a Kenyan cooperative preferred to defer their milk payments but chose to receive an experimental gift at the earlier of two possible payment dates. Potential confounding factors such as differences in stakes, front-end delays, trust, and transaction costs do not seem to account for this discrepancy. Our results are consistent with both the experimental literature, which generally finds a preference for early over late receipts of windfalls (cf. Frederick et al., 2002), and with field evidence revealing lower discount rates for more regular income types and a demand for commitment savings or deferred payments (Ashraf et al., 2006; Bryan et al., 2010; Casaburi and Macchiavello, 2019).

Our findings are not an artifact of the cooperative we chose to work with. In a comparable study in a different part of Kenya, 83 of 96 dairy farmers (86 percent) declined the offer to be paid for their milk upon delivery (Casaburi and Macchiavello, 2019), mirroring our 93 percent of participants who never chose weekly payments. Moreover, 73 percent of those farmers referred to self-control problems or the need to achieve savings targets as motivating their decisions, comparable to our 78 percent. In both studies, farmers appeared to use the deferred milk payments as a commitment device to overcome limited access to sound savings instruments. In addition, we show that this finding is income source-dependent as we cannot replicate it for allocations of an experimental gift. This supports the conclusion by (Cohen et al., 2016) that intertemporal choice over regular income does not always reflect domain-general time preferences.

We propose the timing of lump-sum expenditures, income accounting, habit formation and income visibility as four mechanisms through which the regularity of the income may matter for intertemporal choice. Although our experiment does not allow us to distinguish clearly between these mechanisms, survey evidence and heterogeneity in milk income allocations suggest that farmers assign milk income from the cooperative, but not gift income, to a mental savings account for bulky expenditures. An area for future research would be to investigate whether also in other settings, non-fungibility in intertemporal choice is driven by the regularity of the income source via one of the mechanisms highlighted in the present study, and whether non-fungibility in intertemporal choice is more likely to be observed in the presence of savings constraints.

These findings have implications for the design of informal contracts between farmers and aggregators in agricultural value chains such as cooperatives, producer groups and out-

grower schemes. Farmers may value deferred payments from trustworthy institutions. In such contexts, aggregators should abstain from making more frequent payments the default, irrespective of whether discount rates elicited using experimenter money would suggest otherwise. We do, however, observe a strong demand for advance payments along with the low demand for early and more frequent payments. Instead of paying early, aggregators may want to provide more flexibility in the form of advance payments, which can be accessed if farmers need the money *ex post*, without having to commit to these payments *ex ante*.

Our results suggest that the optimal informal contract in such a setting needs to strike a delicate balance between providing sufficient liquidity to farmers in case of need, without depriving farmers of the ability to commit their income to saving for bulky expenditures. This is consistent with recent empirical work, which finds greater impacts of soft commitment savings devices with flexible rules compared to impacts of more binding alternatives (Dupas and Robinson, 2013; Karlan and Linden, 2017). Aligning the conditions of informal contracts with farmers´ preference for when to be paid could help improve farmers´ loyalty to such contracts. This, in turn, could allow aggregators to operate more effectively and realize economies of scale, an important consideration for increasing agricultural incomes and productivity (Bellemare, 2012; Verhofstadt and Maertens, 2014; Ma and Abdulai, 2016).

Table 5.4: Planned Uses of Milk Income

	All respondents				**Same respondents**			
	Coop		Other		Coop		Other	
	AM	PM	AM	PM	AM	PM	AM	PM
Percentage of respondents planning to use milk income for ...								
- *Food and daily expenditures*	26.5	52.2	100.0	89.8	26.7	46.7	100.0	80.0
- *School fees*	62.6	26.1	9.1	6.8	53.3	20.0	20.0	20.0
- *Expenditures dairy/crop farming*	65.2	43.5	18.2	12.5	86.7	53.3	20.0	0.0
Respondents	313	23	11	88	15	15	5	5

Responses of participants who stated selling AM or PM milk to the respective buyer on the day before the interview. Percentages do not add up to 100 because participants could select up to two spending categories. Other buyers are mostly neighbors and shops/vendors, and we exclude 5 responses of farmers that stated delivering to another cooperative on the day before the interview. The data on intended use of milk income is missing for 3 respondents.

Table 5.5: Use and Perception of Dairy Cooperative Services

	Yes (%)
Took in-kind advance for farm inputs in last 8 weeks	43.5
Took out a cash advance in last 8 weeks	19.9
Two most frequent uses of these advances:	
- Pay for schooling	44.3
- Health care or an emergency	15.7
Situation when taking these advances:	
- Needed money urgently and could not get it elsewhere	55.7
- Needed money but could have gotten it elsewhere	22.9
- Needed money but could have waited a week or two	21.4
Did not select weekly payment, but expected to take advance in next 4 weeks	22.1
Most important reason:	
- I prefer taking an advance later, only if really needed	64.4
- Weekly payments can only be made on Fridays	21.9
- Weekly payments are only about milk delivered over one week	13.7
Perception of advances: "It would be better for me if advances were ..."	
- Available at a lower fee	86.9
- Available already in the first two weeks of the month	48.7
- Available for all milk delivered that month	26.7
- Not available	24.2
- More expensive	10.8
Would side-sell in case of a financial emergency if there were no advances	38.6
Number of participants	355

Question about use of inkind advances in first row only included in the first round (368 respondents). See the Appendix for an introduction of the first round-interviews. Due to a software error, questions about advances were skipped for 3 respondents.

Appendices

5.A Interview Procedures

The study was implemented between November 2015 and April 2016. In November-December 2015, prior to the intervention, participants were informed about the upcoming milk payment allocations through sensitization sessions, held with Metkei staff in order to raise awareness and build trust. The team further distributed flyers at the milk collection points and via the transporters, which was followed by a first interview round during which we collected data on demographic and socioeconomic characteristics as well as milk production, practices, and spending. We also elicited incentivized measures of risk aversion using a Binswanger lottery. The study coordinator paid earnings from this lottery via mobile money on the first Friday after the interview.

In February–March 2016, we visited the same participants for a second interview. In that interview, participants were presented with the two allocation tasks described in Section 5.2.2. Both allocation tasks were preceded with detailed instructions and test questions to make sure participants had understood the setup, including the fact that there would be no additional cost for receiving the weekly payments. The gift was introduced as a reward for participation, but only at the end of the survey, after an intentional break with survey questions.

The experiment elicited a number of milk payment allocations also during the first round, which we use as a robustness check. These allocations differ from second-round allocations in a number of respects. To start, participants allocated a payment between the end of the week and the eleventh of the next month for two weeks instead of one week at a time. This means that every allocation applies to a two-week period instead of only one week.

Further, first-round allocations varied the return on deferred payments by varying the price for milk that participants chose to be paid for on the earlier payment date. Given that the price for milk paid on the regular (later) payment date was fixed at the prevailing Metkei price, a decrease in the earlier milk price increases the return on deferred payments. In first-round allocations, the earlier milk price was either (1) identical to the prevailing Metkei price, that is, a *zero* return on deferring payments; (2) KSh 2 (about 7 percent) higher, that is, a *negative* return on deferring payments; or (3) KSh 2 lower, that is, a *positive* return on deferring payments.

First-round participants made choices for each of the three scenarios for two offers: a short-duration offer, in which participants could receive weekly payments over the next two weeks (and thus over only one two-week period), versus a long-duration offer, in which they could receive weekly payments in each of the next four two-week periods. At the end of the first-round interview, we randomly selected a price, and either the short-duration or the long-duration offer, for which the allocations were implemented by Metkei during the period

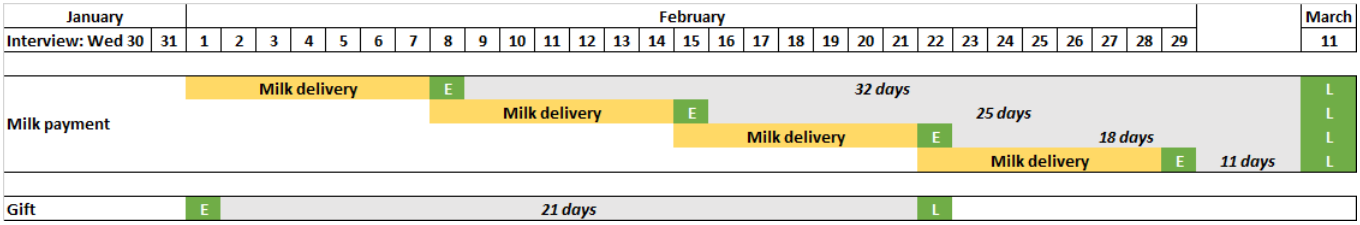

Figure 5.A.1: Timeline for Experimental Tasks: Example for an Interview on Wednesday ("Wed") January 30

On the interview day, the participant allocates payments between an early ("E") and late ("L") payment date. Text in italics indicates the number of days between the early and late payment date. Participants make allocations for in total four milk delivery periods (indicated in yellow) and a gift. Regarding milk payments, the median delay between the two dates is 21 days, with front-end delays (number of days between the interview and the early payment) ranging between 7 and 35 days. Regarding the gift, the delay between the two dates is always 21 days, with a front-end delay between 1 and 7 days.

between the first and the second round.[11]

We started with this more complex design with the aim of assessing under which parameters farmers are interested in weekly payments. In addition, we aimed to create exogenous variation in the take-up of weekly payments in order to be able to assess the impacts of weekly payments on the quantity of milk that farmers deliver to the cooperative. However, as we will show, the demand for weekly payments was very limited, irrespective of the milk price for early payments or the duration of the offer. We therefore simplified the second-round design, and included the allocation of a gift in order to assess whether the strong preference for deferred payments observed in the first round generalizes to other, less regular, income types.

5.B Sampling and Attrition

Participants were sampled using the following procedures. First, from all farmers to whom Metkei made a payment in September 2015, we omitted the 2 percent who delivered, on average, more than 25 kilograms of milk per day. To implement the experiment in a confined geographic area, we then selected all 313 farmers who self-delivered to one of the collection points, and all 220 farmers who delivered through one of the three largest transporters to be approached for interviews. The enumerators were able to locate and conduct first interviews with 64 percent of the self-deliverers and 74 percent of the transporter deliverers, or 363 of the 533 selected households.

[11] We implemented every choice with some probability in order to incentivize participants to state their preferences truthfully. At the end of the interview, after making their allocations for the three price scenarios for both short- and long-duration offers, we randomly assigned half of the participants to the first scenario, in which they had made choices for each of the next four two-week periods (an eight-week offer), and the remaining half to the two-week scenario. For the prices, we assigned 98 percent of the participants to the same-price scenario and 1 percent each to the higher- and lower-price scenarios.

In the first round, we targeted the person responsible for the decision of where to sell milk and also interviewed 11 additional household members who were afternoon suppliers and interested in delivering this milk to Metkei, resulting in a sample of 374 first-round participants. In the second round, enumerators approached all first-round participants for interviews and were able to interview 338 participants or 90.4 percent (see Table 5.B.1). They also interviewed an additional 28 suppliers from the same households who had not been included in the first round, yielding a second-round sample of 355 participants. Attrition was limited and cannot account for our main results: first-round participants who agreed to be re-surveyed during the second round made, on average, similar allocations as first-round participants who were not re-surveyed during the second round, and in analyses that include both first- and second-round allocations, findings are robust to the exclusion of participants who were not surveyed in both rounds (results available upon request).

5.C Participant Characteristics

Table 5.C.1 describes participant characteristics. Panel A focuses on time-invariant demographic characteristics, while Panels B and C summarize time-varying characteristics during the first and second round, respectively. Columns 1 and 2 present statistics for all participants in a given round. Columns 3 and 4 provide summary statistics for the 327 suppliers who participated in both rounds. Column 5 tests for statistically significant differences between the full sample and the balanced panel included in both rounds.

The average participant was 45 years old and had around 14 years of experience with dairy farming. Fewer than half of the participants were women.[12]Nearly 80 percent had completed primary school but less than half had completed secondary school. For the vast majority, dairy farming was the main daily activity and main source of income, often along with crop farming.

During the first round, few participants (18 percent) reported delivering afternoon milk to Metkei. Participants had on average fewer than three lactating cows producing around 13 kilograms of milk the day before the interview. They reported using this mainly for home consumption (48 percent), or supplying it to Metkei (46 percent). Participants reported selling only a small share of their milk (5 percent) to other buyers, potentially due to underreporting of side-selling. Indeed, based on administrative data on suppliers´ daily deliveries, farmers delivered only 36 percent of self-reported production to Metkei the day before the interview, meaning that participants overstated the share delivered to Metkei by about 10 percentage points (assuming unbiased consumption Figures). Metkei offered on average KSh 33.7 per kilogram of milk, net of transportation costs, or KSh 1.7 more than the

[12]In Kenya as well as other parts of eastern Africa, dairy farming is traditionally a female income-generating activity, but men have become increasingly involved as dairy farming has become more commercialized. Our share of female farmers was relatively low compared with the samples of other studies because we targeted the participants in the household who were in charge of making decisions about milk income, not necessarily those spending most time on activities related to dairy farming.

Table 5.B.1: Overview of Sample Construction and Attrition by Round and Milk Delivery Mode

	Round 1			Round 2		
	Total	Self	Trans-porter	Total	Self	Trans-porter
	(1)	(2)	(3)	(4)	(5)	6)
Panel A. Visited for interviews						
Potential subject pool before interviews*	533	313	220	374	209	165
Round 2 only: Household members added	-	-	-	21	13	8
Total subject pool	533	313	220	395	222	173
- Interviewed	363	200	163	359	188	171
- Household not found	156	103	53	3	1	2
- Second Metkei member in household†	3	1	2	-	-	-
- Refused or unavailable	7	6	1	10	8	2
- No longer supplies milk to Metkei	4	3	1	3	3	0
- Cows will be dry the next 8 weeks	0	-	-	20	12	8
- Changed to transporter delivery	0	-	-	10	10	0
Panel B. Included in the analyses						
Excluded from analyses	6	5	1	4	2	2
- Cows dry next 8 weeks	1	1	0	0	0	0
- No longer supplies to Metkei	1	0	1	3	1	2
- Not authorized to decide on milk payments	4	4	0	0	0	0
- Interviewed someone else	-	-	-	1	1	0
Number of participants in analysis sample	368	204	164	355	186	169
- Subsample with administrative data	346	196	150	319	164	155

HH = household. *The potential subject pool in the second round consisted of all respondents interviewed at baseline, plus household members who were not interviewed in the first round but who were responsible for dairy farming. † These are households with two household members registered with Metkei separately. Respondents who could not be matched with the administrative data did not deliver to Metkei in the study period.

local market.

From the first to the second round, the proportion of participants selling afternoon milk to Metkei reduced, especially among the sample that participated in both rounds. In addition, during the second round, Metkei was no longer offering a higher price; on average, participants reported receiving about KSh 3 (11 percent) more per liter of milk sold outside of the cooperative. The number of lactating cows and production did not change substantially. The quantity of milk delivered to the cooperative however increased between the two rounds due to a reduction in milk consumption, as many children who were at home during the first round had gone back to (boarding) school during the second round.

5.D Results: Ruling out Alternative Explanations

Although the allocations of milk payments and the gift were comparable in many ways, choices also differed in a number of aspects. First, there were differences in front-end delays and experimental stakes.[13]Second, there could be differences in trust and transaction costs. Third, the gift allocation was made at the end of the interview, after participants had already made their milk payment allocation, and this may have introduced order effects. We will now argue that these factors are unlikely to explain our results.

5.D.1 Front-end Delays and Magnitude Effects

To rule out that our findings are driven by differences in front-end delays and magnitude effects, Table 5.D.1 assesses the robustness of the design of the two experimental tasks. Treating every choice as one observation, the Table regresses the share allocated to the early date on a binary indicator for allocations of milk payments (using gift allocations as a base), controlling for other choice attributes. Standard errors are clustered by participant. Columns 1–4 focus on second-round allocations only. Columns 5 and 6 include both first-round and second-round allocations. Odd-numbered columns display the results of regressing the share of a budget allocated to the early payment date on a binary variable indicating milk payments and other controls as shown in the Table. Even-numbered columns estimate the same model including participant fixed effects.[14]

[13]The front-end delay is the number of days between the interview and the early payment date. For interviews conducted on a Thursday, the first week would start on Friday and the first possible weekly payment would take place on the next Friday, 8 days later. Interviews conducted on a Friday had the longest front-end delay: the first week would start on the subsequent Friday, and the first weekly payment would therefore be made on the Friday 14 days later. For the gift payment, the front-end delay was shorter. However, note that the front-end delay was still equal to at least 1 day, so that no participant could choose to receive the gift payment directly during the interview. The gift corresponded to about one third of the value of the weekly milk budget that the median farmer could allocate over time.

[14]Because participants made intertemporal allocations of both milk payments and the gift, the main variable of interest, "milk payment", is balanced across participants, and we do not need to control for participant characteristics such as age, gender, or relationship to the household head. In order to improve precision, the even-numbered columns nonetheless control for participant fixed effects.

Table 5.C.1: Respondent Characteristics

	All respondents		**Panel sample**		**Δ (1)-(3)**
	mean (1)	*s.d.* (2)	*mean* (3)	*s.d.* (4)	*p-value* (5)
Panel A: Demographics					
Age	45.2	13.6	45.8	13.5	0.55
Years of experience in dairy farming	13.8	11.8	14.0	11.8	0.82
Female (%)	46.2	49.9	41.6	49.4	0.21
Primary schooling completed (%)	79.3	40.5	79.2	40.6	0.97
Secondary schooling completed (%)	40.8	49.2	40.1	49.1	0.84
Dairy farming main income source (%)	81.4	39.0	83.5	37.2	0.46
Panel B: First round					
Delivers PM milk to Metkei	17.7	38.2	16.5	37.2	0.69
Number of currently lactating cows	2.5	1.8	2.5	1.8	0.96
Kg milk produced yesterday (survey)	12.8	9.8	13.0	9.6	0.74
- Sold to someone else (%)	4.7	10.2	5.0	10.6	0.69
- Consumed (%)	47.6	24.3	45.7	23.2	0.28
- Survey: Delivered to cooperative (%)	45.8	24.5	47.6	23.8	0.33
- Admin.: Delivered to cooperative (%)	36.3	30.5	37.6	30.6	0.58
Net milk price cooperative (KSh)	33.7	2.5	33.6	2.5	0.71
Net milk price other buyer (KSh)	32.0	5.3	31.6	4.5	0.59
Panel C: Second round					
Delivers PM milk to Metkei	13.2	33.9	9.8	29.8	0.16
Number of currently lactating cows	2.7	1.8	2.6	1.8	0.65
Kg milk produced yesterday (survey)	13.1	10.2	13.2	10.2	0.93
- Sold to someone else (%)	5.4	11.6	4.3	9.6	0.21
- Consumed (%)	38.7	20.4	38.7	19.7	1.00
- Survey: Delivered to cooperative (%)	53.4	21.4	54.8	19.5	0.37
- Admin.: Delivered to cooperative (%)	42.6	28.9	43.8	28.6	0.60
Net milk price cooperative (KSh)	28.2	2.1	28.2	2.1	0.94
Net milk price other buyer (KSh)	31.4	4.1	31.5	4.3	0.80
Number of first-round respondents	368		327		
Number of second-round respondents	355		327		

KSh = Kenyan shilling. Admin.: Administrative data. Reported milk prices are averages among those respondents who sold either AM or PM milk to the cooperative or another buyer on the day prior to the interview, net of transport costs. Time-invariant characteristics other than gender are missing for four second round respondents.

Table 5.D.1: Controlling for Potential Confounds and Testing Alternative Designs

	Dependent variable: Share of budget that participant allocates to the early payment date					
	Round 2 only				*Round 1 and 2*	
	(1)	(2)	(3)	(4)	(5)	(6)
Milk payment	-0.847**	-0.847**	-0.854**	-0.863**	-0.864**	-0.853**
	(0.017)	(0.017)	(0.024)	(0.026)	(0.022)	(0.020)
... × budget size (100 kg)			0.024	0.052	0.040	0.013
			(0.026)	(0.056)	(0.036)	(0.025)
Days to early payment			-0.003	-0.003	0.002	0.001
			(0.004)	(0.002)	(0.002)	(0.001)
Days between payments			-0.010*	-0.010*	-0.002	-0.005*
			(0.004)	(0.004)	(0.004)	(0.002)
Share of milk consumed			0.088	0.077	0.002	-0.031
			(0.064)	(0.094)	(0.026)	(0.026)
Milk payment × 1st round					0.027†	0.027†
					(0.015)	(0.014)
... × higher price					0.004*	0.004*
					(0.002)	(0.002)
... × lower price					-0.036**	-0.036**
					(0.008)	(0.008)
... × offer for 8 weeks					-0.024	-0.014
					(0.015)	(0.015)
Respondent fixed effects		✓		✓		✓
Observations	1,770	1,770	1,770	1,770	7,185	7,185
Number of respondents	355	355	355	355	396	396
R-squared	0.766	0.862	0.768	0.863	0.530	0.705
Mean share of gift allocated to early date	0.884	0.884	0.884	0.884	0.884	0.884

Estimated using ordinary least squares with standard errors (in parentheses) clustered at the participant level. Base for comparison: Share of gift allocated to early payment date. Columns 1-4 contain one gift allocation and a maximum of four milk allocations per participant, resulting in a maximum of 1,775 allocations. Since a few participants expected their cows to be dry in some of the weeks, they made less than four milk income allocations, decreasing the sample size to 1,770. In columns 5-6, the samples also include up to 24 first round milk allocations by participant (4 periods × 3 prices× 2 duration scenarios). Days to early payment and between payments are expressed in multiples of 10. The mean share of the gift allocated to the early payment date (last row) does not change when including first-round allocations because the first-round allocations did not include allocations of a gift. In the specifications with respondent fixed effects, "*R*-squared" indicates the explained variation in allocations *within* respondents. The coefficient on "Milk payment x budget size" is identified in these specifications because the milk budget varies within respondents across the four weeks. † $p < 0.1$,* $p < 0.05$,** $p < 0.01$.

Columns 1 and 2 show that participants allocated on average 85 percentage points less of their milk budget than of their gift to the earlier payment date. Columns 3–4 show that the low demand for early milk payments cannot be explained by longer front-end delays or by variation in the delay between the two payment dates.[15] Moreover, we do not find evidence of a magnitude effect (Andersen et al., 2013) since the share of the milk budget allocated to the earlier payment date does not depend on the milk budget size.[16]

One possible concern is that the available "milk budget" can differ from the marketable milk budget because households consume a significant share of the milk, or because they plan on selling their milk outside Metkei. Because we define the milk budget as 50 percent of expected production instead of the expected quantity of milk sold to Metkei, we may overstate the milk budget and hence understate the share of milk income that is allocated to early payments. Therefore, Table 5.D.1 also controls for the self-reported share of milk production consumed on the day prior to the interview. This variable is unrelated to the share of income allocated to the early payment date.

Many participants chose a corner allocation, that is, to allocate their entire budget to either the early or the later payment date but not to both. We therefore also estimate a logit model for binary dependent variables in Table 5.D.2, coding choices as binary variables. In Columns 1–3, the dependent variable takes a value of 1 if at least part of the budget is allocated to the early payment date. In Columns 4–6, it takes a value of 1 if the entire budget is allocated to the early date. The estimated difference between the two allocation types remains large and significant in all specifications. This is consistent with the findings obtained in Table 5.D.1. We hence conclude that our findings are robust to controlling for front-end delays and magnitude effects, and to using logit instead of OLS.

5.D.2 Trust

Next, we consider whether the share of the gift allocated to the early payment date was high due to distrust. Participants may trust the experimenter to pay the gift only on the earlier date, not on the later date. This is a concern mainly in experiments that make the earlier payment during the interview itself, which participants will perceive as a guaranteed or more reliable payment, while the later payment involves the experimenter coming back at a later date, which participants may feel is not guaranteed to happen. In our experiment, the sooner payment was made a few days after the interview. This front-end delay makes trust less

[15] This is also true when allowing the effect of front-end delays to differ for gift versus milk payment allocations (results available upon request).

[16] To test for a magnitude effect, we convert the size of the gift into kilograms of milk using the median net milk price reported by farmers. Moreover, rather than being more impatient, participants with a milk budget of a similar size as the gift were even less likely to select weekly payments (results available upon request). In order to test for the potential existence of a *relative* magnitude effect, we also regressed the share of the gift allocated to the early payment date on the average milk budget size. The coefficient was small and statistically insignificant, suggesting that the size of the gift relative to a participant´s milk budget did not influence the results.

Table 5.D.2: Sensitivity of Main Results to the use of a Logit Model

	Dependent variable: At least part of budget/entire budget allocated to earlier payment date (dummy variable)					
	Some early			All early		
	(1)	(2)	(3)	(4)	(5)	(6)
Milk payment	-0.868**	-0.889**	-0.881**	-0.820**	-0.695**	-0.694**
	(0.019)	(0.018)	(0.019)	(0.020)	(0.235)	(0.173)
Controls		✓	✓		✓	✓
First round allocations			✓			✓
Observations	1,770	1,770	7,185	1,770	1,770	7,185
Number of respondents	355	355	396	355	355	396

Displayed are marginal effects, estimated using a logit model with standard errors (in parentheses) clustered at the respondent level. Controls are the budget size, the number of days to the early payment, the number of days between early and late payments, and the self-reported share of milk consumed yesterday as control variables. In addition, Columns 3 and 6 also control for dummy variables indicating first-round allocations, and dummy variables interacting this variable with the price scenario and an indicator for the eight-week offer. Columns 1-2 and 4-5 contain one gift allocation and a maximum of four milk allocations per participant, resulting in a maximum of 1,775 allocations. However, a few participants made less than four milk income allocations since they expected their cows to be dry in some of the weeks, decreasing the sample size to 1,770. In columns 3 and 6, the samples also include up to 24 first round milk allocations by participant (4 periods $\times$ 3 prices $\times$ 2 duration scenarios). $\dagger\, p < 0.1$,* $p < 0.05$,** $p < 0.01$.

of a concern (Chabris et al., 2010).[17]Moreover, 90 percent of participants had received a payout from a Binswanger-type lottery after the first-round interview, thus having seen the experimenters keep their promises.[18] We therefore conclude that the preference for early payments of the gift cannot be explained by participants being concerned that they would receive the gift only when allocated to the earlier date.

We also consider whether a lack of trust could explain the low demand for early milk payments. The study was carefully designed to ensure that participants trusted Metkei to make the early payment. Metkei made both milk payments, not only the regular (later) payments; endorsed the study to the participants; and enjoyed high trust from participants.[19] Further, the few participants who opted to receive early payments in the first round had received these payments, improving their trust in implementation, and potentially the trust of their neighbors witnessing these payments. A lack of trust in receiving the early payments was indeed never mentioned as a reason for rejecting the early payments, let alone as the main reason for doing so (Table 5.2).

Although a number of participants (9.4 percent) expressed a worry that the early payments might harm the cooperative and hence future prices, only 0.3 percent of participants reported this as the *main* reason for not taking early payments. Participants´ distrust, or a preference to comply with cooperative rules, may have been stronger in the first round, since they had not yet seen the cooperative committing to early payments at that time. Nonetheless, first-round demand for early milk payments was 2.7 percentage points *higher* than second-round demand (see Table 5.D.1). These findings provide further indication that distrust or a preference for complying with cooperative rules do not explain the strong demand for deferred milk payments.

5.D.3 Transaction costs

The study was designed to minimize transaction costs associated with receiving early milk payments. We offered participants the option to receive their weekly payments directly via mobile money at no extra charge, and 60 percent chose the mobile payment. Despite that option, most participants did not opt for weekly payments even in the higher-price scenario (Figure 5.D.1). Moreover, in Table 5.D.3}, we show that even self-deliverers–who lived near the collection points and could pick up their weekly payment at no additional cost when delivering their milk–were not significantly more likely to select weekly payments.

[17]It could still be that trust depends on the time horizon, for instance if the late payment date is after the end of the main study period and participants worry that they then have less clout to enforce the gift payment. However, both proposed gift payment dates were within the four-week period for which the participants made milk payment choices, and farmers knew how to contact us if they did not receive an expected payment.

[18]These payoffs ranged between KSh 125 and KSh 950 (about $1.25 to $9.50) and were sent via M-Pesa, in the same way we sent the second-round gift.

[19]During the first-round survey, the Metkei cooperative received an average of 8.2 on a 10-point scale with 1 as the lowest and 10 the highest possible trust. The main alternative buyer for participants´ milk received a 5.0 on average.

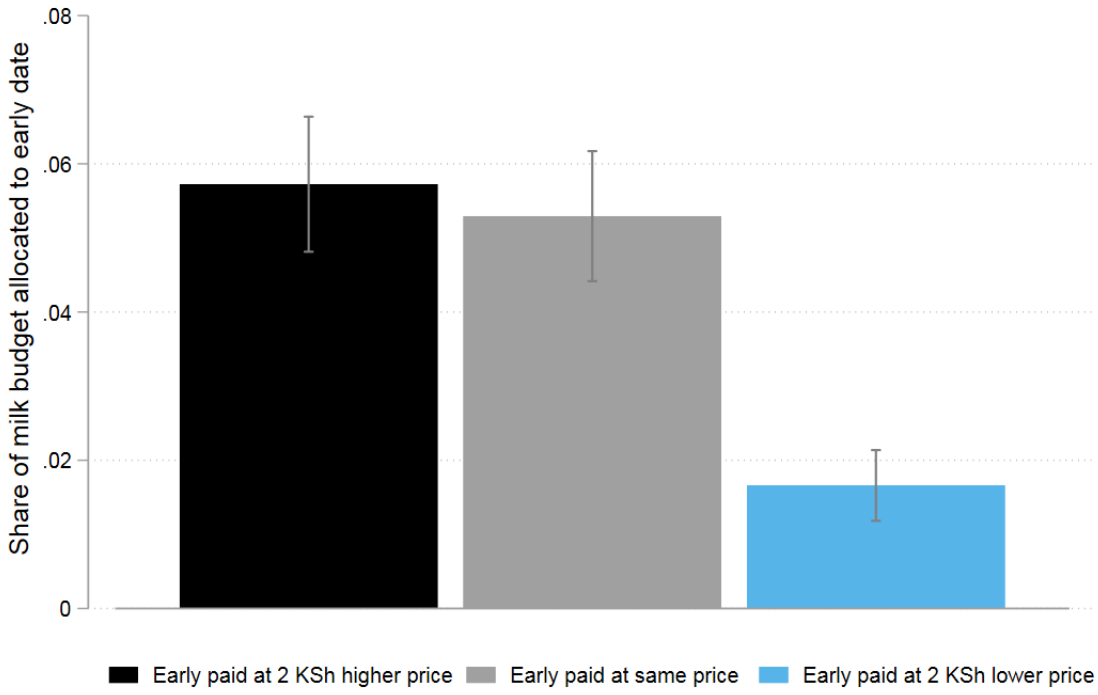

Figure 5.D.1: Sensitivity to the Price of Milk Paid on the Early Payment Date

Average share of the milk budget allocated to the early payment date (instead of the late payment date) during the first round, treating every choice as one observation ($N = 5,415$). The milk budget in a given week is calculated as 50% of the participant´s expected milk production for that week, unless the participant is among the few who delivered afternoon milk only to Metkei, in which case we calculate the budget for milk income allocations as 100% of the participant´s expected milk production for that week.

Consistent with this limited role played by transaction costs, Table 5.2 shows that only 3.3 percent of farmers state a too small payment amount as their main reason for rejecting weekly payments. This also speaks against the interpretation that participants chose to defer their cooperative milk payment because of their preference to receive their milk payment in bulk, not because of their preference to save their milk payment for future needs.

Another concern could be that participants may prefer receiving the full gift on the early date in order to receive a payment only once. Because participants received a payment of KSh 65 (about US$0.65) at both the early and the later date, regardless of their allocation of the KSh 250 budget over both dates, transaction costs were equal for the two payment dates, and there was no penalty for being paid on both dates. If motives related to transaction costs rather than discounting were driving the gift allocations, participants should have been indifferent between allocating all income to either the early or the later date.[20] Hence, allocations to the later payment date should have been equally likely as allocations to the early payment date. Nonetheless, only 6.8 percent chose to receive the entire gift on the later date

[20] In fact, for participants worried about M-Pesa withdrawal fees, which tend to be nonlinear and favor lumpy transactions, the participant should have preferred dividing the gift equally between the two dates, because that would reduce the cost of withdrawing the KSh 65 on both dates.

(see Table 5.1), speaking against transaction costs or a preference for bulky payments being the sole factor driving the gift allocation.

Table 5.D.3: Exploring Mechanisms: Income Allocations of Self-Deliverers

Dependent variable: Share of budget allocated to early payment date	
	(1)
Milk payment	-0.854**
	(0.027)
Self-deliverer	0.025
	(0.029)
... × milk payment	0.001
	(0.034)
Controls	✓
Observations	1,770
Number of respondents	355
R-squared	0.769
Mean share of gift allocated to early payment date	0.884

Estimated for second-round sample using ordinary least squares with standard errors (in parentheses) clustered at the respondent level. The Table presents the result of a regression of the share of the respondent´s budget allocated to the early payment date in a given choice on a dummy variable indicating whether that choice involves a milk payment ("Milk payment"), on a dummy for allocations made by the 186 respondents who reported delivering their milk themselves to the collection point, and an interaction between both variables. Controls: Budget size, number of days to the early payment, number of days between early and late payments, and self-reported share of milk consumed yesterday. † $p < 0.1$,* $p < 0.05$,** $p < 0.01$.

5.D.4 Order effects

A final concern is that the allocations are influenced by order effects. We informed participants about the gift, and elicited the gift allocation, only at the end of the interview, with an intentional break of survey questions between the two allocation types. Thus, milk payments will not have been influenced by the gift allocation. At the same time, participants may have allocated the gift to the earlier payment date because they had already deferred their milk payment. If payments from the two income sources were treated as substitutes, we should observe a negative correlation between the share of the gift and the average share of milk payments allocated to the earlier payment date.

This is however not what we find: In Table 5.1, there is no correlation between these two variables, indicating that the two income sources are not treated as perfect substitutes for one another, and that order effects are unlikely to explain our results. Substitution possibilities were greatest for the 81 participants whose late gift payment date fell on a late milk pay-

ment date. Also for this subsample, we however find a statistically insignificant correlation between the average share of milk payments and the share of the gift allocated to the early payment ($\rho = 0.09$, $p = 0.43$).

Alternatively, participants may have allocated the gift to the early payment date because of fatigue and reduced self-control at the end of the interview. In that case, we would expect participants with a longer interview duration to allocate a larger share of their gift to the early payment date. In Table 5.D.4 Column 3, we test this hypothesis by regressing the gift allocation on a dummy variable indicating above-median interview duration. The amount allocated to the early payment date was not correlated with interview duration, suggesting that also fatigue or reduced self-control at the end of the interview cannot account for our result.

In sum, we show that differences in trust and transaction costs, front-end delays, magnitude effects and order effects are unlikely to account for our findings. Instead, it appears that dairy farmers apply different mental accounts to different sources of income. They earmark most of their regular milk income to save for lump-sum expenditures, whereas they have not developed this spending rule for the irregular windfall from participating in a survey. Participants´ strong demand for deferred milk payments suggests that they are satisfied with the timing of their cooperative milk payments, and that the cooperative plays an important role in providing farmers with a commitment savings device.

Table 5.D.4: Heterogeneity across Allocations of the Gift

	Dependent variable: Share of gift allocated to early payment date		
	vs. all other allocations of a gift (1)	vs. early payment of gift on 12th (2)	vs. below-median interview duration (3)
Late payment date for gift on the eleventh	-0.022	0.008	
	(0.035)	(0.047)	
Above-median interview duration			-0.036
			(0.029)
Observations	355	167	355
R-squared	0.001	0.000	0.004
Mean gift early	0.884	0.863	0.884

Estimated using ordinary least squares including only allocations of the gift. For base of comparison, we use all observations with the late payment date of the gift not being on the eleventh in Column (1), versus only those observations with the late payment date of the gift not being on the eleventh *and* the early payment date of the gift being on the 12th in Column (2), and all observations with below-median interview duration in Column (3). The median interview duration was 56:28 minutes. $\dagger\, p < 0.1$,* $p < 0.05$,** $p < 0.01$.

Table 5.D.5: Expected Expenditures and Regular Milk Payment Weeks

	Spending expected in week t (if expects bulky expenses)			
	All spending categories (1)	Agricultural expenses (2)	Dairy expenses (3)	Schooling expenses (4)
Week includes the eleventh	0.138**	0.240**	0.041	-0.049
	(0.035)	(0.038)	(0.043)	(0.056)
Observations	1392	1308	904	484
Number of respondents	348	327	226	121
R-squared	0.012	0.043	0.001	0.002
Mean dependent variable	0.524	0.290	0.277	0.252

Unit of observation is participant$i$ in week t for the four weeks following the second-round interview. The dependent variable in Column 1 is a dummy indicating whether the participant expects bulky expenditure in week t (conditional on expecting any bulky expenditures in the four weeks following the second-round interview). In Columns 2, 3 and 4, it is a dummy indicating whether the participant expects bulky expenditures on agriculture, dairy farming or schooling, respectively (again, conditional on expecting these expenditures in the next four weeks). Estimated using ordinary least squares with standard errors (in parentheses) clustered at the participant level. † $p < 0.1$,* $p < 0.05$,** $p < 0.01$.