Tied Labour, Savings and Rural Labour Market Wages:

Evidence from a Framed Field Experiment

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Abstract: How does the introduction of tied labour or a saving product affect labour market decisions and wages in rural agricultural labour markets? We develop a theoretical model of labour tying that incorporates risk aversion and inequality (behindness) aversion in the context of a rural agricultural labour market with seasonally fluctuating demand for labour, and test model predictions using a framed field experiment (modified ultimatum game) in rural Uganda. Our main findings are that (1) wages fluctuate with productivity, (2) access to tied contracts decreases wages for casual labour, and (3) access to a saving technology does not improve wages for tied labour. Consistent with model predictions and earlier theory, we empirically find that income for workers goes down (and income for landlords goes up) if an institutional innovation enables consumption smoothing by workers (tied contracts or a saving technology).

Key Words: Insurance; Tied labour; Savings; Rural labour markets; Experiment; Welfare; Risk aversion

1. Introduction

Most rural households in developing countries rely on agriculture for their livelihoods. Seasonal demand for labour implies household incomes tend to be volatile, and in the absence of formal institutions to smooth consumption most households rely on self-insurance and informal insurance mechanisms (Morduch 1994; 1999a; 1999b). A persistent institution used by risk-averse individuals to smooth income is labour tying (Bardhan 1983; Eswaran and Kotwal 1985; Morduch 1999a; Mukherjee and Ray, 1995; Udry, 1994).

Tied workers enjoy a fixed wage all year, and landlords enjoy certainty regarding labour supply. In addition, landlords are able to reduce their total wage bill if risk-averse workers are willing to pay a premium (in the form of a low average wage) to avoid income fluctuations (Bardhan 1979, 1983; Eswaran and Kotwal 1985; Mukherjee and Ray 1995). The magnitude of this premium depends on alternative opportunities for income smoothing, such as the availability of saving technologies. Hence financial markets and rural labour market outcomes are linked. Specifically, gaining access to a saving technology makes casual labour contracts more attractive to workers, so that tied labour wages should increase to restore equilibrium on the rural labour market (Caselli 1997, Banerjee and Newman 1998).

In this paper we present and test a seasonal labour market model with the following features: (i) inelastic supply of labour and (ii) risk aversion. Traditional models of labour tying are based on the Indian context, and start from the assumption of perfectly elastic supply of labour. This assumption becomes less realistic in an era of rapid urbanisation. Moreover, and unlike the case of traditional Indian agriculture, rural labour markets in some settings have long been characterised by labour scarcity. In parts of Africa, for example, population densities were traditionally low. In such contexts, elites did not accumulate wealth by controlling land but by controlling labour (Binswanger and McIntire 1987). This could take the extreme form of "owning labour" (e.g. slavery), but also of principal-agent relationships. The phrase "wealth in people" captures that wealthy individuals are able to command the labour of others (Guyer 1995). Interestingly, the institution labour tying also occurs in this setting, albeit under different conditions than modelled in the existing literature.

In this paper we analyse tied labour in a context that differs from the traditional Indian case. Rather than assuming perfectly elastic supply of labour we assume the polar opposite case of perfectly inelastic labour supply. This is captured in the model (and in the experiment) by a modified ultimatum game played between a landlord and workers. We analyse how the introduction of labour tying affects causal wages, and compare the levels of tied and casual wages offered by the landlord. We also analyse how a saving technology affects the labour market. Consistent with earlier theory our model predicts that, in equilibrium, tied wages are lower than the average casual wage. Unlike conventional models of labour tying, we also predict that access to a saving technology does not affect tied wages.

We test model predictions in an experimental labour market setting. We organized 30 experimental sessions in Kiboga district of rural Uganda in which one (randomly selected) landlord interacts with two workers. We ran three treatments of the game: (i) a standard casual labour market, (ii) co-existing casual market and tied contracts, and (iii) the co-existing labour arrangements in the presence of a saving technology. Each treatment included multiple rounds ("years") of play with two seasons per year (with different productivity levels). As mentioned, each round in the experiment resembles an ultimatum game, and we assume the landowner is the first mover or proposer. Each round the landlord offers a casual wage (and possibly a tied wage, depending on the treatment), which is accepted or rejected by individual workers – determining economic outcomes for landlord and workers.

Our model correctly predicts fluctuations in casual wages across seasons as well as the impact of tied contracts and savings technology on casual wages. Our model also correctly predicts the level of tied wages relative to average casual wage, and the impact of saving technology on tied wages. Earnings for workers do not vary across treatments, and landlords are able to grab most of the rents of institutional innovations even in a context of imperfectly elastic supply of labour. We conjecture that changing the nature of the bargaining process, for example by turning workers into the first mover, will have more effect on worker welfare than investments in financial development.

This paper is organised as follows: in section 2 we briefly summarise the literature on rural labour markets, and present a simple model of rural labour markets with inelastic supply of labour. Section 3 introduces the experiment and summarizes the data. Section 4 explains the identification strategy. Section 5 presents the regression results. Section 6 concludes.

2. Conceptual framework

A large theoretical literature exists on rural labour markets and the role of labour tying. Multiple motives for labour tying are proposed. For example, Bardhan (1983) rationalised tied labour by cost minimizing behaviour of the landlord, who faces high costs to ensure supply of labour in peak periods. Labour tying also enables (valuable) consumption smoothing by workers, who would otherwise face a volatile wage schedule – varying with the seasons. The benefits of this smoothing service may be captured by the landlord who can lower the tied wage to make the worker indifferent between accepting a (low but fixed) tied wage or a volatile wage earned on the casual market (Basu, 2002; Mukherjee and Ray 1995; Caselli 1997). In addition, Eswaran and Kotwal (1986) focused on supervision costs and special tasks, arguing that by entrusting tied workers with crucial tasks landlords can reduce monitoring costs. Tied labourers are expected to shirk less because they stand to lose their privileged position if caught. Of course tied labourers also have incentives to invest in farm-specific knowledge or skills.[1]

The literature on labour tying is based on the context of rural India, characterized by a very skewed distribution of land and an abundant supply of labour. However, the land to labour ratio varies across space, and it is worthwhile to probe models starting from different premises. One alternative case is the one where labour supply is not perfectly elastic. For example, large parts of Africa are traditionally land abundant, and in the presence of urbanisation and commercial production, may face local scarcities of labour (Bryceson, 2002; de Haas, 2014; Duncan & Howell, 1992; Juif & Frankema, 2016; Leavy & White, 1999; Mafeje, 1973; Ndalilah, 2012). The popularity of labour teams in rural African villages is also consistent with local scarcity of labour (Bryceson, 1996, 2006; de Haas, 2014, 2016; Geschiere, 1995; Kevane, 1994; Oya, 2010; Worby, 1995). Indeed, also in the context of rural Africa labour tying is not uncommon (de Haas, 2014; Oya, 2010).

Our model extends the literature by proposing a rural labour market characterized by an inelastic supply of labour, and a setting where labourers do not compete for jobs or drive down wages. To simplify the analysis we assume spatial movement is limited, and also assume there is

[1] If labour tying is a rational response to fluctuating demand for labour (in the context of a desire for smooth consumption patterns), then why is labour tying less prevalent today than in the past? The literature offers several suggestions. Mukherjee and Ray (1995) argue that peak period incentives for contract incompleteness on the supply side are responsible for the reduction in the incidence of tied labour. Bardhan (1979, 1983) points to advances in labour-saving technologies. Caselli (1997) proposes that alternative smoothing technologies (such as borrowing and saving) render labour tying less attractive for workers.

no competition between landlords for workers. Instead, we assume a series of ultimatum games, where the landlord proposes a wage that is accepted by the worker, or not. Upon rejection, the landlord is unable to produce and earns nothing, and the worker also earns no income. In this setting, equilibrium wages will depend on whoever is able to exploit a first mover advantage, and propose the wage. The first mover should propose a wage that is on the other player's indifference curve. Landlords should offer (low) wages so that workers are indifferent between working and not-working. Conversely, if workers were the first movers they would demand high wages that cream off the entire surplus and leave the landlord indifferent between producing and leaving the land fallow. We follow convention, and assume landlords are the first mover.

Production takes place in two periods: a peak season and a slack season. These periods together form one year. The year starts with a peak season, and a slack season follows after. During the peak period, the value marginal product of labour on the farm is "high." In contrast, labour is not very productive during the slack season. To obtain a fixed level of output from a unit of land, one unit of labour is required. In the peak (slack) season, combining one unit of land and labour produces $y_P > 0$ ($y_S > 0$). Obviously $y_P > y_S$. We abstract from shirking, and assume perfect observability of effort across the seasons.

Landlords can employ tied or casual labourers which, in the absence of shirking, are perfect substitutes in production. When accepting the landlord's wage offer, tied workers are contracted for the entire year and receive the same wage across the seasons. In contrast, casual workers are (potentially) contracted per period, and receive a seasonal wage. Denote per season wages by w_i, where subscript $i \in (P, S, T)$, and P indicates peak, S indicates slack and T indicates tied. For the theoretical model we consider the case of one landlord interacting with a single worker. The landlord is endowed with one unit of land, and the worker is endowed with one unit of labour. Production does not require any complementary inputs or capital, but the worker incurs a fixed cost (e) when supplying labour. We assume both the landlord and worker have period-separable utility functions, and perfect information about y_P, y_S and e.

We follow Fehr and Schmidt (1999) and characterise utility of the worker as dependent on own income and income of the landlord. We assume workers are behindness averse (Bartling, Fehr, Maréchal, & Schunk, 2009; Bartling & von Siemens, 2004). Utility of the landlord depends on output levels (varying across rounds) and the workers' wage.

We assume the landlord has access to a (storage) technology, allowing him to save between peak and slack season and smooth his consumption. Landlords are therefore assumed to be risk neutral within years. Workers do not have access to this technology in our basic treatment, so workers are assumed to be risk averse. In case of a match, per period utility of the landlord is given by equation (1), and that of the worker is given by equation (2).

$$u^{LK}(y_i, w_i^K, \alpha) = (y_i - w_i^K)^{\gamma_l}, \text{ and} \quad (1)$$

$$u^{WK}(w_i^K, e, y_i, \alpha) = (w_i^K)^{\gamma_w} - e - \alpha(y_i - 2w_i^K). \quad (2)$$

We assume $\gamma_l = 1, \gamma_w = \frac{1}{2}, \ 0 < \alpha \leq 1$. Next, $K \in (C, CT, CTS)$ defines the three markets we will discuss below: casual market (C); casual market when the landlord can also offer tied contracts (CT); and finally a casual market with tied contracts and where workers can also save and carry their earning from one season to the next (CTS).

The right-hand side of (1) captures net income from using the land. The first term captures wage income for the worker, the second is the utility cost from working, and the third term represents behindness aversion.

The landlord's problem is to maximise his utility subject to the worker's participation constraint. Optimal wages are defined by the workers reservation wage, or the wage that makes him indifferent between working and not working.

2.1 A casual labour market

Assume per period utility of the worker is given by equation (3).

$$u^{WC}\left(w_i^C, e, y_i, \alpha\right) = \left(w_i^C\right)^{\frac{1}{2}} - e - \alpha\left(y_i - 2w_i^C\right) \tag{3}$$

We normalise utility of the worker to zero if she does not work, which defines reservation utility for casual labour. Setting reservation utility $u^{WC}\left(\underline{w_i^C}, e, y_i, \alpha\right) = 0$ defines the worker's reservation wage $\underline{w_i^C}$ so that the worker supplies one unit of labour for wages $w_i^C \geq \underline{w_i^C}$. The optimal wage set by the landlord (w_i^{C*}) is given by $w_i^{C*} = \underline{w_i^C}$: the peak wage is $w_P^{C*} = \underline{w_P^C}$, and the slack wage is $w_S^{C*} = \underline{w_S^C}$. Since $w_i^{K*\prime}(y_i) > 0$ (proof in appendix), and $y_P > y_S$, it follows that $w_P^{C*} > w_S^{C*}$. The optimal wage varies across the seasons because of behindness aversion: since landlords earn more in the peak season, workers also demand a higher wage.

Prediction 1:

i. $0 < w_S^{C*} < w_P^{C*}$.

2.2 *Introducing tied contracts*

Conventionally, tied contracts enable risk averse workers to smooth their income. Yearly utility of a tied worker is given by equation (4):

$$u^{WCT}(w_T^{CT}, e, y_P, y_S, \alpha) = 2(w_T^{CT})^{\frac{1}{2}} - 2e - \alpha(y_P - 2w_T^{CT}) - \alpha(y_S - 2w_T^{CT}) \qquad (4)$$

where w_T^{CT} is the tied wage in the casual market when the landlord can offer tied contracts. Assume that workers on a tied wage contract compare their annual earnings with those of their landlord, so that for every season the tied worker's utility depends on how his tied wage compares to the landlord's average earnings:

$$u^{WCT}(w_T^{CT}, e, y_P, y_S, \alpha) = (w_T^{CT})^{\frac{1}{2}} - e - \alpha\left(\frac{1}{2}(y_P + y_S) - 2w_T^{CT}\right) \qquad (5)$$

Reservation utility of tied labourers is defined by $u^{WCT} = 0$, so that $u^{WCT}\left(\underline{w_T^{CT}}, e, y_P, y_S, \alpha\right) = 0$ defines the reservation wage, $\underline{w_T^{CT}}$. The optimal wage for tied labour (w_T^{CT*}) is simply $w_T^{CT*} = \underline{w_T^{CT}}$. Defining optimal wage as a function of landlord endowment, ${w_i}^{K*}(y_i)$, we show that ${w_i}^{K*\prime}(y_i) > 0$, and ${w_i}^{K*\prime\prime}(y_i) > 0$ (proof in appendix), ${w_i}^{K*}(y_i)$ is convex, so that ${w_i}^{CT*}\left(\frac{1}{2}(y_P + y_S)\right) = w_T^{CT*} < \frac{1}{2}w_S^{C*}(y_s) + \frac{1}{2}w_p^{C*}(y_p)$. In words, the tied wage is lower than the average casual wage in the casual market when labour tying is not possible; therefore the first-moving landlord faces reduced costs and earns a higher income.

Labour tying increases yearly income and welfare of the landlord in comparison to his yearly income and welfare in the casual market without tied contracts: $u^{LCT}(y_P, y_S, w_T^{CT*}, \alpha) > u^{LC}(y_P, w_P^{C*}, \alpha) + u^{LC}(y_S, w_S^{C*}, \alpha)$. Assume the landlord has the opportunity to offer the worker both casual and tied contracts, and offers w_T^{CT} and w_P^{CT} at the beginning of the peak season. He offers w_S^{CT} later, when the slack season starts. Denote by w_P^{CT*} the equilibrium wage offered to casual labour in the peak period when a tied contract is available. Then optimal strategy for the landlord is to offer $w_P^{CT*} < w_P^{C*}$, so that the worker earns negative utility in the casual market and voluntarily selects into the tied labour contract.

Prediction 2:

i. $w_S^{C*} < w_T^{CT*} < w_P^{C*}$;

ii. $w_T^{CT*} < \frac{1}{2}\left(w_S^{C*} + w_p^{C*}\right)$;

iii. $w_P^{CT*} < w_P^{C*}$.

2.3 Introducing a saving technology for the worker

If casual workers are also able to access the saving technology, they can shift income from the peak to the slack season and increase their utility. Denote by s the amount saved by the worker in the peak period (and dis-saved in the slack period). The optimal amount to save (s^*) for casual workers is given by $s^* = \frac{1}{2}(w_P^{CTS} - w_S^{CTS})$ (see appendix for proof). This enables the casual worker to spend the same income each period, or $\frac{1}{2}(w_P^{CTS} + w_S^{CTS})$, yielding per-period utility:

$$u^{WCTS}\left(w_i^{CTS}, e, y_i, \alpha, s^*\right) = \left(\frac{1}{2}\left(w_p^{CTS} + w_S^{CTS}\right)\right)^{\frac{1}{2}} - e -$$

$$\alpha\left(\frac{1}{2}(y_P + y_S) - (w_P^{CTS} + w_S^{CTS})\right) \qquad (6)$$

The ability to transfer income across periods increases the worker's utility of working in the peak season (earning a high casual wage). Since part of the peak income can now be costlessly transferred to the slack season, where the marginal utility of income is higher, the casual worker would obtain a positive utility level if casual market wages did not adjust (that is: a utility level that exceeds reservation utility). However, in equilibrium wages adjust, and saving workers are brought back to zero utility. A risk-neutral landlord seeking to maximize his earnings will offer wages such that the worker is indifferent between not-working and working, and indifferent between casual and tied labour.

This is formalised as follows. Denote by w_P^{CTS*}(w_S^{CTS*}) the equilibrium wage offered to casual labour in the peak (slack) period when the landlord can offer the tied contract and worker can save. Next w_T^{CTS*} denotes the equilibrium wage offered to tied labour when workers can save. A risk neutral landlord sets yearly utility from tied labour and causal labour at zero. He offers $w_T^{CTS*} = w_T^{CT*}$, and w_P^{CTS*} and w_S^{CTS*} such that $(w_S^{CTS*} + w_P^{CTS*}) = 2w_T^{CTS*} < (w_S^{C*} + w_P^{C*})$. The yearly utility level of a saving casual worker is given in (7), and the utility of a tied worker is given by (8):

$$u^{WCTS}(w_i^{CTS*}, e, y_P, y_S, \alpha, s^*) = 2\left(\left(\frac{1}{2}(w_P^{CTS*} + w_S^{CTS*})\right)^{\frac{1}{2}} - e - \alpha\left(\frac{1}{2}(y_P + y_S) - (w_P^{CTS*} + w_S^{CTS*})\right)\right) = 0 \quad (7)$$

$$u^{WCTS}(w_T, e, y_p, y_S, \alpha) = 2\left(\left(w_T^{CTS*}\right)^{\frac{1}{2}} - e - \alpha\left(\frac{1}{2}(y_P + y_S) - 2w_T^{CTS*}\right)\right) = 0 \quad (8)$$

The landlord is also indifferent between tied labour (where he provides the smoothing service, at zero cost to himself) and casual labour (where the worker saves for herself). Observe that these outcomes are different from the ones in Caselli (1997), where the introduction of a saving technology forced the landlord to increase the tied wage in order to remain "competitive."

Prediction 3:

$i\ w_T^{CTS*} = w_T^{CT*}$;

$ii\ \ w_P^{CTS*} = w_P^{CT*}$;

$iii.\ \frac{1}{2}(w_S^{CTS*} + w_P^{CTS*}) = w_T^{CTS*}$;

$iv.\ \ s^* = \frac{1}{2}(w_P^{CTS*} - w_S^{CTS*})$.

Figure 1 summarizes these outcomes for worker and landlord income. From the model we obtain the following testable hypotheses. For the labour market with casual contracts only, (i) the peak wage exceeds the slack wage. The introduction of tied contracts implies: (ii) the tied wage is between the casual wages, and lower than the average casual wage on a casual market without tied contracts; and (iii) the average peak wage decreases. Further introducing a saving technology: (iv) leaves the tied wage unaffected; and (v) leaves casual wages unaffected compared to the context where only tied contracts (but again, lower than in the casual market without labour tying). When workers can save, labour costs for the landlord are the same on the tied and casual market.

<< Insert Figure 1 about here >>

3. Experimental design

We designed a framed field experiment that mimics key elements of rural labour markets in Africa. The game consisted of two types of players: "landlords" and "workers", who engage in a series of ultimatum wage offer games. Each treatment was played for 4 years (eight rounds), or four "peak seasons" and four "slack seasons." Each landlord was paired with two workers, who could work on two different plots of land. There is no competition between workers, so the design maps one-on-one on the single-worker theory discussed above. At the beginning of each round the landlord offered a wage to his workers, who could individually accept or reject the offer. There was no direct communication between landlords and workers, and there was no scope for cooperation or coordination among workers – interaction took place via enumerators.[2] In case a worker rejected the offer, both parties earned nothing. Workers accepting the offer were given a simple task, but this did not affect their earnings.[3] The field experiment therefore is a modified ultimatum game.

Within a year, the peak season always occurs first. During peak seasons, the landlords received 20,000 shillings per worker for successful matches, and during slack seasons landlords received only 5,000 USh per employed worker. [4] Landlords had access to an automatic (and perfect) savings technology, allocating earnings equally to the two seasons within each year. Hence, upon acceptance of both wage offers, landlord's seasonal income is 20,000 minus peak wage plus 5,000 minus slack wage, divided by two. This saving technology guarantees that landlords are risk neutral within a year and can take advantage of income smoothing opportunities for the workers. Worker's income per round was given by the wage minus a transaction cost associated with working. Across all rounds and seasons we assume this cost equals 1,000 USh. Enumerators recorded incomes for landlords and workers, and individually informed all players about their income after each round. Payoff functions were public information, so workers knew how much the landlord stood to gain from a "match." After the experiment, one season was randomly chosen for payment. This design feature provides risk

[2] Enumerators talked to the landlords and then informed each worker individually about the landlord's offers and then provided feedback to the landlord about the total number of workers who had accepted and rejected.

[3] Accepting workers were given 500 grams of mixed yellow and maroon beans to sort based on colour (for two minutes), but their productivity in this task did not affect their own earnings or those of the landlord.

[4] At the time of experiment, USD 1 exchanged for 3600 Uganda shillings.

averse workers with an incentive to “smooth” earnings and avoid realizations with zero or low earnings.

Reflecting the theoretical model above, we organised three experimental treatments.

Treatment 1: Casual market. This treatment simulated the casual labour market and allowed only one-period (one-season) contracts. Before each peak and slack season the landlord extended wage offers, which workers accepted or rejected.

Treatment 2: Labour tying. In this treatment, landlords offered seasonal wages as well as a “tied contract” covering both seasons (same wage across seasons). Before the peak season, the landlord made a peak offer and a tied wage offer. Workers accepted one offer, or rejected both. Casual or unemployed workers received another offer before the slack season.

Treatment 3: Savings technology. This treatment resembles the former, but also allows workers to carry earnings from one season to the next (within the same period). Workers accepting the peak wage were asked at the beginning of the period how much they intended to shift to the slack season—if anything.

We conducted the experiment in ten randomly selected villages in Kiboga district, Central Uganda. Kiboga is largely a rural district, with 77% of the population living in rural villages (MoWE, 2010). Agriculture is the major economic activity, and the main crops in the region are maize, beans, bananas, sweat potatoes, cassava, groundnuts, onions, cabbage and tomatoes. In each village we randomly selected eighteen household heads to participate in the experiment. After explaining the protocol (see Appendix), we randomly assigned participants into six groups of three people each, and randomly picked one group member to play as landlord.

We engaged each group separately in all three treatments[5]. As mentioned, each treatment was played for eight rounds but per treatment only one season from one year was picked for actual payment for workers (for landlords one season-worker combination was picked). So payments for workers were based on one draw from 8 outcomes, and payments for landlords were based on one draw from 8 outcomes (2 workers and 4 years).

In total, 180 respondents participated in the experiment: 120 workers and 60 landlords. After the experiment we held a short exit survey to collect data on socio-economic characteristics of the participants. In Table 1 we summarize these data, which demonstrate that the sample was balanced across the subsamples of workers and landlords. Sixty percent of the participants practice farming as their main occupation, 50 percent of the participants are women. Most participants attended primary school and are members of a Savings, Credit and Cooperative Organisation (SACCO). Hiring and selling causal labour was common to almost all respondents, and the great majority of subjects was also familiar with the concept labour tying.

<< Insert Table 1 about here >>

4. Identification

We test key hypotheses by estimating a series of multivariate OLS models. In all the models, we use heteroscedasticity robust standard errors clustered at landlord level. The main dependent variable is wage offers by the landlord (peak, slack, or tied), We first focus on behaviour in the casual market, and estimate model (9) for Treatment 1 observations only:

$$w_{lkt} = \alpha_0 + \theta_1 Peak_i + \varepsilon_{lit}, \tag{9}$$

[5] Order of play of treatments was randomized at village level.

where w_{ltk} is the wage offered by landlord l in year k and market t, α_0 is the constant (or average wage offer in the slack period), $Peak_k$ is a dummy with value one during the peak season, and ε_{lkt} is the error term. Coefficient θ_1 picks up the difference between average peak wage offer and the average slack wage offer, which we expect to be positive because of behindness aversion, shown in prediction $1i$: $\theta_1 > 0$.

Next, we turn to the observations from Treatment 2 and estimate (10):

$$w_{lkt} = \alpha_0 + \varphi_1 Peak_k + \varphi_2 Tied_k + \varepsilon_{lit} \quad (10)$$

$Tied$ is a dummy with value one for tied wage offers. Coefficient φ_2 estimates the difference between the average tied wage offer and average slack wage offer (which we expect to be positive from prediction *2i*: $\varphi_2 > 0$). Our model also predicts (in prediction *2i*) that the average tied wage offer is lower than the average peak wage offer, or that $\varphi_1 - \varphi_2 > 0$. The model prediction (prediction *2ii*) with respect to labour tying is that the tied wage is below the (average) casual wage for the markets without tied contracts, or that $\varphi_2 < \frac{\hat{\theta}_1}{2}$.

Next, we introduce the saving technology, pool the data from treatments, and estimate model (11) for slack, peak, and tied wage offers separately:

$$w_{lkt}^f = \alpha_1^f + \beta_1^f Tiedmkt_t + \beta_2^f Savingsmkt_t + \varepsilon_{lit} \quad (11)$$

where f:{P,S,T} respectively denotes peak, slack and tied wage offer. For this model, α_1^f is the average peak or slack (or tied) wage offer in the casual (tied) market , $Tiedmkt_t$ is a dummy with value one for Treatment 2, and $Savingsmkt_t$ is a dummy with value one for Treatment 3. Coefficient β_1^f captures the effect on wage offers due to the presence of a tied market.

Coefficient β_2^f picks up the effect on wage offers due to the introduction of a saving technology. Based on the model we expect that peak wage decreases when the landlord can offer tied contract (prediction *2iii*), or that $\beta_1^P < 0$. We next test whether the introduction of a saving technology affects tied wage offers (prediction *3i*), or that $\beta_2^T = 0$. We then test whether introduction on savings technology does not change peak wage offer (prediction 3*ii*), or that $\beta_2^P = \beta_1^P$.

Our model predicts that when workers can save, the tied wage equals the average casual wage (prediction *3iii*). To test this, we estimate (10) for only Treatment 3 observations and test $\varphi_2 = \frac{\varphi_1}{2}$.

Finally, we are interested in savings behaviour in the experiment, and estimate model (12) based on Treatment 3 to test prediction *3iii* from our model:

$$optsav - sav_{ki} = S_0 + S_1 X_k + \varepsilon_{ki} \quad (12)$$

where $optsav - sav_{ki}$ is the difference between optimal savings (full income smoothing) and actual savings for worker k in year i, X_k is vector of control variables, and ε_{ki} is the error term. As controls we include education and survey-based (i.e. hypothetical) measures of time – and risk preferences. If on average workers optimally smooth consumption, then $S_0 = 0$.

5. Results

Figure 2 shows an overview of the variation in average wage offers, acceptance rates and landlord earnings across the three labour markets, enabling us to verify most model predictions. The top-left panel shows that the average peak wage offer is higher than the average slack wage offer on the casual labour market. But the sharing rule varies across the seasons: in peak seasons, the average wage offer is almost 27.5% of the surplus and in slack seasons the average wage offer is more than 40% of the surplus. Observe that the average tied offer is between the average peak and slack offers, and consistent with model predictions it is below the average casual market wage offer. When workers gain access to the savings technology, as predicted, the average peak wage offer, average slack wage offer are not changed. As predicted, average tied wage offers are not affected by the saving technology.

<< *Insert Figure 2 about here* >>

The top-right panel summarizes acceptance rates. Almost 90% of the wage offers in the casual market are accepted by workers, suggesting the great majority of offers is evaluated as sufficiently fair. As predicted, introducing tied labour reduces acceptance rates in the casual market. However, acceptance rates are not reduced to zero – indeed, top-right panel reveals that even after introducing tied contracts the majority of the landlords and workers rely on the casual market for contracting. The introduction of the saving technology, however, does not appear to make the casual market more attractive.

The bottom panel plots average earnings for landlords. Observe that tied contracts make the landlord better off, and that the landlord is indifferent between a casual market with tied contracts and a labour market where workers can save.

We next explore these issues in a regression framework. Table 2 gives estimation results for models (9) and (10).

<< *Insert Table 2 about here* >>

Consistent with model predictions, results in column 1 show that landlords offer casual labourers 3,200 shillings (USD90 cents) more in peak rounds than in slack rounds. The average casual wage offered in the slack rounds equalled 2,270 shillings (USD 60 cents), which increased to 5,460 shillings (USD 1.5) in the peak season. This result is robust to landlord and year fixed effects (column 2). The income volatility in the casual market can be attenuated by a tied wage contract. Estimation results in column (3) show that tied wages are higher than average slack period wages, but lower than the average peak wage offer and also lower than the average casual wage offer. Specifically, the tied wage offer equalled 3,560 shillings (USD 1) and the average casual offer was 3,870 shillings (USD 1.1). Hence, landlords earn extra rents by offering tied contracts to workers to smooth their incomes.

<< Insert Table 3 about here >>

Table 3 summarizes estimation results for model (11). Estimation results in column (3) show that the average peak offer is lower in the presence of a tied labour market and stays the same when workers gain access to a savings technology. This result is robust to including landlord and year fixed effects. These results imply landlords exploit the income smoothing opportunities of the worker. As expected, and reported in column (5), tied wages do not respond to the introduction of the saving technology. This result is also robust to landlord and year fixed effects.

We next analyse savings behaviour. Table 4 gives estimation results for model (12).

<< Insert Table 4 about here >>

The difference between optimal savings and actual savings is not statistically different from zero, suggesting that workers on average save the optimal amount. A significant share of the workers

(53%) self-selected into casual labour, and used the savings technology to obtain smoothing of their earnings.

6. Discussion and Conclusion

We examined the interaction between labour tying and a saving technology as mechanisms to smooth consumption for rural workers when incomes fluctuate over the seasons. Unlike earlier work we consider the case of inelastic supply of labour, and allow for inequality aversion of workers. Previous work, based on the context of the Indian countryside, is based on the assumption of perfectly elastic supply of labour. The polar opposite case of the one presented in these models would be a model where landlords compete for labourers. Our model seeks to reflect the East African context, so we consider an intermediate case where neither labourers intensively compete for jobs, nor landlords for workers. In keeping with reality, we also assume that landlords are the first movers in the game where wages are set.

Consistent with earlier theory we demonstrate that the introduction of labour tying may enable the landlord to secure a larger share of the economic rents. Behindness aversion will limit the extent to which the landlord will seek to exploit the worker by offering a wage that is very low. While it is an open question to what extent behindness aversion "matters" in the field as it does in lab-style settings, we propose that some sensitivity to income inequality will always be present. We next introduce a saving technology for the worker in order to enable her to carry income from the peak to the slack season (or from seasons with high wages to seasons with low wages), which should be welfare improving. To restore equilibrium, and make workers again indifferent between the casual and tied contract, the landlord can increase the tied wage offer or reduce the casual market wages. The latter option is obviously preferable for the landlord as it increases his own income.

We obtain a number of testable predictions from the theoretical model, which we week to test using a framed field experiment in rural Uganda. Consistent with the hypothesis of behindness aversion we find that (i) casual wages vary across the seasons. We also find support for the predictions that (ii) the tied wage offer extended by landlords is between the slack and peak wage offers on the casual labour market, and average casual market wages exceed average tied wage. Our results are also consistent with the prediction that, (iii) landlords reduce casual wage in the peak period, to benefit from tied contracts as compensation for the consumption smoothing service he provides to the worker. When workers can save, consistent with predictions, we find that relative to the casual market without tied contacts and savings technology, landlords (iv) reduce casual wages and maintain workers at their reservation utility level. In equilibrium, (v) landlords are indifferent between tied and casual contracts (when workers can save), and prefer both of these outcomes to outcomes on the simplest casual market where consumption smoothing cannot occur.

Overall, the experiment suggests that labour tying may be a persistent agrarian institution, even in the face of ongoing urbanisation and decreasing surplus labour in the countryside. When landlords are first movers, they either benefit from labour tying (when workers cannot save) or they are not worse off (when workers can save). In equilibrium, workers earn the same reservation level of utility. This suggests interventions to improve outcomes for workers should not focus on introducing complementary institutional innovations, such as new contracts or access to microfinance. Instead, changing the nature of the game – so that workers are no longer responders or second-movers in an ultimatum game – may be a more fruitful approach.

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Figures and Tables

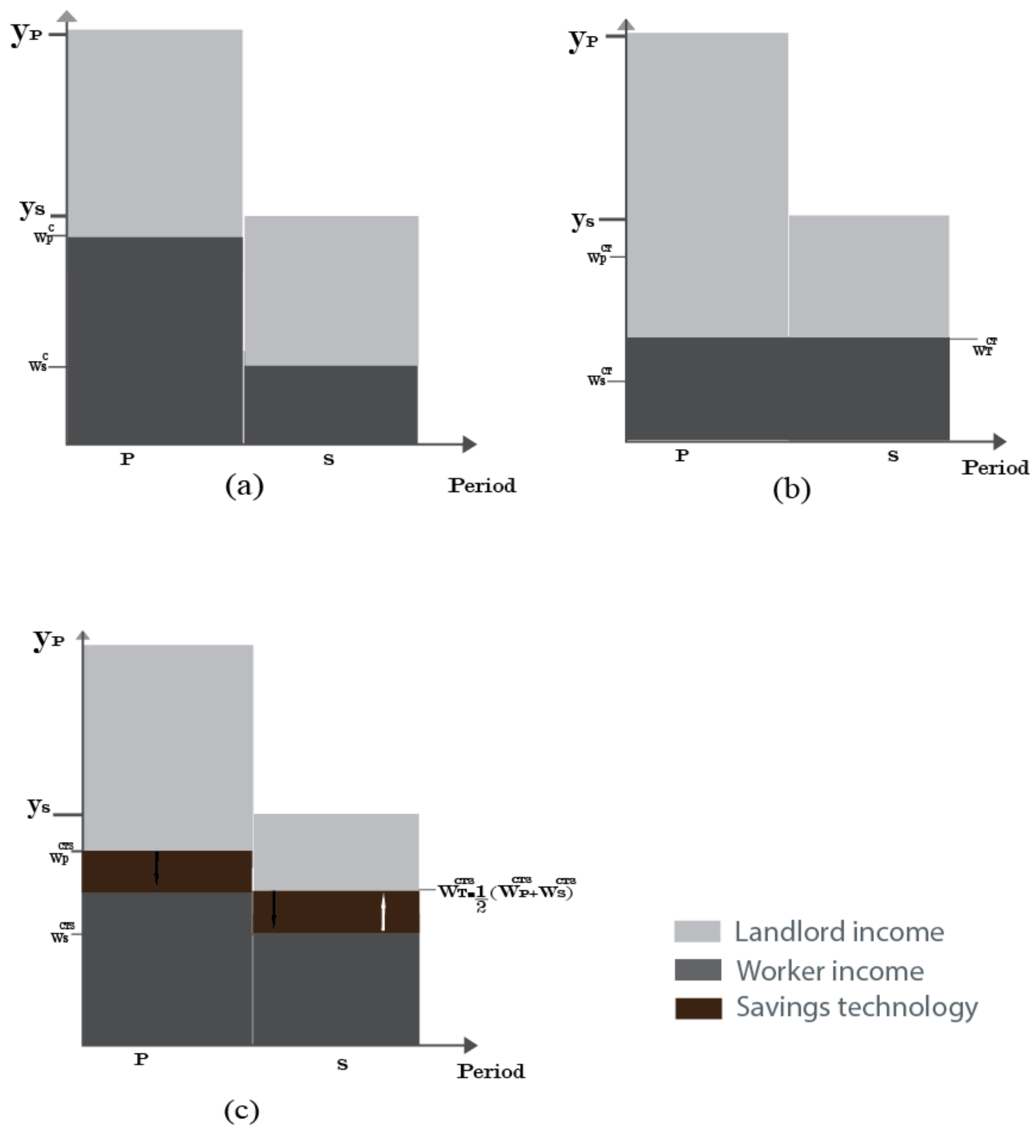

Figure1: Panel (a) shows fluctuations in income of the landlord and worker in the casual market. Panel (b) shows incomes of landlord and worker in the casual market with tied contracts. The landlord obtains extra surplus from tied labour, and a tied worker obtains perfect smoothing of her income. Panel (c) shows income of landlord and worker in a casual market with tied contracts and saving technology for the worker. The landlord grabs extra surplus from the saving technology of the worker. A casual worker uses the saving technology to obtain perfect smoothing of her income.

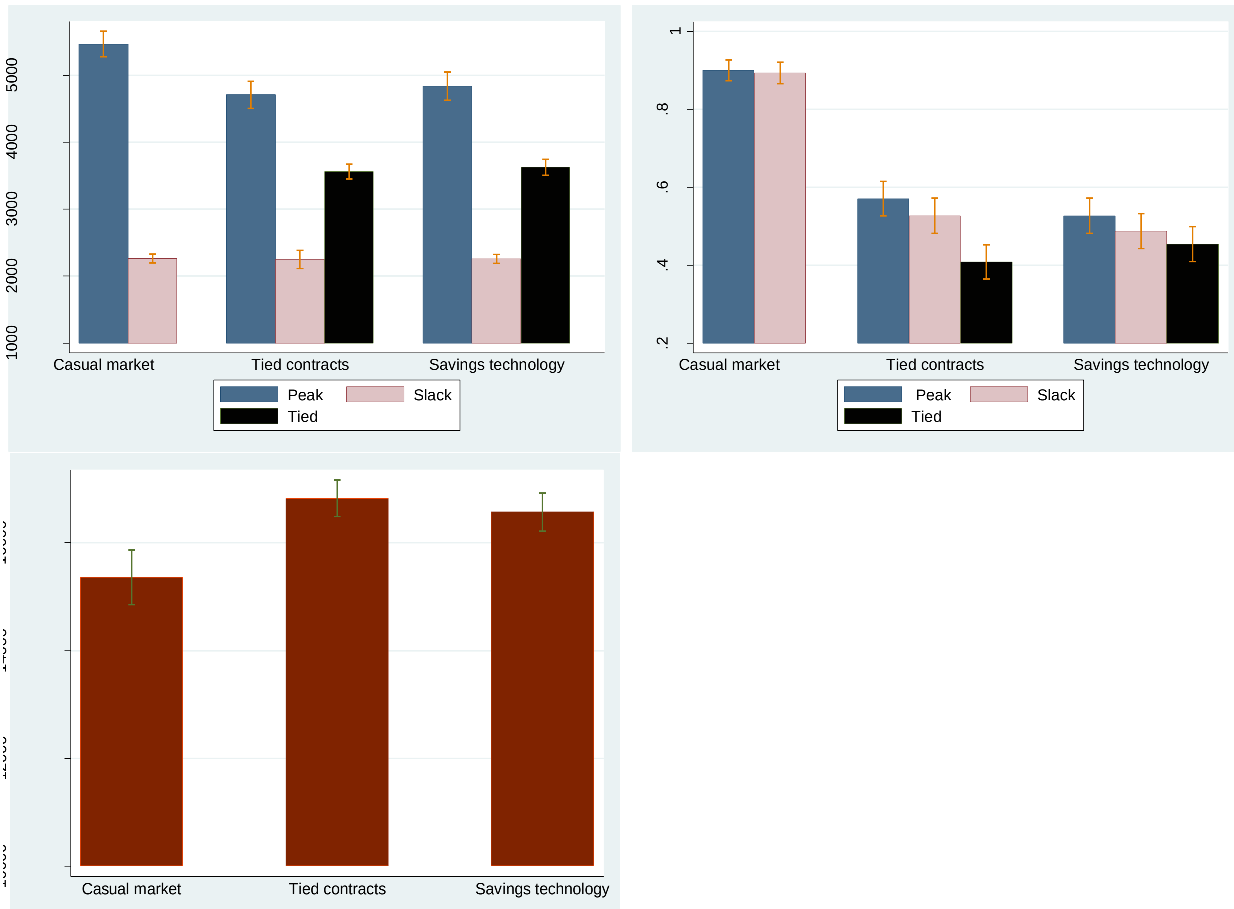

Figure 2, Variation across markets by treatments: average wage offers (top-left), average wage offer acceptance rates (top-right), and average landlord earnings (bottom),

Table 1: Social-economic characteristics of participants

Variable	Mean Landlords (1)	Mean Workers (2)	P(1=2)
Farm size (acres)	3.72	3.23	0.58
Farm output (million shillings)	1.10	1.02	0.75
Tied workers employed	2	2	0.97
Casual workers employed	2	3	0.66
Age	41.38	39.53	0.42
Women	0.48	0.48	1
Major occupation-farming	0.67	0.67	1
Primary education	0.93	0.94	0.83
SACCO members	0.68	0.68	1

Table 2: Estimates of average wage offers

	Average wage offer					
	(1)	(2)	(3)	(4)	(5)	(6)
Peak wage offer	3,201.46***	3,201.46***	2,460.62***	2,460.62***	2,581.25***	2,581.25***
	(159.45)	(170.92)	(174.15)	(182.20)	(166.01)	(173.69)
Tied wage offer			1,313.75***	1,313.75***	1,369.58***	1,369.58***
			(112.33)	(117.52)	(91.49)	(95.72)
Slack wage offer	2,265.00***	2,541.04***	2,246.67***	2,671.53***	2,256.67***	2,962.78***
	(57.60)	(123.67)	(84.51)	(86.91)	(56.23)	(90.70)
N	480	480	720	720	720	720
R-squared	0.671	0.835	0.410	0.638	0.464	0.684
Landlord dummies	NO	YES	NO	YES	NO	YES
Year dummies	NO	YES	NO	YES	NO	YES
Prediction 1i: $\theta_1 > 0$	[0.00]	[0.00]	-	-		
Prediction 2i: $\varphi_2 > 0$	-	-	[0.00]	[0.00]		
Prediction 2i: $\varphi_1 - \varphi_2 > 0$	-	-	[0.00]	[0.00]	-	-
Prediction 2ii: $\varphi_2 < \frac{\hat{\theta}_1}{2}$	-	-	[0.00]	[0.13]	-	-
Prediction 3iii $\varphi_2 = \frac{\varphi_1}{2}$	-	-	-	-	[0.48]	[0.50]

Robust standard errors in parentheses. Standard errors clustered at landlord level. $***p < 0.01$. $**p < 0.05$. $*p < 0.1$. *p-values are in brackets.*

Table 3: Impact of markets on average wage offers

	(1) Slack	(2) Slack	(3) Peak	(4) Peak	(5) Tied	(6) Tied
Tied Contracts	-18.33	-18.33	-759.17***	-759.17***		
	(84.09)	(87.98)	(158.94)	(166.29)		
Savings technology	-8.33	-8.33	-628.54***	-628.54***	65.83	65.83
	(55.55)	(58.12)	(176.88)	(185.06)	(72.83)	(78.07)
Casual market	2,265.00***	2,203.89***	5,466.46***	6,106.46***	3,560.42***	4,664.58***
	(57.62)	(58.88)	(173.52)	(113.39)	(98.37)	(56.22)
N	720	720	720	720	480	480
R-squared	0.000	0.307	0.043	0.622	0.001	0.626
Landlord dummies	NO	YES	NO	YES	NO	YES
Year dummies	NO	YES	NO	YES	NO	YES
Prediction 2iii: $\beta_1^P < 0$			[0.00]	[0.00]		
Prediction 3i: $\beta_1^T = 0$					[0.37]	[0.40]
Prediction 3ii: $\beta_2^P = \beta_1^P$			[0.37]	[0.39]		

Robust standard errors in parentheses. Standard errors clustered at landlord level. $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.1$. *p-values are in brackets.*

Table 4: Savings Behaviour

	Dependent variable: Optimal savings (-) actual savings
Constant, $\hat{S}_0$	43.35
	(157.10)
Hypothetical Low discount rate	395.10 **
	(180.41)
Hypothetical Risk averseness	121.13
	(173.16)
Post-primary education	-54.97
	(177.31)
N	472
R-squared	0.035
Prediction 3iv: $S_0 = 0$	[0.78]

Robust standard errors in parentheses. Standard errors are clustered at landlord level. $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.1$. *p-values are in brackets.*

Appendix A:

Landlord's per period utility:

$$u^{LK}(y_i, w_i^K) = (y_i - w_i^K)^{\gamma_l}$$

Since the landlord is risk neutral and has access to a saving technology, we assume $\gamma_l = 1$

$$u^{LK}(y_i, w_i^K) = y_i - w_i^K$$

Landlord's income is decreasing in w_i^K. Since supply of workers is perfectly inelastic, worker's incentive constraint is binding in equilibrium.

Worker's per period utility:

$$u^{WK}(w_i^K, e, y_i, \alpha) = (w_i^K)^{\gamma_w} - e - \alpha([y_i - w_i^K] - w_i^K)$$

$$u^{WK}(w_i^K, e, y_i, \alpha) = (w_i^K)^{\gamma_w} - e - \alpha(y_i - 2w_i^K)$$

For $\gamma_w = \frac{1}{2}$,

$$u^{WK}(w_i^K, e, y_i, \alpha) = (w_i^K)^{\frac{1}{2}} - e - \alpha(y_i - 2w_i^K).$$

Casual market:

Worker's incentive constraint:

$$u^{WC}\left(w_i^C, e, y_i, \alpha\right) = \left(w_i^C\right)^{\frac{1}{2}} - e - \alpha\left(y_i - 2w_i^C\right) \geq 0$$

For reservation wage $\underline{w_i^C}$

$$u^{WC}\left(\underline{w_i^C},, e, y_i, \alpha\right) = \left(\underline{w_i^C},\right)^{\frac{1}{2}} - e - \alpha\left(y_i - \underline{2w_i^C}\right) = 0$$

Since the worker's incentive constraint is binding, optimal wage $w_i^{C*} = \underline{w_i^C}$, $w_P^{C*} = \underline{w_P^C}$ and $w_S^{C*} = \underline{w_S^C}$, and

$$u^{WK}(w_i^{K*}, e, y_i, \alpha) = (w_i^{K*})^{\frac{1}{2}} - e - \alpha(y_i - 2w_i^{K*}) = 0 \quad \text{(A1)}$$

To prove that $w_P^{C*} > w_S^{C*}$, we investigate how w_i^{K*}changes due to a change in y_i by taking the first derivative of function $w_i^{K*}(y_i)$ with respect to y_i,: $w_i^{K*'}(y_i) = \frac{dw_i^{K*}}{dy_i} > 0$.

Taking the total differential of the implicit function (A1), we find

$$\frac{1}{2}w_i^{K*-\frac{1}{2}}\frac{dw_i^{K*}}{dy_i} - \alpha + 2\alpha\frac{dw_i^{K*}}{dy_i} = 0,$$

$$\frac{dw_i^{K*}}{dy_i} = \frac{2\alpha w_i^{K*\frac{1}{2}}}{1 + 4\alpha w_i^{K*\frac{1}{2}}}. \qquad \text{(A2)}$$

Given $\alpha > 0$, for positive optimal wage offers $w_i^{K*} > 0$, $\frac{dw_i^{K*}}{dy_i} = w_i^{K*\prime}(y_i) > 0$; since $y_P > y_S$ then $w_P^{C*} > w_S^{C*}$.

Tied contracts:

To show how the tied labour wage compares to casual wages, we prove $w_i^{K*}(y_i)$ is a strictly convex function for $w_i^{K*} > 0$ by showing that $w_i^{K*}(y_i)$ has a continuous second derivative and nonnegative $w_i^{K*\prime\prime}(y_i) > 0$ everywhere. To reach $w_i^{K*\prime\prime}(y_i) > 0$, we take the derivative of (A2) with respect to y_i,

$$\frac{d^2w_i^{K*}}{{dy_i}^2} = \frac{\left(1 + 4\alpha w_i^{K*\frac{1}{2}}\right)\alpha w_i^{*-\frac{1}{2}}\frac{dw_i^{K*}}{dy_i} - 2\alpha w_i^{K*\frac{1}{2}}\left(2\alpha w_i^{K*-\frac{1}{2}}\right)\frac{dw_i^{K*}}{dy_i}}{\left(1 + 4\alpha w_i^{K*\frac{1}{2}}\right)^2}$$

$$\frac{d^2w_i^{K*}}{{dy_i}^2} = \frac{2\alpha^2}{\left(1 + 4\alpha w_i^{K*\frac{1}{2}}\right)^3}$$

Given $\alpha > 0$, for $w_i^{K*} > 0$, $\frac{d^2w_i^{K*}}{{dy_i}^2} = w_i^{K*\prime\prime}(y_i)$ is continuous and always positive, $w_i^{K*\prime\prime}(y_i) > 0$. Therefore, ${w_i}^{K*}(y_i)$ is strictly convex and the convexity of $w_i^{K^*}(y_i)$ implies ${w_T}^{CT*}(\frac{1}{2}y_p + \frac{1}{2}y_S) < \frac{1}{2}w_P^{C*}(y_p) + \frac{1}{2}w_S^{C*}(y_S)$.

Savings technology:

Peak wage offered is ${w_P}^{CTS}$ and slack wage offered is w_S^{CTS}.

Let the worker save such that her utility is given by (A3).

$$u^{WCTS}(x,y) = (x)^{\gamma_w} + (y)^{\gamma_w} \qquad \text{(A3)}$$

where $x + y \leq w_P^{CTS} + w_S^{CTS}$

The worker's problem is to maximise her utility in A3 subject to constraint $x + y = w_P^{CTS} + w_S^{CTS}$.

Let $w_P^{CTS} + w_S^{CTS} = a$; then $x + y = a$, and $y = a - x$.

Therefore the corresponding Lagrangian function:

$$L = (x)^{\gamma_w} + \left((a-x)\right)^{\gamma_w} + \mu(x + a - x - a)$$

$$\frac{dL}{dx} = \gamma_w (x)^{\gamma_w - 1} - \gamma_w \left((a-x)\right)^{\gamma_w - 1} = 0$$

$$x = a - x$$

$$2x = a$$

$x = \frac{1}{2}a = \frac{1}{2}(w_P^{CTS} + w_S^{CTS})$, $y = \frac{1}{2}a = \frac{1}{2}(w_P^{CTS} + w_S^{CTS})$.

But $x = w_P^{CTS} - s, \rightarrow s = w_P^{CTS} - x$,

so $s = w_P^{CTS} - \frac{1}{2}(w_P^{CTS} + w_S^{CTS})$,

and $s = \frac{1}{2}(w_P^{CTS} - w_S^{CTS})$.

Also $y = w_S^{CTS} + s$, $y = w_S^{CTS} + \frac{1}{2}(w_P^{CTS} - w_S^{CTS})$,

so $y = \frac{1}{2}(w_P^{CTS} + w_S^{CTS})$.

Optimal savings $s^* = \frac{1}{2}(w_P^{CTS} - w_S^{CTS})$, and worker's income each period is $\frac{1}{2}(w_P^{CTS} + w_S^{CTS})$.

Worker's yearly utility with savings is then:

$$u^{WCTS}\left(w_i^{CTS}, e, y_P, y_S, \alpha, s^*\right) = \left(\frac{1}{2}(w_P^{CTS} + w_S^{CTS})\right)^{\frac{1}{2}} - e - \alpha\left(y_P - 2\left(\frac{1}{2}(w_P^{CTS} + w_S^{CTS})\right)\right) + \left(\frac{1}{2}(w_P^{CTS} + w_S^{CTS})\right)^{\frac{1}{2}} - e - \alpha\left(y_S - 2\left(\frac{1}{2}(w_P^{CTS} + w_S^{CTS})\right)\right)$$

$$u^{WCS}\left(w_i^{CTS}, e, y_P, y_S, \alpha, s^*\right) = 2\left(\left(\frac{1}{2}(w_P^{CTS} + w_S^{CTS})\right)^{\frac{1}{2}} - e - \alpha\left(\left(\frac{1}{2}(y_P + y_S)\right) - (w_P^{CTS} + w_S^{CTS})\right)\right) = 0$$

Yearly utility of a tied worker is given by:

$$u^{WCTS}\left(w_T^{CTS}, e, y_p, y_S, \alpha\right) = (w_T^{CTS})^{\frac{1}{2}} - e - \alpha(y_P - 2w_T^{CTS}) + (w_T^{CTS})^{\frac{1}{2}} - e - \alpha(y_S - 2w_T^{CTS})$$

$$= 0$$

$$u^{WCTS}\left(w_T^{CTS}, e, y_p, y_S, \alpha\right) = 2\left((w_T^{CTS})^{\frac{1}{2}} - e - \alpha\left(\left(\frac{1}{2}(y_P + y_S)\right) - 2w_T^{CTS}\right)\right) = 0$$

Appendix B: Experiment Protocol[6]

Welcome to this research experiment.

Today we are going to play games imitating incomes of farmers and workers.

In every year, farmers have good seasons (peak seasons), and low seasons (slack).

Farmers also need workers. The productivity of workers depends on the season. Workers productivity is high in peak seasons and low in slack seasons.

Farmers can hire tied (permanent) workers or casual workers.

Casual workers are hired and paid for each season separately. This means that wages can be different, depending on the seasons.

Tied workers are hired for the entire year and get the same income each season.

Today we are going to play a game about hiring labour in peak periods and slack periods.

We play this game for many seasons or rounds. We are going to play three versions of the game. In all the versions we will play 8 seasons. One season will be picked at random from each version for payment. You will be paid based on how much you earned in that season.

Do you have any questions so far?

Status quo:

In all the games we are going to play, we will have a landlord and workers.

The landlord offers tasks to workers, and offers a wage. The workers decide individually whether they accept or reject the offer.

There are 4 years and 2 seasons within each year: peak and slack.

What happens when workers accept the wage offer of the landlord?

Each peak season, the landlord will receive 20,000/= per worker who accepted the wage offer. For each slack season, the landlord will receive 5,000/= per worker who accepted the offer. But of course he should pay a wage to the worker.

If the worker accepts the offer, he will receive the wage. But he also incurs a cost of 1000/= for say lunch or transport each season while working for the landlord.

The landlord's earnings per worker for each peak season is? 20,000 minus the worker's wage.

The landlord's earnings per worker for each slack season is? 5000 minus the worker's wage.

The worker's earnings for each season is? Worker's wage – 1000,

[6] This protocol was given to participants verbally in local language.

Remember workers decide individually about accepting the offer or not, and not as a group. Communication between participants is not allowed.

If the worker rejects the landlord's offer:

Both the worker and landlord earn 0/= for that season.

We let the lottery decide who are going to play as landlords and who will be their workers.

For the workers who accept the landlords offer, they will be given mixed yellow and maroon beans to sort according to colour for two minutes (same for the peak and slack seasons), and afterwards enumerators will weigh the sorted beans together at ounce and grams sorted will be recorded.

You now have two minutes to deliberate on the rules of the game, and if any questions arise, I answer them.

Any questions?

We are going to proceed with the games, but in groups.

We have a total of eighteen participants here, we are going to randomly form six groups, each of three people. I will randomly pick one landlord to play with 2 workers for each group.

As mentioned, we will play three versions of the game. For each version, you will play for 8 seasons, 4 for the peak and 4 for the slack. One season or round will be picked at random from the version for actual payment to you. For workers, it can be peak or slack season. For landlords, one year corresponding to one of the workers will be picked at random. Landlord earnings will then be given by a half of total year income of the landlord, corresponding to the randomly chosen worker and year. Landlord earnings therefore do not depend on the season, but rather on his earnings in that year.

This implies the landlord's picks from 8 years (4 years and two workers), and workers pick from 8 seasons.

Workers determine the landlord earnings as well. When a worker rejects the wage offer, the landlord cannot employ the worker and cannot earn money from that worker. So if a worker rejects the wage offer, that landlord earns nothing in that season. If in the lottery a year where a worker rejected all wage offers is picked, the landlord earns nothing. Therefore landlords, you need to be very calculative.

Workers also stand a chance of earning 0/= in a version, if they reject wage offers in some seasons, and if one of these seasons is picked for payment.

At the end of each version you will be asked to make a draw to determine the season/year you will be paid for that version at the end of the experiment.

Enumerators will be making calculations and recording your earnings for each version.

You will be informed about your earnings for each version, if you wish you may write it down.

Please make sure you understand the rules of the game, before you make any decisions.

Direct communication between landlord and workers is not allowed.

Enumerators will talk to the landlord and relay to workers individually each season. Enumerators then will give feedback to landlords regarding the number of workers who accepted and rejected wage offers each season.

Enumerators will be reminding you of the status quo information at the beginning of each version.

At the beginning of each version, one trial round will be carried out for the landlords.

Version 1 (Treatment 1): Seasons game; Casual market

Welcome to this version.

We are going to play for 4 peak and 4 slack season. Eight seasons or rounds in total.

The game is organised in pairs of seasons; one peak season and one slack season together make up one hypothetical year.

The landlord will make wage offers for all eight different seasons. The enumerator will share the season offer with the workers. The workers decide to accept or reject. The enumerator then informs the landlord about how many workers have accepted the offer.

Your season earnings will then be computed accordingly.

Workers who accepted the landlords offer will be given two minutes to perform the landlord's task.

Version 2 (Treatment 2): Tied game; Tied contracts

Welcome to this version.

We are going to play again for 4 peak and 4 slack seasons. Eight seasons or rounds in total.

The game is again organised in pairs of seasons; one peak season and one slack season together are one hypothetical year.

In this version, the landlord will offer a wage for the season, as before. But in addition he now makes an offer for the two seasons together: the same wage for peak and slack season. This is called the tied wage: it is a contract for two seaons rather than one. Workers can accept either the peak wage offer or the wage offer for the pair of seasons. Or they can reject both offers.

Through the enumerators, workers will inform the landlord if they accept any of the offers or reject both.

For workers who accept the wage for a pair of seasons, they will get the same wage in both the peak and slack season. They have to take no more decisions that year. For workers who accept the peak wage offer and those who reject both wage offers, another wage offer will be made by the landlord at the beginning of the slack period.

Your season earnings will then be computed accordingly.

Workers who accepted the landlords offer will be given time to perform the landlord's task.

Version 3 (Treatment 3): Tied with savings game; Savings technology

Welcome to this version.

We are again going to play for 4 peak and 4 slack seasons. Eight seasons or rounds in total.

The game is organised in pairs of seasons; one peak season and one slack season together make up one hypothetical year.

In this version, landlord will again offer per season wage offers. They also offer a tied wage, or one contract for the whole year (two seasons). Workers can again accept either the peak wage offer or the tied wage offer for the pair of seasons. Or they can reject both.

Through the enumerators, workers will inform the landlord weather they accept any of the offers or reject both.

Workers who accept the tied wage for a pair of seasons will receive the same wage in both the peak and slack season. Workers who accept the peak wage offer and those who reject both wage offers will receive another wage offer for the slack season.

One thing is different from the previous version. Workers who accept per season (peak) wage will be allowed to move money and transfer it between the seasons. That is, they can move some of their peak wage earnings to their slack season. Transferred money will be added to earnings for the slack season.

Season or round earnings will then be computed accordingly.

Workers who accepted the landlords offer will be timed to perform the landlord's task.

At the end of the eight seasons, you will make a draw to determine your earnings for this version. For workers you will choose one season from the eight, and for the landlord you will choose one year from 8 years.

We thank you for your time.