

ARTICLE

# Do smallholder farmers prefer commitment or flexibility in pension savings accounts? A randomised experiment of cocoa farmers in Ghana

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## Abstract

This paper examines the intertemporal choice preference for long-term savings of cocoa farmers in Ghana. We test the uptake of two pension products: with one, farmers are free to withdraw 50% of their savings with no penalties prior to retirement age; with the other, only 30%. Using a randomised controlled trial we test the difference in uptake of two pensions products where we vary the flexibility of cash withdrawals from the pension account. We find an overall higher uptake of the more flexible pensions account, especially for women, who cannot inherit land titles in Ghana.

**Key words:** Cocoa farmers; Commitment; Ghana; pensions; Randomised Experiment

## 1. Introduction

An extensive body of development economics literature stresses the importance of personal savings. An increase in savings can help improve the welfare of the poor (Karlan *et al.*, 2014). Furthermore, not only are savings considered less risky than credit, but they can also provide insurance against unexpected expenditure shocks, such as those caused by disasters, health problems, and seasonal shortfalls. Therefore, several studies have examined possibilities to increase the uptake of savings. In the informal finance sector, for example, multiple randomised controlled trials have addressed the uptake of savings accounts by rural and urban dwellers (for a literature review, see Karlan *et al.*, 2014). Another stream of literature shows that committing or locking a part of savings is an effective way to increase savings rates (Ashraf *et al.*, 2006; Bryan *et al.*, 2010). However, only a few studies have examined the uptake of long-term or pension savings. This is surprising given increased social change with stronger reliance on the nuclear family than the wider family or community.

The aim of this paper is to compare the uptake of two pension savings products that differ in the degree of flexibility for cocoa farmers in Ghana. To the best of our knowledge, our study is the first to consider the uptake of any commitment long-term savings product for a homogeneous group of smallholder cocoa farmers. Focusing on the ‘pension behaviour’ of cocoa farmers is particularly useful because these farmers are faced with extremely high income fluctuation. Moreover, cocoa is a biannual crop, yielding income only twice a year. Farmers are faced with the challenge of aligning consumption needs in the present with future consumption needs when they are no longer able to work on farms.

Our study compares the uptake of two pension products that differ in the degree of flexibility savings withdrawals: one pension product locks half the savings until retirement age, such that agents are not allowed to access it until a future date, and allows withdrawals of the other half with no financial

consequences. The other product locks 70% of savings until retirement age, thereby allowing flexible withdrawals for only 30% of savings. By varying the degree of flexibility of savings withdrawals, our study addresses the question whether committing or locking a part of savings may be an effective approach to increase savings. The literature is still ambiguous about the relevance of commitments in increasing long-term savings rates.

The literature provides two reasons commitment savings may be relevant. First, a commitment device that restricts possibilities to save and dissave may be welfare improving for somebody who is a hyperbolic discounter (Ashraf *et al.*, 2006). Compared with agents with an exponential discount function, agents with a hyperbolic discount function have a high discount rate at present and a low discount rate over longer horizons (Laibson, 1997). According to the multiple selves model, a taste for immediate gratification may result in self-control problems if all selves have present-biased preferences. However, in the case of a *sophisticated* hyperbolic discounter (Laibson, 1997; Bauer *et al.*, 2012), commitment devices may be attractive because they restrict behaviour of the future self. Savings rates for sophisticated agents with hyperbolic preferences are therefore likely to increase if they are given the choice to opt in to commitments (Ashraf *et al.*, 2006; Bauer *et al.*, 2012). Basu and Bisht (2015) find that this type of committed savings motivated rural entrepreneurs in India to take up long-term (pension) savings accounts.

In addition to self-control issues, research emphasises that individuals may prefer commitment devices because of spousal, familial, and neighbour bargaining (e.g., Platteau, 2000; Anderson and Baland 2002; Ashraf, 2009); this is especially the case in a developing country context. Anderson and Baland (2002) find that using group rotating savings commitment accounts is a strategy that married women in Kenya employ to protect savings against claims by husbands for immediate consumption. This was especially the case for women who had some but not much or too little autonomy. Consequently, we can assume that women with a high degree of autonomy, such as female household heads, would prefer lower restrictions or commitments due to spousal relations. A few factors are positively associated with the uptake of commitment savings, including higher education level, being female, and having limited spousal control (Karlan *et al.*, 2014).

Locking savings might not be a preferred strategy for many reasons, however. While the neoclassical model does not explicitly consider the relevance of commitments, locking savings would clearly prevent individuals from maintaining a constant level of consumption throughout their lifetime and thus be negatively valued. Moreover, commitments, in the form of withdrawal fees or minimum balance requirements, imply an increase in transaction costs. Commitments also reduce liquidity for borrowers, which may not be compensated by higher returns, which would especially be problematic for poor credit-constrained households faced with uncertain future income flows. Therefore, it seems obvious that rational agents, who, in line with the neoclassical theory, discount the future exponentially, would always prefer the most flexible savings possibilities available: a savings product with whatever form of commitment attached, which is not compensated by higher returns, would always be inferior to a similar savings product without commitments attached.

There is a dearth of literature on commitment pension savings in any context, especially that of farming of a biannual crop with high income fluctuations, such as cocoa farming. Grameen Bank introduced a hard commitment mid-term savings scheme in Bangladesh in the early 2000s in which no interest was paid on accounts with withdrawals within five years of opening an account. The programme was a huge success, attracting millions of users (Rutherford, 2006). Ashraf *et al.* (2006) and Basu and Bisht (2015) found that commitment savings products with penalties for early withdrawals had a significantly higher uptake than savings accounts with no penalties, a finding that likewise applies to an urban context with high financial literacy (Thaler and Benartzi, 2004). Beshears *et al.* (2020) found similar results in their more recent study. They conducted an experiment to compare account deposits on a liquid account without any withdrawal restrictions with commitment accounts with different early withdrawal penalties, using participants from the RAND American Life Panel. In general, higher early-withdrawal penalties attracted more deposits.

We compare preference for commitments of cocoa farmers in Ghana, who have uneven income distribution throughout the year, as cocoa is a biannual crop. On the one hand, their savings must cover expenses incurred between two income seasons; on the other hand, they need to fend off the present bias and ensure their long-term well-being. Managing these two opposing demands is a balancing act between exerting self-control and having high income fluctuation and uncertainty of expenditures. Designing a pension savings product suitable for seasonality of income of cocoa farmers thus needs to combine farmers' current and future financial needs.

Finding the right balance between managing current cash flow needs and the future cash needs is challenging for agents themselves, but even more so for institutions that are trying to encourage agents to save. For this reason, we aim to compare uptake of two types of pension savings products that differ only in the percentage of savings that can be withdrawn freely without penalties. More specifically, we offer a randomly selected group of cocoa farmers in Ghana the possibility to open a long-term savings account from which they can withdraw 50% of the savings at any moment in time without penalties and offer another randomly selected group the possibility to withdraw only 30% without penalties. In addition, we conduct heterogeneous treatment analyses to test which group of farmers values flexibility over commitments.

In section 2, we elaborate on current elderly care mechanisms in Ghana. Section 3 describes the methodology of the intervention itself and the relevant findings from our baseline survey. Section 4 summarises the results. Finally, section 5 presents the limitations and suggestions for future research.

## 2. Current social security systems for the elderly in Ghana

Kpessa (2010) examines how the state, the market, and pre-existing social norms interact to ensure old-age income support in Sub-Saharan countries. The social protection plans supporting old age can broadly be divided into four categories: state, market, family, and community. During the last century, Ghana went through various stages of these four support structures. The traditional social support system is structured around the family and the community. Dating back to pre-colonial times, the family was the epicentre of social support, where the nature of social interactions was collective and reciprocal, and extensive family members and the community were the only source of risk and resource pooling in times of need or in old age (Hyden, 2008). Throughout history, as well as today in the informal and rural sector, people typically rely on rotating schemes for wealth accumulation against old-age income insecurity or protection against adversities such as illness, unemployment, and hardship (Boon, 2007).

On the opposite end of family- and community-based social security systems are state- and market-social schemes. These formal schemes were initially designed to reward 'loyal' civil servants and employees during colonial times (Darkwa, 1997). However, anyone within the informal economy, which includes the agricultural and mining sectors, was excluded from the colonial pension scheme. In the 1990s, Ghana moved to *pay-as-you-go* social security schemes, under which benefits are directly linked to contributions.<sup>1</sup> In the 2000s, Ghanaian social security has officially progressed towards a three-tier pension system comprising a mixture of *pay-as-you-go* and state-defined benefit arrangements (Dorkenoo, 2006). Some blue-collar workers and the urban middle class enjoy access to these protectionist arrangements, while rural inhabitants continue to rely on informal social mechanisms (MacLean, 2002). However, Ghana's social security falls short of meeting any formal retirement plans (Darkwa, 1997), as an estimated 80% of the population works in the informal economy (Baah-Boateng and Turkson, 2005). The elderly often find themselves in a vulnerable position as their children no longer feel obliged to support them (Collard, 2000). This is a direct result of migration, the breakdown of extended family structures, and a cultural shift to self-reliance in Sub-Saharan countries.

In the context of cocoa farmers in Ghana, multiple studies have reported a drastic problem of ageing farmers, with children of cocoa farmers moving to towns in search of higher-paid work opportunities

<sup>1</sup>For a summary of the social security system in Ghana since the colonial days, see Boon (2007).

(Bymolt *et al.*, 2018). By contrast, few studies address retirement income of cocoa farmers in Ghana. Older farmers in Ghana usually have land, but above the age of 60, they are not very active on farms, nor do they make any farm investments. Some elderly cocoa farmers view cocoa as a cash crop and use it as retirement income, without making farm investments. These farmers are referred to as ‘harvesters’ because they are inactive on their farms (Bymolt *et al.*, 2018). Typically, their children have migrated to towns, so in the absence of the younger generations, they often engage in sharecropping contracts, leasing land to younger farmers who can manage and harvest the cocoa plantation (Bymolt *et al.*, 2018). Proceeds from these sharecropping arrangements are then shared between the landowner and the sharecropper, with the harvest serving as a source of retirement income for landowners.

Offering farmers an option between flexible and less flexible pension savings accounts helps us evaluate the extent of trade-off between current consumption needs of farmers and their family/network and their long-term consumption needs.

### 3. Methodology

#### 3.1 Pension product design

To test the relevance of commitments versus flexibility in the context of a long-term savings product, we set up an intervention with Pension Trust Ghana, which introduced a retirement savings programme for micro-entrepreneurs in Ghana. The product is a combination of a pension and a savings account, which allows consumers to withdraw a part of their savings at any point in time to give some flexibility for financing emergencies, with the other part locked until their retirement (60 years of age). Pension Trust Ghana introduced two pension products. Pension 1 allows farmers to withdraw 50% of their savings at any point in time, with the other 50% saved until their official retirement age. Pension 2 allows them to withdraw only 30% of their savings, with the other 70% saved until their retirement age. Thus, the only difference between the Pension 1 and Pension 2 account is that the latter offers reduced liquidity, which is not compensated by higher returns. One might expect Pension 1 to always be preferred to Pension 2; however, as we explained previously, this may not be the case. Note that the pension accounts yield returns that are higher than alternative options available in Ghana. The interest rate on the pension accounts is twice the treasury bills rate, 24% per annum, and there is no opening fee for farmers in our experiment, whereas the interest rate on a ‘momo’ (mobile money) account is only 7% per annum and on a Yello Save<sup>2</sup> is approximately 12% per annum.

In our study, a commissioned agent kept record of every farmer’s pension contribution in a ledger received from Pension Trust. The information recorded includes farmer names, the amount of savings received from each farmer, and the date the savings were collected. The agent would then go to the nearest bank and deposit the money in a collective account of the pension company.

#### 3.2 Experiment design and model specification

We conducted a baseline survey of 1,500 farmers dispersed over 22 communities in 2016. Later that year, one community was expelled from the cooperative, leaving us with 21 communities with 1,169 farmers. To assess the uptake and use of the two committed pension products, we employed an experimental approach. More specifically, we randomly determined three groups: (i) all farmers in group 1 (*Group1*) were introduced to and allowed to open a Pension 1 account, (ii) all farmers in group 2 (*Group2*) were introduced to and allowed to open a Pension 2 account, and (iii) all farmers in group 3 (*Group3*) were also allowed to open a Pension 1 account; however, they were not exposed to any direct promotion or encouraged to open accounts. We randomised the three groups at the community level.<sup>3</sup> Note that we instructed sales agents to open only the account type that we assigned to

<sup>2</sup>Yello Save is a high-interest savings product that allows mobile money customers to instantly open a savings account with Fidelity Bank.

<sup>3</sup>Our analysis includes respondents above the official retirement age. For this group of respondents, Pensions 1 and 2 are similar as there are no withdrawal penalties.

the group. Thus, farmers in *Group2* (*Group1* and *Group3*) were not allowed to open Pension 1 (Pension 2) accounts.

We randomly selected three groups of seven communities each. For *Group1*, a representative from Pension Trust visited seven selected communities and introduced Pension 1 (50% locked, 50% flexible savings) to all farmers. For *Group2*, the same Pension Trust representative visited seven other communities to introduce Pension 2 (70% locked, 30% flexible savings). For *Group3*, the pension product was not introduced directly to farmers; rather, the experiment (including details of Pension 1) was explained at a cooperative assembly meeting, which was attended by community leaders from all 21 communities.<sup>4</sup>

Our design enables us to test the impact of product design (flexible vs. less flexible) by comparing uptake of pension accounts by farmers from *Group1* and *Group2*. It also enables us to test the impact of differences in promoting the pension product by comparing uptake of pension accounts by farmers in *Group1* with the uptake of pensions by farmers in *Group3*. While the latter analysis is not the main aim of the paper, it provides information about the possibility to promote the product at the cooperative level, which has the potential to reduce transaction costs for Pension Trust. A comparison of uptake by farmers in *Group3* and *Group2* would test a combination of differences in design and promotion strategy; however, we are not interested in this comparison and do not refer to it further.

We examine uptake by running simple linear probability regressions, of the following form:

$$Y = \sum_i \beta_i P_i + \gamma X + \varepsilon, \quad (1)$$

where  $Y$  is a binary uptake dummy equal to 1 if an account has been opened and 0 otherwise;  $P$  refers to the three treatments (*Group1*, *Group2*, and *Group3*); the subscript  $i$  refers to *Group1*, *Group2*, or *Group3*;  $X$  is a vector of controls; and  $\varepsilon$  is an error term. We cluster all standard errors at the community level to control for within-community-level correlation of error terms.

We are primarily interested in the comparison of uptake of the three groups. In principle, due to the randomisation, simply comparing means of the three groups would suffice. However, to improve precision of the estimates, we add controls, which also enables us to test the extent to which uptake is affected by different controls.

To avoid ethical issues and spillover effects, we randomised at the community level rather than the individual level. To improve balance and power, we first ranked the 21 communities on the basis of weighted averages of relevant independent variables, including number of farmers per community, average years of schooling, age, gender, whether farmers have a bank account already, cocoa income, income in good versus bad months, total savings (formal and informal), whether farmers have income from other farming activities or from non-farming activities, and any outstanding debts. After ranking communities by the normalised score of these variables, we assigned 21 communities to seven strata, which we then randomly assigned to one of the three treatments per stratum. We verified whether the randomisation resulted in equal groups by performing balancing tests (see Appendix Tables A1a and A1b), which showed that the groups are indeed balanced. The only two variables that were not balanced are *years of schooling* and *total savings*. Although perfectly balanced groups are not a prerequisite for making valid statistical references (Mutz *et al.*, 2019), we include these variables as control variables in our regression analysis, to avoid potential issues with endogeneity.

### 3.3 Study context: descriptive statistics and balance tests

Table 1 lists descriptive statistics for the cocoa farmers in our sample, presenting averages (and standard deviations) for the whole sample, but also by group. The demographics obtained from our baseline survey show that 71% of the respondents were male, that the average age was 55 years, and that, on

<sup>4</sup>It is possible that community leaders informed farmers in the community about the pension product that was not assigned to them. These potential ‘spillover effects’ may have influenced the uptake in the different groups. However, as we did not hear about any farmer complaints of not being allowed to open the other account, we expect these potential effects to be small.

**Table 1.** Descriptive statistics

Variables	Overall		Group1		Group2		Group3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Nr inhabit in community	3,174	3,600	2,723	1,888	3,929	6,300	3,068	1,826
Female	0.29	0.45	0.35	0.48	0.25	0.43	0.27	0.44
Age	55	13	55	14	55	13	56	13
Years of schooling	11	4	11	4	11	4	11	4
Interest in pension	0.92	0.28	0.91	0.28	0.92	0.27	0.92	0.28
Shock 1	0.41	0.49	0.35	0.48	0.50	0.50	0.41	0.49
Shock 2	0.47	0.50	0.46	0.50	0.43	0.50	0.50	0.50
Income from other farming	0.83	0.38	0.82	0.38	0.867	0.340	0.814	0.389
Income good month	2,663	3,737	2,494	3,775	2,322	3,746	2,278	3,704
Income bad month	803	1,382	786	1,332	840	1,450	794	1,382
Existing loans	0.173	0.378	0.185	0.39	0.150	0.357	0.177	0.382
Bank savings	0.562	0.496	0.528	0.500	0.571	0.500	0.585	0.493
Total savings	2,966	5,133	2,891	5,074	3,404	5,529	2,749	4,908
Receive remittances	0.395	0.489	0.393	0.489	0.412	0.493	0.387	0.488

Note: Nr inhabit in community = number of inhabitants in a community; Female = female (a binary gender dummy equal to 1 for female); Age = age; Years of schooling = number of years of schooling; Interest in pension = dummy variable with 1 if respondent indicated being interested in a pension product; Shock 1 = Shocks related to drought, floods, bushfire, or landslides; dummy equal to 1 if respondent experienced these shocks in last 12 months; Shock 2 = Shocks related to unusually high levels of pests and diseases on farm (dummy equal to 1 if respondent experienced these shocks in last 12 months); Income from other farming = binary dummy equal to 1 if a farmer farms any crop other than cocoa; Income good month = income of a farmer in a good month; Income bad month = income of a farmer in a bad month; Existing loans: a binary dummy equal to 1 if the respondent or any household members have any debts or loans at the moment; Bank savings = binary dummy equal to 1 if respondent or anyone in household has a self-owned savings bank account; Total savings = Total amount respondent has in savings at the moment of interview; Receive remittances = a binary dummy equal to 1 if respondent receives remittances.

average, farmers had 11 years of schooling. Approximately 25% of the respondents were above the official retirement age of 60 years. Considering that Ghana's median age is 21 years,<sup>5</sup> we can indeed confirm that cocoa farming is an ageing business. The survey also revealed that approximately 17% of the families of our respondents have a loan or some type of debt, while 56% have a self-owned savings bank account, 89% (44% of total) of whom have savings in it.<sup>6</sup> Almost 40% of the respondents receive remittances. When asked about their interest in taking up pensions, a great majority (92%) indicated they were interested in saving for retirement. However, we also found that old farmers are less likely to be interested in pensions, especially those with low income.

Cocoa is a biannual crop; the main cropping season in Ghana is from August to January, and the light-crop season is from April to June. Improperly maintained farms have harvest only during the main season. Savings and diversification into other farm or non-farm activities enable farmers to better cope with income fluctuations resulting from unpredictable production of this biannual crop.

Our survey shows that 83% of our respondents have other farming activities, whereas 45% are involved in non-farming activities. According to our baseline, income diversification into both other farming and non-farming activities is more common among young farmers than old farmers. In addition, 71% of our respondents are landowners. Approximately 22% are Abunu farmers, or sharecroppers who take over a farm, make all the investments to replant trees, apply input supplies, and so on, and they give one-third of proceeds to the landowner. Another sharecropping arrangement is Abusa farmers, who are simply farm caretakers, and they give two-thirds of their proceeds to the landowners. Less than 7% of Abusa farmers make up our sample.

Table 1 suggests that for almost all variables presented, averages per group do not differ substantially: for most variables, the group averages are similar and similar to the overall average. As is common practice, we formally tested whether the averages per group significantly differ from each other. In other words, we conducted balance tests for the three groups of farmers in the study. Balance tests provide evidence for whether the randomisation 'worked' (i.e., resulted in similar treatment groups).

<sup>5</sup>[https://www.indexmundi.com/ghana/median\\_age.html](https://www.indexmundi.com/ghana/median_age.html).

<sup>6</sup>We assume that these accounts are flexible, though they usually have a minimum savings balance.

**Table 2.** Total annual income 2016 (in Ghana Cedis, GhC)

	Income equivalence	Total	Group1	Group2	Group3
<2,851	Below minimum wage (\$1.8/day)	24	21	29	24
2,851–5,244	Min. wage–\$100/month	27	25	30	28
5,245–10,944	\$100/month–\$200/month	34	36	30	36
>10,944	>\$200/month	14	17	11	13
# of respondents		1,017	345	264	408

Note: The columns Total, Group1, Group2, and Group3 show which percentage of respondents belongs to the different income categories for the different treatment groups, as well as the total sample. The last row presents the total number of respondents per group.

Appendix Tables A1a and A1b present the results. The balance checks indicate that the randomisation was carried out correctly: for all observational characteristics, there is balance between *Group1* and *Group2*. In the comparison of *Group1* (*Group2*) and *Group3*, the variables *years of schooling* and *total savings* are not balanced. However, this is not a problem because at a 5% significance level, lack of balance will occur by chance for 1 out of 20 variables. Yet we add these variables to our regressions as explanatory variables to control for any possible remaining imbalances.

Table 2 summarises the annual income of the farmers we surveyed and how it compares with that of alternative jobs in towns. Considering income is important given that the ability to commit to savings depends on current income earned. We created income categories comparable to a local minimum wage in Ghana, a low-wage equivalent in town based on the 2016 exchange rate (US\$100/month), and a taxi driver wage equivalent in town (US\$200/month). It appears that roughly 24% of farmers live below the minimum wage equivalent (US\$1.9 per day). Whether anyone from this group of farmers would be able to commit to any savings account is questionable. Table 2 also presents percentages of respondents in each income category, per treatment group. The percentages are comparable for each treatment group. Yet *Group2* has relatively more respondents in the poorest income group and fewer respondents in the highest income group.<sup>7</sup>

#### 4. Results

Table 3 provides a summary of our regression analysis. Dummies for strata, as explained previously, are taken into account in all regressions. Regressions 1, 2, and 3 use the whole sample, whereas regressions 4 and 5 use a restricted sample (sample of farmers in *Group1* and *Group2* only).

As column 1 of Table 3 shows, the uptake in *Group1* (i.e., Pension 1) is higher than that in *Group2* (i.e., Pension 2) and *Group3* (the latter is reflected by the constant; i.e., Pension 1, without personal visits). Almost 24% of farmers in *Group1* have taken up a pension (reflected by the sum of the constant and the coefficient for the group), whereas only 7% in *Group2* have done so (constant plus coefficient *Group2*). Although this difference is large, it is not statistically significant, probably due to the cluster randomisation and the implied correlation within clusters, which increased the cluster robust standard errors. We may be faced with power problems and incorrectly dismiss significance because we have too few communities from which to draw any significant statistical inferences. Adding controls in columns 2 and 3 does not change the results much. Yet, for the model with a full set of controls, the difference between the coefficients for *Group1* and *Group2* is non-significant at the 10% level (see the Wald test in the table). Thus, we find some modest evidence of a preference for the more flexible pension product.

In columns 4 and 5 of Table 3, we ignore farmers from *Group3* who were offered Pension 1 through community leaders and not directly through Pension Trust. Here, the pension uptake in *Group1* is 30%, reflected by the constant, and is significantly higher than the uptake of *Group2*, which is less than 16%. We confirm this finding when adding the control variables.<sup>8</sup>

<sup>7</sup>On average, however, the total annual income in 2016 is balanced for the three treatment groups. The calculation is available on request.

<sup>8</sup>We also conducted uptake regressions for a sample of respondents that excludes farmers older than the official retirement age. The results do not change: *Group1*, *Group2*, and the constant are non-significant in the first three regressions, while the constant becomes significant for the restricted sample. These results are available on request.

**Table 3.** Uptake of pension accounts

Variables	(1) Without controls	(2) With 2 controls	(3) All controls	(4) Restricted sample	(5) Restricted sample with 2 controls
Group1	0.140 (0.124)	0.141 (0.124)	0.141 (0.117)		
Group2	0.0169 (0.0697)	0.0179 (0.0696)	-0.0128 (0.0632)	-0.147 (0.110)	-0.146 (0.110)
Strata1	-0.0420 (0.0751)	-0.0434 (0.0760)	0.0407 (0.0998)	-0.0375 (0.0523)	-0.0411 (0.0530)
Strata2	-0.168** (0.0748)	-0.167** (0.0742)	-0.0843 (0.0967)	-0.234*** (0.0749)	-0.235*** (0.0743)
Strata3	-0.174** (0.0749)	-0.174** (0.0742)	-0.116 (0.0991)	-0.237*** (0.0737)	-0.236*** (0.0719)
Strata4	0.213 (0.226)	0.214 (0.227)	0.232 (0.213)	-0.0570 (0.257)	-0.0585 (0.257)
Strata5	-0.0482 (0.114)	-0.0484 (0.114)	-0.0325 (0.110)	-0.0114 (0.166)	-0.0109 (0.165)
Strata6	-0.0394 (0.100)	-0.0387 (0.0999)	0.0332 (0.106)	-0.0441 (0.117)	-0.0410 (0.117)
Nr inhabit in com.			$2.00 \times 10^{-5*}$ $(9.94 \times 10^{-6})$		
Gender			0.0199 (0.0273)		
Age			0.000625 (0.000646)		
Bank savings			0.00619 (0.0202)		
Total savings		$-9.98 \times 10^{-7}$ $(1.64 \times 10^{-6})$	$-1.06 \times 10^{-6}$ $(1.80 \times 10^{-6})$		$-2.92 \times 10^{-6}$ $(2.06 \times 10^{-6})$
Income good month			$5.58 \times 10^{-6}$ $(1.12 \times 10^{-5})$		
Income bad month			$-8.22 \times 10^{-6}$ $(2.73 \times 10^{-5})$		
Income from other farming			-0.0226 (0.0372)		
Existing loans			-0.0135 (0.0141)		
Interest in pension			-0.0669 (0.0578)		
Years of schooling		-0.000991 (0.00216)	-0.00227 (0.00185)		0.000603 (0.00259)
Shock 1			0.0116 (0.0235)		
Shock 2			-0.0199 (0.0141)		
Receive remittances			-0.0149 (0.0216)		
Constant	0.108 (0.0947)	0.121 (0.109)	0.0893 (0.175)	0.302*** (0.0454)	0.304*** (0.0642)
Observations	1,169	1,169	1,137	701	701
Adjusted $R^2$	0.139	0.138	0.172	0.101	0.100

Note: Cluster robust standard errors are in parentheses; ordinary least squares (OLS) regressions; dependent variable: a binary dummy uptake of pension product equal to 1 if a pension account has been opened. Linear probability regressions are conducted for ease of interpretation. Restricted sample: *Group1* and *Group2* only, without *Group3*.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

#### 4.1 Heterogeneity effects

In addition to these simple linear regressions, we test for heterogeneous treatment effects by interacting the treatment dummies with different variables. That is, we test whether the uptake for different



subgroups of the more restricted long-term savings product differs significantly from the uptake of the group with the more flexible pension. As the main aim of our analysis is to test whether the uptake differs for two pension products that vary in the degree of flexibility of withdrawals of savings, we only consider the restricted sample (i.e., *Group1* and *Group2*, without *Group3*). By focusing on this restricted sample, the interpretation of the results becomes more straightforward. However, we also carry out all regressions with the whole sample. These results are qualitatively similar to the results presented in the main text.<sup>9</sup>

The regressions are specified as follows:

$$Y = \alpha + \beta_1(1 - I) \times P_2 + \beta_2 \times I \times P_2 + \beta_3 \times I \times P_1 + \mu X + \varepsilon, \quad (2)$$

where  $\alpha$  represents the constant,  $P_2$  refers to treatment *Group2*,  $P_1$  refers to treatment *Group1*,  $X$  is a vector of controls (including the strata dummies), and  $I$  is a vector of interaction terms (always binary, defining 'groups'). Note that the constant reflects the uptake of Pension 1 by the group defined by  $1-I$ . For example, if  $I$  denotes the binary variable gender, equal to 1 for female and 0 otherwise, the constant reflects uptake by men in *Group1* and, thus, Pension 1. Next,  $\beta_1$ ,  $\beta_2$  measure the increase/decrease in uptake of *Group2* (and, thus, Pension 2) for groups denoted by  $I$  or  $1-I$  compared with the uptake of *Group1* (and, thus, Pension 1) for the group denoted by  $1-I$ ,<sup>10</sup> and  $\beta_3$  measures the additional increase/decrease in uptake of treatment *Group1* (and, thus, Pension 1) for group  $I$  compared with the uptake of treatment for *Group1* (and, thus, Pension 1) by group  $1-I$ .

The individual characteristics include the existence of income diversification strategies or financial shock management strategies (see balance tests in section 4.4 for a summary of all variables considered). Examples of these strategies include income from non-farming activities, other savings, health insurance, and remittances.

Table 4 summarises our findings of the heterogeneous effects regressions. In column 1 of Table 4, we test the difference between men and women. Recall that one reason for a preference for commitment devices is bargaining power. Women may prefer commitments to be able to counteract their spouse's claims for immediate consumption. However, our results do not provide support for this view, as they show that women have a significantly higher uptake of the more flexible pension (column 1) than men, as is indicated by a significant coefficient for the interaction term *Female*  $\times$  *Group1*. Moreover, women have a higher uptake of Pension 1 than of Pension 2, as is indicated by a significant difference between *Female*  $\times$  *Group2* and *Female*  $\times$  *Group1* (see Wald 2), and women do not choose to save in Pension 2 accounts significantly more often than men, as is indicated by the finding that *Female*  $\times$  *Group2* and  $(1-female) \times Group2$  do not differ significantly from each other (see Wald 1). These results suggest that women prefer a higher level of flexibility or liquidity than men. Regarding level of *schooling*, we find no significant evidence that the uptake of *Group1* as compared with that of *Group2* is higher for either the highly educated group or the less educated group. Several income fluctuation management strategies also influence farmers' preference for commitment versus flexibility. First, we test whether access to alternative savings matters for the choice of one of the two pension products. Intuitively, when someone already has savings (or is more financially secure), the lower liquidity associated with Pension 2 is less of a risk. Thus, we would expect demand by treatment *Group2* (and, thus, demand for Pension 2) to be higher for farmers with access to other savings products; however, we find no evidence of this (column 2, Table 4). Second, in addition to income diversification, the analysis also considers the effect of income shocks on adoption of pension accounts. The results show that the uptake of Pension 1

<sup>9</sup>Further details are available on request.

<sup>10</sup>Recall that treatment *Group1* is only allowed to take Pension 1 and treatment *Group2* is only allowed to take Pension 2. This implies that the uptake of *Group1* reflects the uptake of Pension 1 and the uptake of *Group2* reflects the uptake of Pension 2.

**Table 4.** Heterogeneous treatment effects: Part 1.

Variables	(1) Gender	(2) Access savings	(3) Education	(4) Shocks	(5) Access health insurance
Female × Group2	−0.0926 (0.0897)				
(1-female) × Group2	−0.127 (0.118)				
Female × Group1	0.0865*** (0.0284)				
Sav × Group2		−0.143 (0.111)			
(1-Sav) × Group2		−0.137 (0.105)			
Sav × Group1		0.0124 (0.0497)			
Educ × Group2			−0.0492 (0.132)		
(1-Educ) × Group2			−0.121 (0.0918)		
Educ × Group1			0.0968* (0.0517)		
Shock × Group2				−0.163* (0.0891)	
(1-Shock) × Group2				−0.157 (0.0939)	
Shock × Group1				−0.0348 (0.0693)	
Hins × Group2					−0.149 (0.120)
(1-Hins) × Group2					−0.0874 (0.140)
Hins × Group1					0.00427 (0.0391)
Constant	0.271*** (0.0425)	0.296*** (0.0609)	0.210** (0.0782)	0.309*** (0.0370)	0.298*** (0.0765)
Observations	695	701	701	701	701
Adjusted R <sup>2</sup>	0.107	0.098	0.103	0.099	0.099
Wald 1	0.37	0.75	0.25	0.75	0.11
Wald 2	0.08	0.22	0.22	0.39	0.18
Wald 3	0.10	0.21	0.02	0.43	0.49

Note: Cluster robust standard errors are in parentheses; Wald 1: p-value equality test  $A \times \text{Group}2 = (1-A) \times \text{Group}2$ ; Wald2: p-value equality  $A \times \text{Group}1 = A \times \text{Group}2$ ; Wald3: p-value equality  $(1-A) \times \text{Group}1 = A \times \text{Group}2$ , where A is female, sav, educ, and so on. The regressions do not include controls, other than STRATA dummies, to facilitate a simple interpretation of the results. Results including controls are similar and are available on request. *Female* = gender dummy equal to 1 for female; *Sav* = savings dummy equal to 1 for farmers who do have access to a formal savings account; *Educ* = education dummy equal to 1 if respondent's education level is higher than primary; *Shock* = dummy variable equal to 1 if the respondent experiences in the last 12 months drought, floods, bushfire, or landslides; *Hins* = binary dummy equal to 1 if the respondent has health insurance. The different dummies are interacted with either *Group1* or *Group2*, which leads to different groups. The 'missing' group is reflected by the constant. OLS regressions. The dependent variable is a binary uptake dummy equal to 1 if an account has been opened and 0 otherwise.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

and/or Pension 2 is not higher for farmers who have experienced an unexpected shock with financial repercussions within the last year than for farmers who have not experienced such a shock. However, the uptake of Pension 1 for farmers who have not experienced a shock is significantly higher than the uptake of Pension 2 for farmers who have experienced a shock. Farmers who have experienced an unexpected shock with financial repercussions within the last year are significantly less likely to take up the more rigid pension product. We also expected farmers who have health insurance to be less affected by some of these income shocks and thus be more open to less flexible accounts. However, we found no significant uptake of either pension account for farmers with health insurance (column 5, Table 4).

**Table 5.** Heterogeneous treatment effects: Part 2

Variables	(1) Remittances	(2) Hhnumber	(3) Nonfarmactivities	(4) Highlowincome	(5) Retired
Remit × Group2	-0.126 (0.131)				
(1-remit) × Group2	-0.191* (0.106)				
Remit × Group1	-0.0454 (0.0463)				
Hhnumhigh × Group2		-0.144 (0.128)			
(1-hhnumhigh) × Group2		-0.184 (0.105)			
Hhnumhigh × Group1		-0.0406 (0.0328)			
Nonfarma × Group2			-0.127 (0.112)		
(1-nonfarma) × Group2			-0.110 (0.109)		
Nonfarma × Group1			0.0698** (0.0251)		
Incomelow × Group2				-0.129 (0.136)	
(1-incomelow) × Group2				-0.217* (0.101)	
Incomelow × Group1				-0.0578 (0.0376)	
Retired × Group2					-0.0845 (0.128)
(1-retired) × Group2					-0.159 (0.0971)
Retired × Group1					0.0464 (0.0343)
Constant	0.323*** (0.0523)	0.320*** (0.0532)	0.273*** (0.0492)	0.320*** (0.0450)	0.285*** (0.0518)
Observations	701	701	701	701	701
Adjusted R <sup>2</sup>	0.104	0.101	0.104	0.108	0.105
Wald 1	0.16	0.27	0.30	0.23	0.15
Wald 2	0.53	0.40	0.10	0.56	0.33
Wald 3	0.14	0.17	0.13	0.10	0.07

*Note:* Cluster robust standard errors are in parentheses; Wald 1: p-value equality test  $A \times \text{Group2} = (1-A) \times \text{Group2}$ ; Wald2: p-value equality  $A \times \text{Group1} = A \times \text{Group2}$ ; Wald3: p-value equality  $(1-A) \times \text{Group1} = A \times \text{Group2}$ , where A is remit and so on. The regressions include STATA dummies but do not include other controls to facilitate a simple interpretation of the results. Results including controls are similar and are available on request. Remit: binary dummy if the respondent obtained remittances; Hhnumhigh = binary dummy if household of respondent contains more than 5 members; Nonfarma = binary dummy equal to 1 if the respondent has non-farm business activities; Incomelow = binary dummy equal to 1 if the respondent has a total income below 5,050 Cedis (the medium income in our sample); Retired = binary dummy equal to 1 if the respondent is older than 60 years (the official retirement age). The different dummies are interacted with either *Group1* or *Group2*, which leads to different groups. The ‘missing’ group is reflected by the constant. Linear probability regressions. The dependent variable is a binary uptake dummy equal to 1 if an account has been opened and 0 otherwise.  
 \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

Remittances are another strategy a farmer may use to manage income fluctuation risks. For the group of farmers who receive no remittances, the most flexible pension product is taken up significantly more (column 1, Table 5). This is in line with our expectation that farmers prefer to have more flexibility if they have fewer sources of income. Having a higher number of household members is also a way to diversify income, given that more household members means more labourers and, thus, income per household. However, if a greater number of those household members are children, income expenditures on education and health care are also higher. However, we do not find any differences regarding household size. Income diversification through non-farming activities is also another way of managing income fluctuation. A Wald test (Wald 2) indicates that for farmers with income-generating activities other than farming, the uptake of the flexible pension product is higher than the uptake of the less flexible product – that is, for farmers who can diversify income through

non-weather-dependent activities (column 3, Table 5). This latter result may be due to higher incomes of those farmers. We therefore also conducted a heterogeneity analysis on annual income (column 4, Table 5), which indeed shows that farmers with a relatively high income prefer the more flexible product while for farmers with a relatively low income, this is not the case. Finally, we ran a heterogeneity analysis on age. We tested the extent to which farmers below and above the retirement age differ. For farmers above the retirement age, the withdrawal restrictions no longer hold, such that the two pension products become similar. We indeed find that retired farmers have no preference for one of the pension products (see the non-significant Wald 2). For farmers who are not yet retired, we also do not find a significant difference at the 10% level. However, this group of farmers prefers the flexible pension product at the 15% significance level.

Our results show that especially women and farmers with income from non-farming activities have a stronger preference for Pension 1 in general. We also find a significantly lower uptake of Pension 2 than Pension 1 for farmers who have experienced an unexpected expenditure shock within the last year and for farmers who receive no remittances from others.

## 5. Discussion and conclusions

Although the uptake of the two pension products on average does not differ significantly at the usual significance levels, our analysis suggests that a more flexible long-term savings product is preferred to the less flexible savings account. This conclusion is confirmed by our heterogeneity analysis, which shows that women and farmers with non-farming income-generating activities have a higher preference for Pension 1. By contrast, better income diversification does not translate into a higher uptake of the more rigid account, Pension 2. If anything, farmers who have experienced a financial shock within the last year and those who receive no remittances have a significantly lower uptake of this more rigid pension account.

These findings enable us to conclude two things. First, if pension flexibility is valued, farmers should choose the less rigid account. Farmers who have sufficient income to save for pensions, or, in other words, balance long-term consumption despite income fluctuations, are those who simply have more sources of income. The implication of this finding is that a 50% flexible product creates a better balance between current and future consumption needs. More rigid savings become impossible for farmers who have fewer sources of income, such as farmers who receive no remittances or those who are still recovering from financial shocks from last year. These subgroups of farmers are less likely to be able to balance current and long-term expenditure. Perhaps rigid pension savings are more desirable in Western countries where income fluctuation is generally less severe, partially because of existing government social security systems that are in place to protect their citizens. In Ghana, however, locking 70% of pension savings is simply not optimal to balance either current consumption or future consumption. This is not a matter of hyperbolic discounting versus exponential discounting discussed previously – perhaps locking 70% of savings creates an opposite scenario of hyperbolic discounting, in which consumers would not discount future rewards – but the contrary, in which they would need to value their future rewards *more* than their current rewards. Such a scenario is simply not realistic, which is how we explain the lower uptake of Pension 2. Even under relatively ‘ideal’ circumstances in which farmers have income diversification strategies, receive remittances, and have not experienced any financial shocks within the last year, they still have a preference for the more flexible savings account. This is an indication that locking 50% of savings is more realistic in balancing current consumption with temptation. However, to what extent the more flexible pension accounts would protect farmers against their own behavioural biases remains unclear. A possible solution is to develop pension products with withdrawal restrictions, conditional on future financial shocks, so that both the behavioural biases and the potential liquidity shortages can be addressed. Future research might try to address this issue more carefully.

Second, women are usually the ones who take care of long-term well-being of all family members. The flexible pension accounts allow them to balance consumption demands of family and community

members with long-term care of the household. Women in developing countries have historically been known to be responsible for the well-being of the family as a whole. It is normally women who make sure that children's school fees are paid and that there is enough food on the table for the whole household. This indicates high current expenditure costs. By contrast, women in many African countries, including Ghana, are still not allowed to inherit land titles. This means that they cannot lease their land in sharecropping agreements or use farm proceeds as retirement income, as older male cocoa farmers do. Because of the nature of land titles, women are not in a position to do that. Therefore, pension savings allow them to tailor income for their own old age as well as for current household needs and unexpected expenses.

A limitation of our study is that the number of communities in our sample is relatively small. For ethical reasons, we had to randomise at the community level. This also has advantages in terms of avoiding spillover effects. However, with the small number of communities, we may face problems in terms of only being able to pick up small effect sizes and thus incorrectly fail to reject the null or no significant differences. Future research using a larger group of communities would avoid these limitations.

Another limitation is that with the relatively small number of communities, we were not able to compare a larger variety of pension products, as this would have resulted in additional power problems. To better assess 'optimal' commitment levels, a larger variety of pension products (including one without any restrictions) should be considered. Finally, this study measures only the uptake of different pension savings products. Additional research is necessary to identify the retention of long-term savings and how this changes over time.

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## Appendix

### Balance tests

Balance tests provide evidence for whether the randomisation ‘worked’, that is, resulted in similar treatment groups. They can be done by conducting *t*-tests on the differences between groups or, similarly, by running simple OLS regressions of different key characteristics (measured at baseline) on a constant and treatment dummies. We used the latter approach. As randomisation occurred at the community level, we need to take into account (in all analyses, including the balance checks) the extent to which farmers in the communities have correlated outcomes by using, for example, standard errors that are clustered at the community level.

In [Tables A1a](#) and [A1b](#), a non-significant coefficient for *Group1* and/or *Group2* suggests balance between *Group1* (*Group2*) and *Group3* (picked up by the constant). We test the equality of the regression coefficients for *Group1* and *Group2* (i.e., the balance checks between them) by conducting a Wald test. The Wald statistics (i.e., *p*-values) are provided in the last row of the tables. The balance checks suggest that we carried out the randomisation correctly: for all observational characteristics, there is balance between *Group1* and *Group2*. Regarding the comparison of *Group1* (*Group2*) with *Group3*, two variables are not balanced, *years of schooling* and *total savings*. However, this is not problematic because at a 5% significance level, lack of balance will occur by chance for 1 out of 20 variables. Yet we add these variables in the regressions as explanatory variables to control for possible remaining imbalances.

**Table A1a.** Balance tests: demographic variables, interest in pension, and shocks<sup>11</sup>

Vars	(1) Nr inhabit. in community	(2) Female	(3) Age	(4) Years of schooling	(5) Interest in pension	(6) Shock 1	(7) Shock 2
<i>Group1</i>	−335.3 (1,050)	0.0815 (0.0558)	−0.884 (1.628)	0.649* (0.336)	−0.00391 (0.0109)	−0.0674 (0.110)	−0.0514 (0.0580)
<i>Group2</i>	861.0 (2,245)	−0.0178 (0.0780)	−0.421 (1.125)	0.428 (0.308)	0.00543 (0.0195)	0.0893 (0.0659)	−0.0745 (0.0775)
Constant	3,068*** (826.7)	0.266*** (0.0453)	55.71*** (0.446)	10.70*** (0.194)	0.917*** (0.00852)	0.412*** (0.0543)	0.506*** (0.0422)
Observations	1,169	1,161	1,155	1,169	1,151	1,169	1,169
Adjusted <i>R</i> <sup>2</sup>	0.015	0.007	−0.001	0.003	−0.002	0.013	0.002
<i>Group1</i> = <i>Group2</i> (Wald test)	0.59	0.18	0.81	0.55	0.63	0.14	0.77

*Note:* Cluster robust standard errors are in parentheses; we also tested balance between *Group1* and *Group2*. For all variables presented in this table, there is balance between *Group1* and *Group2*. Female = a binary gender dummy equal to 1 for female; Age = age; Years of schooling = number of years of schooling; Interest in pension = dummy variable equal to 1 if respondent indicated being interested in a pension product; Shock 1 = shocks related to drought, floods, bushfire, or landslides; dummy equal to 1 if respondent experienced these shocks in last 12 months; Shock 2 = shocks related to unusually high levels of pests and diseases on farm; dummy equal to 1 if respondent experienced these shocks in last 12 months. \*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.10.

<sup>11</sup>As the analysis includes respondents who are older than the retirement age, we also conducted a balance test for age conditional on being older than the retirement age. The average age of this group, which is also balanced across the three groups, turned out to be 69 years.

**Table A1b.** Balance tests: income fluctuation management variables

Vars	(8) Income from other farming	(9) Income good month	(10) Income bad month	(11) Existing loans	(12) Bank savings	(13) Total savings	(14) Receive remittances
<i>Group1</i>	0.00840 (0.0619)	215.5 (455.0)	-8.050 (118.2)	0.00765 (0.0309)	-0.0580 (0.0339)	141.9 (340.9)	0.00575 (0.0459)
<i>Group2</i>	0.0530 (0.0440)	43.47 (263.1)	45.12 (90.60)	-0.0278 (0.0214)	-0.0140 (0.0426)	654.5* (374.5)	0.0252 (0.0334)
Constant	0.814*** (0.0339)	2,278*** (128.6)	794.4*** (61.48)	0.177*** (0.0186)	0.585*** (0.0172)	2,749*** (230.8)	0.387*** (0.0144)
Observations	1,169	1,169	1,169	1,169	1,169	1,169	1,169
Adjusted $R^2$	0.002	-0.001	-0.001	-0.000	0.001	0.001	-0.001
<i>Group1 = Group2</i> (Wald test)	0.46	0.73	0.66	0.20	0.38	0.20	0.72

Note: Cluster robust standard errors are in parentheses; Group1 = Group2 refers to a Wald test on equality for Pension 1 and Pension 2. The numbers presented refer to Prob>F. The Wald test suggest that for all variables presented in this table, there is balance between *Group1* and *Group2*. Income from other farming: binary dummy equal to 1 if a farmer farms any crop other than cocoa; Income good month: income of a farmer in a good month; Income bad month: income of a farmer in a bad month; Existing loans: a binary dummy equal to 1 if the respondent or anyone household members have any debts or loans at the moment; Bank savings = binary dummy equal to 1 if respondent or anyone in household has a self-owned savings bank account; Total savings = total amount respondent has in savings at the moment of interview; Receive remittances: a binary dummy equal to 1 if respondent receives remittances. We also tested some other variables, such as income from non-farming activities and health insurance; all were balanced. However, because of space limitations, they are not presented here and are available on request. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.