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Contract Duration under Incomplete Land Ownership Rights

Empirical Evidence from Rural Ethiopia

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Abstract

Using the land tenure system in Ethiopia, where all land is state-owned and only farm households have usufruct rights, as a case study, we assessed the links between land owners' tenure insecurity, associated behavioral factors, and contract length. In this paper, we analyze these links with survey data of rural households in the Amhara National Regional State of Ethiopia. The empirical strategy follows a hazard function model employed in duration data analyses and investigates the fitness of the data to the alternative exponential and Weibull functional forms. The results show that landlords' risk aversion increases the duration of contracts, which is in line with the reverse tenancy argument that landlords' risk preferences affect land-contract decisions. The findings of the study also indicate that tenure insecurity is a critical factor in the nature and length of contracts; hence, policies should aim to reduce landlords' frustrations regarding future land redistribution by the state. An important implication of the results is that secure tenure systems can reduce the disincentives from tenure insecurity due to uncertainty about contract duration and thereby enhance tenants' welfare. Longer-term and stable contracts can improve the land rental market. In addition, the impact of risk preferences points toward the importance of poverty in the functioning of the land rental market.

Key Words: contract length, tenure insecurity, risk and rate of time preferences, Ethiopia

JEL Classification: D2, Q12, Q15

Contents

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Introduction

In jurisdictions where land sales and mortgages do not exist, the performance of land rental markets and the associated contractual features are pivotal for agricultural productivity (Eswaran and Kotwal 1986; Binswanger et al. 1993; Deininger and Jin 2006; Pender and Fafchamps 2006). Land-contract duration is one of the most critical terms of such agreements, owing to its effect on tenants' motivations to improve or invest in the land, or simply make it productive.[1] Its impact is even more critical in Ethiopia, where land is state owned and individual land ownership is characterized by massive tenure insecurity. The objective of this paper is to assess the impact of land owners' tenure insecurity, along with associated behavioral factors, such as risk aversion and discounting of stream of benefits, from the duration of land contracts.

The tenant's decision on the length of a contract likely hinges on balancing the costs and benefits of short-term versus longer-term duration (Cheung 1969). As Yoder et al. (2007) argue, the most noted advantage of long-term contracts is the incentives they give to tenants to exert greater effort in production and investment. When the costs of transferring tenant assets attached to the land are high, long-term contracts become more attractive (Cheung 1969). In addition, long-term contracts guarantee employment and help the tenant smooth consumption fluctuations (Bandiera 2007). Despite their inherent incentives, however, long-term contracts reduce the landlord's power to use eviction or threats to elicit effort from the tenant (Bandiera 2007).

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[1] Understanding the nature and determinants of durations in a land rental contract is crucial to improving the critical outcomes of a land rental market, such as investment and (agricultural) productivity. Various studies have revealed the importance of the land rental market to efficiency of resource allocation in agriculture (e.g., Tikabo et al. 2008). For instance, a wealth of empirical evidence is available on the nature, type, and function of land rental markets in Ethiopia (e.g., Bezabih 2009; Deininger et al. 2008; Teklu and Lemi 2004; Ayele and Mamo 2004).

Although shorter-term contracts weaken the incentives for greater production and investment by tenants (Reid 1979; Allen and Lueck 1992; Yoder et al. 2005), they are preferable at times because they reduce the costs of enforcing contract stipulations, renegotiating the contract, or evicting tenants (Cheung 1969; Bandiera 2007). Hence, the optimal contract provides sufficient incentive for effort to the tenants and, at the same time, reduces the landlords' costs of dividing the land asset, making specific investment, and searching for and dismissing tenants.

In addition to these factors, the peculiarities of the Ethiopian land tenure system and land markets bring other factors into play in determining contract duration. First, land owners' limited usufruct rights (full land ownership belongs to the state) imply that landlords inherently are insecure about their land ownership to begin with. Tenure insecurity has an impact on contract renewal decisions in two ways. Since land reallocation is based on family size, renting out land for a long period signals that the family holding is "excessive," which can make it a candidate for land redistribution.[2] Hence, unlike previous studies that focused on the potential impact of tenants' insecurity about their contracts (and the limits on their ability to realize the full benefits of their investments), we look into how landlords' tenure insecurities influence the land-contract duration.[3]

Second, the traditional land-contract literature is based on the supposition of risk-neutral landlords and risk-averse tenants, stemming from an implicit assumption that landlords are wealthier than their tenants. Yet, there is growing evidence about the so-called reverse-tenancy agreements, in which landlords are considerably poorer than their tenants (Bellemare 2009).[4] This implicit assumption is reflected in Bandiera's (2007) argument (discussed in the paragraph above) that longer-term contracts are beneficial for risk-averse and credit-constrained tenants.

[2] While there is no immediate threat that landlords will lose their land (redistribution stopped in 1997 in the Amhara Region), the fact that land is state owned always induces a sense of tenure insecurity. Indeed, during the pilot survey for this paper, one of the authors held a discussion with the respondents, where they confirmed they feared they would lose land with lengthy rentals. In addition, particularly for female land owners, social norms prescribe relatively strong access rights to tenancy by relatives and in laws, which effectively amounts to loss of land.

[3] In line with this, Rozelle et al. (2002) argue that an indirect form of transaction cost in the land rental market derives from the risk of land loss. Other studies that identify tenure insecurity as a major constraint in the land rental market include Deininger and Jin (2006) on China; Deininger et al. (2008c) and Holden et al. (2011a) on Ethiopia; and Holden et al. (2008) on Ethiopia, Kenya, Malawi, and Uganda.

[4] Other countries where this occurs include Lesotho (Lawry 1993), South Africa (Lyne and Thomson 1995), Eritrea (Tikabo 2003), Ethiopia (Bezabih 2007), Bangladesh (Pearce 1983), and Malaysia (Pearce 1983).

In the context of Ethiopia, landlords are poorer than tenants and the land rental market can be a way of equalizing the factor ratio between landlords with relatively abundant land and relatively labor- and capital-richer tenants (Holden and Bezabih 2008). Hence, behavioral factors, such as landlords' risk aversion, can be an important determinant of contract duration.

An additional and important determinant of contract duration, which has so far been largely overlooked in the literature, is the degree to which land owners value a stream of benefits from duration of contracts longer than one year. As discussed above, choosing between shorter and longer duration contracts is tantamount to balancing the perceived costs and benefits of the alternatives, which hinge on how these costs and benefits are discounted. The use of discount rates as important parameters in investment decisions is increasingly common in the context of developing countries (Pender 1996; Holden et al. 1998; Yesuf and Bluffstone 2009; Godoy et al. 2001). To our knowledge, the importance of such behavioral factors has not been assessed in similar previous studies.

Hence, this study makes contributions to the literature in contract duration in two important respects. First, there are virtually no studies on Africa that try to address the determinants of the length of land contracts.[5] Second, our research includes variables that have not been considered in other similar studies, such as the effect of private rate time preference—especially in Ethiopia—where the magnitude of time preferences is exorbitantly high (Yesuf and Bluffstone 2009).

The paper is organized as follows. The next section briefly reviews the Ethiopian land tenure system and land-contract activity. Section 2 discusses the empirical model, namely, duration econometrics. Section 3 explains the data and summary statistics. Section 4 presents the empirical results, and the last section is the conclusion and policy implications.

1. The Ethiopian Land Tenure System and Land Market Activity

Historically, tenure rights to land in Ethiopia have been vested in either the *rist* system (communal land), the *gult* system (private land holdings), or the *samon* land owned by the

[5] Similarly, despite a considerable number of studies on land contracts in Ethiopia, we are not aware of any studies that look into the determinants of contract duration. Examples include Pender and Fafchamps (2006), Gavian and Teklu (1996), and Holden and Ghebru (2008); Holden et al. (2011); Teklu and Lemi (2004); Gavian and Ehui 1999; Kebede and Croppenstedt (1995).

Ethiopian Orthodox Church (Gebreegziabher et al. 2011). The rist system was the dominant type of land tenure in the northern half of the country, including Gojjam, Tigrai, then Begemder and Semien, and then Eritrea and parts of Wello and Shewa provinces, before the 1975 land reform (Nickola 1988). The rist system was a communal land tenure system, in which the right to land was not exclusive but shared. Under this system, individuals had usufruct (or rist) rights to land in a given community—but only if they could establish a direct line of descendance from the recognized original holder of the land. That is, members of each community have a common cognatic descent and lineage to a certain pioneer father, who originally established a recognized claim over that defined unit of land. The rist system, or communal land tenure, may be regarded as egalitarian, as is the case in the rest of Africa (Besley 1995), in the sense that the distribution was based on the principle of equality, with the land allocated by lottery after being divided into parcels according to quality.

Although there was room for temporary lease, the individual's usufruct rights to land were not transferable to others through sale or mortgage. Moreover, as the right to land under the rist system did not imply a right to any specific parcel, land redistribution occurred periodically to ensure that young adults who wanted to farm their own land were granted access (Gebreegziabher et al. 2011). This implied land fragmentation. In addition, the knowledge that no one could sell land for a profit or leave it to an heir, and that anybody's land parcels might be reallocated to distant kinsmen, reduced a farmer's incentive to invest in long-term land improvements and, hence, implied deterioration of land quality (Hoben 1995; Hagos et al. 1999). The gult system was private land tenure that prevailed in the southern half of Ethiopia. It was characterized by absentee owners, as it was the royal kinsmen or kinswomen who had the gult holdings (Hussein 2004). Samon land required that tenants pay tribute to the church.

These prior systems of tenancy were abolished by the 1975 radical land reform in Proclamation No. 31, in February 1975 (Nickola 1988). This land reform proclamation nationalized all rural lands, claiming that all land was now owned by the state and given to farmers on a right-to-use (usufruct) basis, organized via peasant associations (Kebede 2008). The farmers' membership in the peasant associations made them claimants, endowed with access rights, some management rights, and limited exclusion rights. An attendant measure redistributed land over the country to the farmers.

The 1975 land reform gave rise to a class of free-holder subsistence producers, who only had usufruct rights. The proclamation also prohibited land transfer rights through mortgages, leases, sales, or bequests, as well as regulating hiring labor to work the farm. Before the 1975 radical land reform, Ethiopia had an active land market, but all land market activity was

prohibited from 1975 to 1991 during the Derg regime (Benin et al. 2005; Pender and Fafchamps 2005).

After the downfall of the Derg regime and Ethiopian People's Revolutionary Democratic Front (EPRDF) took power in 1991, a new constitution was drafted. In many respects, the EPRDF-led government largely retained the land policy of its predecessor. It kept all rural and urban lands under public (government) ownership. For example, Article 40 of the Constitution states that "the right to ownership of rural and urban land is exclusively vested in the state...and shall not be subject to sale or exchange" (FDRE 1995). The constitution guarantees the rights of access to land for peasants and pastoralists. It also specifies the right of individuals to the improvements they make on land, including the right to bequeath, transfer, remove, or claim compensation for such improvements when the right expires. However, the mechanisms that ensure these rights and other land issues are left to the regional states (Gebreegziabher et al. 2011).

Land leases and informal land transfers have returned since 1991 with the change in regime, particularly after the ban on short-term leases was lifted. There is also an ongoing land certification program since 1998. It covers four regions of the country, i.e., Tigrai, Amhara, Oromiya, and SNNP (Southern Nations, Nationalities, and People's Region). A decentralized implementation process by popularly elected Land Use and Administration Committees (LACs) at the village level is a major feature of the certification program (Deininger et al. 2011). The largely uncompensated LACs are primarily empowered to register and certify lands. (Holden and Teferra 2008; Bezabih and Holden 2010).

Over 5 million certificates have been delivered to farm households since the LACs were established (Bezabih and Holden, 2010). The program is considered to be highly cost-effective and a success, although this has not been formally assessed. For example, the program is relatively pro-poor (Deininger et al., 2008a). Moreover, both poor and less-poor households have the same probability of receiving land certificates and there is an increased the perception of tenure security for both men and women (Holden and Teferra 2008).

The limited land endowment in Ethiopia, which is under increasing threat of degradation, makes it imperative that the available land resources be used in the most productive ways possible. Moreover, agriculture is the mainstay of the economy, accounting for over 40 percent of gross domestic product and over 80 percent of employment. This suggests that well-functioning land rental markets, which allow people with little comparative advantage in agriculture to take up non-agricultural employment, are vital to overall development and a more

diversified rural economy. Given the experience elsewhere in Ethiopia, land rental markets play a major role in promoting mobility of labor out of agriculture and transferring land to more productive producers.

2. Methodology

The empirical framework for this study is based on duration analysis. The term duration is primarily used in medicine, particularly in research on how long patients survive from the time a disease is diagnosed or treatment is administered. The term survival analysis is also apt in econometric analysis of child mortality, where the dependent variable is the duration that a child survives from birth (e.g., Omariba et al. 2010; Handa et al. 2010). The techniques of survival analysis are also employed in economics to analyze labor market conditions—unemployment duration.[6] Generally, the purpose of any duration analysis is to statistically identify those factors which have a significant effect on the length of duration.

In our case, the survival time refers to the length of time (number of years) the current tenant has been on the land. This was captured in our survey by asking the landlord, "How many years has it been since you gave the land to the current tenant?" This implies the survey does not include information on number of years the land was rented before the current tenant, if it was at all.[7]

Following Kiefer (1988), let $T \geq 0$ denote the duration, which has some distribution in the population; t denotes a particular value of T. In survival analysis, T is the length of time a subject lives. A survival time (T) in our case is the time measured in years until the household terminates the contract. The cumulative distribution function (CDF) of T is defined as:

$$F(t) = P(T \leq t), \quad t \geq 0 \tag{1}$$

We assume that T is continuous and a differentiable CDF. The survivor function is defined as:

[6] Duration or survival analysis has also been applied in the area of technology adoption (e.g., Hannan and MacDowell1984; Dadi et al. 2004; Abebe and Koch 2011).

[7] It should be noted that, because in Ethiopia all land is owned by the state and there have been frequent land redistributions, land owners are inherently tenure insecure and contracts normally cover one production year. Hence, contract duration in this context essentially refers to repeated and consecutive (in most cases) one-year contracts.

$$S(t) = 1 - F(t) = P(T \geq t) \tag{2}$$

and this gives the probability that duration will last longer than time *t*. At any instance *j*, the survival function gives the probability that the duration lasts longer than the duration at *j*, given that it has survived this far.

The hazard function in the analysis of duration data represents the rate at which failure occurs at time *t.* A higher hazard rate, all things the same, suggests a shorter duration. In the case of land contracts, a higher hazard rate thus indicates a higher termination rate of land contracts. Accordingly, the hazard function specifies the instantaneous rate of failure at $T = t$, conditional upon survival up to time *t*. In our case, the hazard function, therefore, represents the probability that a household terminates the contract at time *t*, given that it has been (or worked) on the land before *t.* Technically, the hazard rate is defined as:

$$h(t) = f(t)/S(t) \tag{3}$$

As defined before, $S(t)$ is the survival function and $f(t)$ is the probability density function. A variety of functional forms have been proposed for duration models: the logistic, Weibull, exponential, lognormal, and gamma probability distributions (Keifer 1988). The two widely used parametric distributions in the literature are the exponential and the Weibull distributions. The exponential distribution is characterized by a constant hazard function, $h(t) = \lambda$, where the parameter $\lambda \succ 0$, implying that the passage of time does not influence the hazard rate. That is, subjects fail at the same rate through time and the hazard function is a flat line. This is why the exponential distribution sometimes is termed "memoryless" (Keifer 1988).

On the other hand, the Weibull distribution is characterized by the hazard function $h(t) = \lambda p t^{p-1}$ with $\lambda \succ 0$ and $p > 0$. When the shape parameter $\rho > 1$, the hazard function is monotonically increasing. It is a decreasing hazard, if $p < 1$; and in the case where it is constant hazard (p=1), the Weibull distribution reduces into the exponential case. The table below summarizes the hazard, survival, and cumulative density for the two most commonly applied distributions.

Table 1. Functional Forms for the Exponential and Weibull Models

Model	Hazard function, *h(t)*	Survival function, *S(t)*	Cumulative density, *F(t)*
Exponential	λ	$\exp(-\lambda t)$	$1-\exp(-\lambda t)$
Weibull	$\lambda p t^{p-1}$	$\exp(-\lambda t^{p})$	$1-\exp(-\lambda t^{p})$

Note: The parameters *λ* and *p* represent the scale and shape of the distribution, respectively. These parameters can be estimated by maximum likelihood.

Assuming the duration for each individual t_i is independent of the others, the log-likelihood function for completed spells is:

$$L(\theta) = \sum_{i=1}^{n} \ln\ f(t_i, \theta) \tag{4}$$

where $f(t_i, \theta)$ is the density function and θ is the parameter vector, which, for the Weibull distribution, would comprise only the parameters λ and p. One of the problems in duration analysis is that some observations may be censored. In our case, right censoring exists because we do not know the year of termination of contract between the landlord and the current tenant.

When the analysis includes censored observations, information on their exact durations may not available and thus the density function cannot be applied. However, we know that the duration of these observations is at least t_j. Therefore, to account for censoring, the corresponding likelihood function becomes:

$$L(\theta) = \sum_{i=1}^{n} d_i\ ln\ f(t_i, \theta) + \sum_{i=1}^{n} (1-d_i) ln\ S(t_i, \theta), \tag{5}$$

where $d_i = 1$ if the i^{th} spell is not censored and $d_i = 0$ if censored. Maximum likelihood procedures can be used to estimate the parameters.

The distribution of land-contract durations may be influenced by so many other factors, such as household and individual characteristics (age, sex, and education level of household

head, household composition, and asset ownership).[8] These variables may affect the number of years households waited before terminating the contract.

Let *X* be a vector of time invariant covariates and β a vector of associated unknown parameters. Therefore, the hazard function can be reformulated to allow for the influence of explanatory variables as follows:

$$h(t,x,\Theta,\beta)=h_0(t,\Theta)g(x,\beta) \tag{6}$$

where the first term in the right side of the equation $h_0(t,\Theta)$ represents the baseline hazard and the second term is the relative hazard. This approach has come to be known as the Cox proportional hazard model. One of its most attractive features is that the baseline hazard need not be estimated. Further, the model does not impose any shape on the hazard function. It is only assumed that the hazard function is the same for each subject and that, given the covariates, the hazard between one subject and the other differs only by a multiplicative constant.

The most common specification of the relative hazard is the exponential form:

$$g(x,\beta)=exp(x'\beta), \tag{7}$$

which ensures the necessary non-negativity without imposing restrictions on β. Another advantage of this specification is that the coefficient can be easily interpreted. As the covariates act multiplicatively on the baseline hazard, the signs of β are interpreted as the direction of the effect that the explanatory variables have on the hazard function.

3. Data, Variables, and Descriptive Statistics

In this section, we present the nature and sources of data used for the empirical analysis. We used data collected in 2005 from a sample of rural households in the East Gojjam and South Wollo zones of the Amhara Region of Ethiopia. This data is part of a longitudinal survey conducted through a collaborative research project of the Department of Economics at Addis

[8] One of the limitations of this model is that variables are assumed to be constant over the contract period. However, some of the variables may change over time, which requires a long-term panel survey to ascertain. We, however, believe that the assumption of time-invariant is valid for most of the variables in the model.

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The selection of zones was deliberate so that the variations in agricultural potential, agro-ecology, and infrastructure across regions were represented. Households from each site were chosen randomly. A total of 1,760 households from 14 sites were interviewed in the survey and 204 households (all landlord households in the survey) and the corresponding 1,017 rented-out plots were used in the analysis. The data include household characteristics, land use, tenure security, input use, production, and productivity. The survey is unique in that it includes experimentally generated information on individual time preference and risk preference measures.

3.1 Dependent Variables

In the survey, households were asked to state the input- and output-sharing rules in their land-contract arrangement. This enabled us to categorize four land-contract arrangements. The first is pure fixed rent, where the tenant gives the landlord an upfront cash payment for the period of the contract, all input costs are borne by the tenant, and the tenant keeps all output. The second category is the premium payment category, similar to pure fixed rent in that it involves a cash prepayment and all production costs are covered by the tenant. However, the landlord also gets some part of the output at the end of the production period.

The third category is pure sharecropping, which involves sharing output with the landlord at the end of the production period. In addition, all inputs, such as fertilizer and seeds, are contributed by the tenant. The last category is cost sharing. Like sharecropping, cost-sharing arrangements involve sharing end-of-period output. But under cost sharing, the landlord contributes to inputs, such as seeds and fertilizer, and even labor in some cases.

The pure fixed rent category was too small to stand alone as a separate category in the analysis, so we combined pure fixed rent and premium payment into one category, fixed rent.

The dependent variable is the number of years the tenant has continuously been on the land. We constructed three different types of dependent variables based on the contract types: fixed rent (pure rent and sharecropping with prior payment), pure sharecropping, and cost sharing. The duration ranges from 1 to 20 years, and most contracts in the sample concentrate on the first five years.

3.2 Explanatory Variables

Independent variables include household (landlord) characteristics,[9] resource endowments, land tenure security, plot characteristics, and private rate of time preference.

The household characteristics that are hypothesized to affect the length of a land contract include sex, age, and education of the household head, and the number of adult male and female household members. Age of the landlord may have a negative effect on the length of land-contract duration. We assume that male-headed households tend to rent their land for longer periods, compared to female-headed households. Female landlords face a higher opportunity cost of time and higher monitoring and renegotiation costs (Bandiera 2007), which is likely to affect their land-leasing behavior. Moreover, possible differences in the tenure insecurity of male and female landlords may play a significant role. Hence, tenure insecurity concerns of female landlords will likely reduce the probability of renewing and extending the duration of the contract.

Since education plays a significant role in the level of awareness of the landlord about applicable law, it helps to renew and extend the land contract. Availability of more adult members in a family may have a negative effect on the length of land-contract period, since more adult members means more demand for land for cultivation.

We included two variables related to land tenure security. First, the variable "security" indicates the landlords' expectations of their land holdings. Landlords were asked whether they anticipated gaining or losing any of their land holdings. Tenure insecurity (expectation of a decrease in land size) reduces the probability that land is rented out (Holden et al. 2010) and should also reduce the probability that contracts are renewed (Otsuka 2007). This variable, therefore, is expected to negatively affect the length of contract duration.

The second variable related to tenure security is a household's experience with changes in land holdings. Households were asked whether they had gained or lost holdings as a result of land redistribution in the last five years. If the landlord experienced any change in land ownership, then it will reduce the probability of renewing the contract. That means the total number of years the land stays with the current tenant will also decrease.

[9] We were not able to include tenants' characteristics in this study because the questions were directed to the landlords. Hence, the information on tenants obtained from the landlord may not be reliable. Moreover, most of the observations on tenants' characteristics are missing and incomplete.

Ownership of more livestock may represent the wealth status of the household in the study area. This variable may have a positive effect on the length of land-contract duration. Plot size in hectares is also expected to increase the contract duration. Similarly, plot distance from homestead is negatively correlated with the length of land-contact duration. We assume that if the land is far away from the landlord's place of residence, then the possibility of extending the contract—and, hence, the total number of years the land is with the current tenant—may decrease due to the difficulty of monitoring. On the other hand, land located far from the homestead usually has poor soil quality, which is an incentive for the landlord to lease out the land. However, this depends on the objective of the land transaction and the type of contractual agreement (Gavion and Teklu 1996).

3.3 Rate of Time Preference

Variables of economic interest can at times be measured with both experimental (stated) data, as well as revealed (observed) data. Both approaches have advantages and disadvantages. The revealed (observed data) approach is not fully exogenous and confounds credit constraints with other factors, such as resource constraints faced by farmers.[10] This is particularly important in developing countries, where market imperfections are prominent and production and consumption choices are inseparable. On the other hand, the most pervasive problem of the experimental approach is hypothetical bias when experiments are launched in hypothetical settings (Yesuf and Bluffstone 2007).

The approach that we employ here is the most common and uses experimental methods, in which people evaluate stylized inter-temporal prospects involving real or hypothetical outcomes (Yesuf and Bluffstone 2007). As discussed above, despite the hypothetical bias, this measure is theoretically grounded. The use of experimental rate of time preference (RTP) measures over proxies can be advantageous because it does not confound discounting behavior with other behavioral patterns. In addition, a number of studies show that experimental RTP measures are significantly correlated with proxies, such as wealth. For instance, Yesuf and Bluffstone (2007), Klemeck and Yesuf (2008), and Holden et al. (1998) find that livestock, land

[10] Discount rates can also be elicited with observed behaviour from economic decisions based on consumption surveys. The consumption data approach, however, can be criticized for confounding discounting behavior with other behavioral patterns (Yesuf and Bluffstone 2004).

area per capita, value of capital stock, and cash are significantly correlated with higher rates of time preference.

The experimental setup follows Yesuf and Bluffstone (2007), in which each respondent was confronted with a choice between a specific amount of money given on a specific day (an immediate, smaller payment) and an alternative amount to be received on the same date one year later. The choice sets were arranged in such a way that the difference between the present and future amounts was randomly sequenced.

All choice sets offered choices between ETB[11] 50 to be received today and an amount ranging between ETB 65 and ETB 195 to be received in one year. The choice set with the largest difference had an immediate reward of ETB 50 and a later reward of ETB 195. RTP is implied (as a range) by a switch from the choice of an early reward to a choice of delayed reward, giving a measure of RTP for each respondent.[12]

The instantaneous individual discount rate was computed as $\delta i = \log(\alpha 2 / \alpha 1)$, where $\alpha 2$ is the amount provided after 12 months, and $\alpha 1$ is the amount provided instantaneously. The average RTP measure is 1.05, which is identical to the median discount rate figure obtained by Yesuf and Bluffstone (2007).

3.4 Risk Preference

A hypothetical risk preference experiment was conducted with all respondents in the main survey, using a lottery choice experiment. The structure of the experiment follows Binswanger (1980) and Yesuf and Bluffstone (2009), in which the game offers individuals a choice of six pairs of farming systems. The choice of any alternative among the six choice sets classifies individuals into a risk-aversion class with an assigned name to simplify the discussion (Binswanger 1980). Each choice consists of a pair of good and bad outcomes, with an outcome having a probability of 50 percent. This enables the calculation of the expected gains (i.e., the average of the two outcomes), and the spread (i.e., the difference between the two outcomes).

Farmers are typically assumed to be risk averse in cases where a certain outcome with a lower payoff is preferred over an uncertain outcome with a higher expected payoff. In contrast, risk-seeking behavior occurs when individuals consistently choose a gamble over a certain

[11] ETB = Ethiopian birr. The exchange at the time of the survey was USD 1 = ETB 8.31.

[12] The structure of the experiment is presented in appendix 3a.

payoff with a higher payoff value (Teklewold and Köhlin 2011). Accordingly, the extreme risk-aversion category represents households that are willing to take the smallest spread in gains and losses, followed by severe, moderate, intermediate, and slight risk-aversion categories; the neutral risk-aversion category corresponds to respondents willing to take the biggest spread in gains and losses.

The choice sets were arranged in a tree structure, where the choice made in the first choice set determines whether one branches into a more- or less-risky choice alternative. A choice of a more-risky alternative followed by choice of a less-risky alternative determines the individual's risk preference. For instance, choosing a moderately risky alternative in a choice set, followed by a choice of a less-risky alternative, indicates the individual's risk preference is moderate. Appendix 3b presents the complete choice sets presented to the respondents.[13]

The fact that higher expected returns can only be realized at the cost of higher variance implies that the risk-aversion classes vary with expected income. To obtain a measure of risk aversion that is fixed, regardless of the level of payoffs, we follow Binswanger (1980) to construct a constant partial risk-aversion coefficient, corresponding to each risk-aversion class (see table 2).[14] To obtain unique measures of partial risk aversion associated with the indifference points between two alternatives, we use a constant partial risk-aversion function of the form $U = (1-\gamma)w^{(1-\gamma)}$, where w is the certainty equivalent of the prospect and the parameter γ will then be equivalent to the constant partial risk-aversion coefficient (Binswanger 1980).

[13] A bad harvest ranges from between a 0 kilogram (kg) output to a 100 kg output, while a good harvest ranges between 100 kg and 400 kg. An extreme outcome consists of an expected gain of 100 kg and a spread of 0 kg, while a neutral outcome consists of an expected gain of 200 kg and a spread of 400 kg.

[14] It should be noted that the constant partial risk aversion, chosen in our study and previous similar studies by Binswanger (1980) and Yesuf and Bluffstone (2009), gives a fixed measure of risk that does not vary with wealth levels and is not sensitive to the scale of the game. However, evidence in the latter studies show that individual farm households are more risk averse as the size of the game increases, which is consistent with non-linear, risk-averse utility functions and increasing partial risk aversion (Yesuf and Bluffstone 2009; Binswanger 1980). However, the use of an increasing partial risk-aversion coefficient for any indifference point will then not be unique and will depend on the rate at which partial risk aversion increases, in other words, on the choice paths across the game scale (Binswanger 1980).

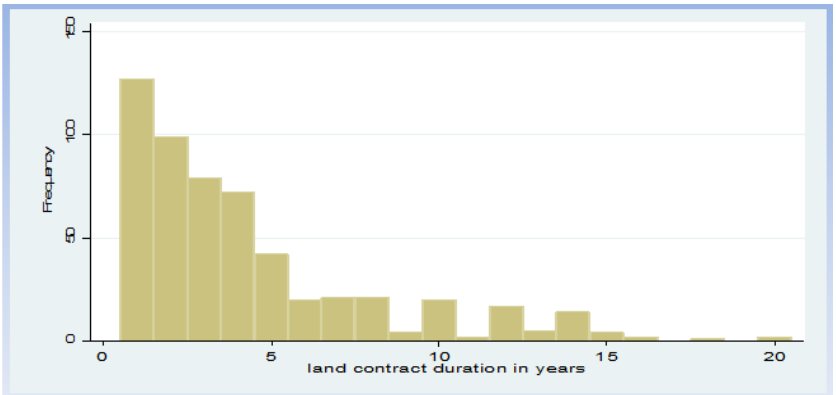
Table 2. Descriptive Statistics of Explanatory Variables (N = 1017)

Variable	Mean	Std. dev.	Min.	Max.
Age of household head	54.702	18.02	13.00	95.00
Sex of household head	0.338	0.47	0.00	1.00
Household head can read and write	0.634	0.48	0.00	1.00
No. of adult male members	1.537	1.23	0.00	6.00
No. of adult female members	1.873	1.01	0.00	7.00
Livestock owned (in TLU/ha*)	3.232	4.42	0.00	24.22
Time preferences	1.070	0.44	0.00	1.36
Constant partial-risk aversion	0.566	1.02	0.00	7.23
Plot size (in hectares)	0.246	0.17	0.01	1.40
Plot distance from homestead (in minutes)	19.068	39.81	0.00	900.00
Household expects land size to decrease in the coming five years	0.350	0.48	0.00	1.00
Household's previous experience with change in land holdings	0.126	0.33	0.00	1.00
Tenant is a blood relation	0.387	0.49	0.00	1.00
Tenant is an in-law	0.134	0.34	0.00	1.00

* TLU/ha = tropical livestock units per hectare

A simple tabulation of the frequency of land-contract choice shows that about 7 percent is fixed rent (contract type), about 58.5 percent is pure sharecropping, and the remaining 34.5 percent is cost sharing. Figure 1 below shows the distribution of the number of households, based on length of land-contract duration.

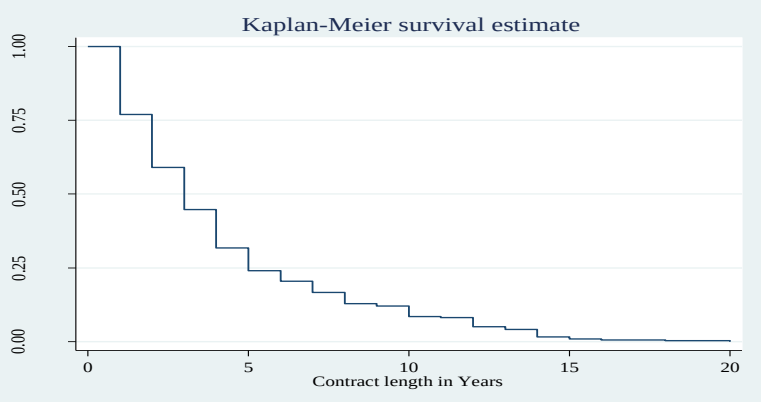
Figure 1. Number of Sample Households and Land-Contract Duration



4. Empirical Results

While econometric relationships can be characterized non-parametrically, using the density and cumulative distributions, such characterizations are not appropriate when the data are censored. An alternative non-parametric approach—the Kaplan-Meier estimator—has been commonly employed for non-parametrical estimation of survival functions and the related distributions. Figure 2 shows the survival function for the pooled sample.[15]

Figure 2. Survival Function for Land Contracts



In figure 2 above, the vertical axis represents the proportion of sample households who still hold the contract. The horizontal axis is the length of the contract in years. Therefore, the

[15] The survival functions for each type of contract arrangement are found in appendix 2.

figure shows the proportion of contract spells surviving for a given period in time *t*. In order to test whether the survival functions for the different land-contract arrangements are statistically different or not, we employed both the log rank and Wilcoxon tests. Both tests for equality of survivor functions show that our analysis rejects the null hypothesis of equality at the 1 percent level of significance; in other words, the three groups face the same hazard of failure. From the survival figure in appendix 2, we see that the cost-sharing category has the lowest survival rate, compared to pure share cropping and fixed rent. As is clear from figure 2 above, the median survival time is estimated to be 4.42 years.

The fitness of the model specification to our data was examined using Akaike's AIC and BIC information criteria.[16] The result of the AIC model selection criteria shows that the Weibull model (AIC = 1358.45) is preferred to the exponential model (AIC = 1443.09). Using the BIC, we obtained similar results. In table 3, we can see that the shape of the hazard function P > 1 indicates that the hazard is monotonically increasing.

In the analysis of survival data, unobserved heterogeneity may exist due to functional form misspecification, omission of important variables, or misspecification of included variables (Kiefer 1988). Heterogeneity in duration models leads to misleading inferences about the nature of duration dependence and potentially to misleading inferences about the effects of estimates of the covariate. Therefore, following Gutierrez (2002), we fit the Weibull model with gamma-distributed heterogeneity. The likelihood ratio test is used to check the presence of unobserved heterogeneity.

The likelihood ratio test shows that the frailty model is preferred to the reference non-frailty model for the pooled and pure share cropping regression. The Weibull model for cost sharing and fixed rent is estimated without taking into consideration the issue of unobserved heterogeneity, as the estimation does not converge for both.

[16] For parametric duration models, AIC = -2 ln$L$ + 2 (k + c); where k equals the number of independent variables, and c is the number of model-specific distribution parameters. It is equal to 1 for the exponential distribution and equal to 2 for the Weibull.

Table 3. Weibull Regression Results of Determinants of the Duration of Land Contracts

Variables	Pooled	Pure share-cropping	Cost sharing	Fixed rent
Age of household head	-0.028***	-0.017***	-0.017**	0.058**
	(0.006)	(0.005)	(0.007)	(0.025)
Sex of household head	-1.353***	-1.013***	0.055	-2.716**
	(0.240)	(0.235)	(0.279)	(1.077)
Head of household can read and write	-0.07	0.014	-0.983***	2.985**
	(0.213)	(0.195)	(0.294)	(1.370)
Adult male members	-0.247***	0.082	-0.033	0.718
	(0.091)	(0.090)	(0.119)	(0.513)
Adult female members	0.021	0.134*	-0.345**	-1.867***
	(0.095)	(0.075)	(0.135)	(0.712)
No. of livestock (TLU/ ha)	0.068***	-0.026	0.075***	1.953***
	(0.023)	(0.025)	(0.021)	(0.472)
Time preference	0.129	-0.115	0.043	0.208
	(0.210)	(0.191)	(0.225)	(0.822)
Constant risk partial risk aversion	0.340*	-0.066	0.495**	-7.699***
	(0.193)	(0.099)	(0.201)	(1.548)
Plot size in hectares	0.23	0.732	-0.771	-4.593
	(0.499)	(0.499)	(0.574)	(3.810)
Plot distance	-0.004***	-0.002	-0.021***	0.034
	(0.002)	(0.001)	(0.005)	(0.026)
Household expects decrease in land size	-0.297	0.212	-1.012***	5.623***
	(0.191)	(0.183)	(0.205)	(1.423)
Experience change in land holding	-0.571*	0.269	-0.701*	1.451*
	(0.293)	(0.267)	(0.360)	(0.802)
Tenant is a blood relation	-0.529**	-0.175	0.316	2.624***
	(0.210)	(0.193)	(0.232)	(0.925)
Tenant is an in-law	-0.265	0.446	0.031	-7.685***
	(0.294)	(0.275)	(0.453)	(1.913)
Constant	-0.317	-1.905***	0.263	-9.164***
	(0.419)	(0.449)	(0.460)	(2.401)
N	*552*	*325*	*192*	*34*

Notes: The numbers in brackets are the standard errors.
For the pooled regression, the likelihood-ratio test of theta = 0: chibar2(01) = 64.85 Prob > = chibar2 = 0.000.
For the case of pure share cropping, the likelihood-ratio test of theta = 0: chibar2(01) = 9.14 Prob > = chibar2 = 0.001.

The parametric regression results show that household characteristics, such as age and sex of the household head, have a negative and significant effect in the length of land contracts in all the regressions, except for cost sharing, where gender is not significant. The result also shows that male landlords are less likely to give longer duration contracts, particularly under pure sharecropping.

Education has a positive effect on the duration of land contracts for fixed rent, possibly because more educated household heads may engage in other off-farm activities. However, education is significantly and negatively correlated to the length of land contracts for cost sharing. However, the results should be interpreted with caution, as the sample size for fixed rent is too small. Education of household head has no significant effect on the length of duration of land contracts for pure sharecropping.

The number of male adults in a household is negatively correlated with the duration of land contracts across contract types, and significant only in the pooled regression. Relatively, labor-abundant households seem to depend on their own land. But the availability of more female adult members is negatively and significantly correlated with the length of land contracts for cost sharing and fixed rent. On the other hand, the wealth indicator of the landlord, livestock ownership, is positively and significantly correlated with the length of land contracts for the two types of contractual arrangement: cost sharing and fixed rent. It has also a positive and significant effect on the pooled regression. This may occur if relatively richer households possess non-land input that is in excess of their land holdings.

The results show that landlords prefer to lease out distant plots for shorter periods of time. The distance of the plot from the homestead is negatively correlated with the length of land contracts. The reason may be because landlords are less willing to renew and extend a contract when the plot is farther away. The difficulty of monitoring distant plots increases the transaction cost for the landlord. For instance, less observation of a tenant's labor effort increases the cost of labor supervision in the case of cost sharing. However, we found that the size of the plot does not matter in length of contract duration, irrespective of the type of contractual arrangement. Another possible explanation is that constraints to labor and other non-land inputs may motivate leasing out more distant plots if the quality of the land is different from the owner-farmed plots. This is true especially in the case of households with older members or household with fewer labor-capable members (Teklu 2004).

In order to examine the impact of credit market imperfections (financial constraints) on the length of land-contract duration, we used the RTP of households. We expect that, in general,

those households with higher RTPs (poorer and impatient landlords) are likely to have contracts of shorter duration than those who have more patient landlords. The result is not significant for the pooled or other categories of contractual arrangement.

As argued in the previous sections, the result for the effect of the risk variable on the land-contract length is in line with the reverse tenancy argument that landlords' risk preferences play an important role in land-contract decisions. Our results indicate that risk-averse landlords prefer to keep the same tenant for long periods. This may be because long-term contracts with the same tenant will guarantee the landlord stable output from the rented-out land. The results also show that landlords' risk preferences varied based on the type of land contract: cost-sharing contracts tend to be longer if the landlord is risk averse.

The effect of RTP was also included in the analysis. The findings of the empirical analysis show that liquidity constraint, measured based on experimental information on private time preference, is not a significant determinant of land-contract length in the study area. This implies that risk preference has a stronger explanatory power than the RTP variable.

Controlling for the risk preferences in pure sharecropping and cost sharing in table 3, as presented in columns 2 and 3, respectively, shows that risk aversion is insignificant in pure sharecropping and positive and significant in cost sharing. The coefficient of the risk aversion variable is significant and negative in the fixed rent category, possibly due to the fact that fixed rent contracts involve cash payments before the production season and are normally entered into if the landlord needs immediate cash.[17] The coefficient of RTP was insignificant in both the pooled and the separate land-contract categories. This implies that risk preference has a stronger explanatory power than the RTP variable. The results here may also imply that the effect of the risk behavior of landlords depends on the type of contractual arrangement.

Plot distance from the homestead and the size of the plot were also included in the analysis, producing interesting results. The distance of the plot from the homestead is negatively correlated with the length of land contracts. The reason may be because landlords are less willing to renew and extend a contract when the plot is located far away. As opposed to other studies, landlords may not have marginal lands that they consider to be low quality. The difficulty of monitoring distant plots increases the transaction cost for the landlord. For instance, the less

[17] The authors confirmed the links between fixed rent and the immediate cash need of landlords via informal discussions with the respondents.

opportunity a landlord has to observe a tenant's labor effort increases the cost of labor supervision in cost sharing. However, we found that the size of the plot does not matter for the length of contract duration, irrespective of the type of contractual arrangement.

One of the most important issues in this study is the analysis of tenure security-related variables on the length of land contracts. Generally, we expect that high tenure security of a landlord is an incentive for long-term land contracts. The results in our case, however, are different, depending on the type of contract arrangement. We included actual experience of landlords related to land ownership and land size, as well as perception about their land size in the future, in order to examine whether they have any influence on the length of land-contract duration. The expectation of the landlords about the size of their land in the future may affect the terms of the contract in the land market. As expected, this variable had a negative effect on the land-contract length for cost sharing, but a positive and insignificant effect for pure sharecropping.

The role of land certification can also be considered in the land rental market. Several studies have found that the program increased tenure security, land-related investment, and rental market participation (Deininger et al. 2011). A household's previous experience with changes in land holdings has a similar effect on the length of land-contract duration. Both indicators of tenure security have a positive and significant effect in the case of fixed rent.

A dummy variable indicating whether the tenant is a blood relation (kinship) of the landlord is also included in the empirical analysis. The variable was statistically significant and negatively related to the length of land-contract duration in the pooled regression and pure sharecropping (but not significant). While these results appear counterintuitive, they may be explained by the disincentives of renting out to kin or blood-related tenants. As Bezabih (2009) and Kassie and Holden (2007) show, land contracts with in-law and blood-related tenants yield inefficient outcomes. Our results also show that the length of land contact duration may not be affected if the tenant is an in-law, but for the reasons mentioned above, it has a negative and significant effect on fixed rent.

The above results lead us to the conclusion that farm households' behavior may be better understood if we can separately examine the determinants of land-contract duration.

5. Conclusion and Policy Implications

This paper assesses the determinants of land-contract length in a setting characterized by massive inherent tenure insecurity and pervasive production risk. The essence of understanding

long-term contracting stems from the importance of longer-term contracts in producing more stable tenant-landlord relationships and giving an incentive for long-term investment in the land. Accordingly, the major focus of the paper is its incorporation of institutional factors (such as tenure insecurity), as well as behavioral factors (such as risk and rate of time preferences), which control for possible interdependencies across these factors. These have been left out in previous similar studies that focused on contract duration. Thus, our study adds to the limited empirical literature, particularly in Africa, that test empirical relationships between contract duration on the one hand, and risk, RTP, and tenure insecurity on the other.

The analysis uses plot level data collected from East Gojjam and South Wollo Zones in the Amhara National Regional State of Ethiopia. The empirical strategy follows a hazard function model employed in duration data analyses and investigates the fitness of the data to the alternative exponential and Weibull functional forms. Based on this, the covariates of land-contract length are examined for the pooled sample, as well as for different types of contractual agreement—pure sharecropping, fixed rent, and cost sharing.

The results show that landlords' risk preference has differential impacts on, contract duration, depending on the type of land contract. However, private RTP is not a significant determinant of land-contract length. This implies that risk preference has a stronger explanatory power than the RTP variable. The expectation of the landlord on future land size and the landlord's previous experience may affect the terms of the contract in the land market. As expected, this variable has a negative effect on the land-contract length for cost sharing, but a positive and insignificant effect for pure sharecropping.

The results of this study improve our understanding of the behavioral and policy factors that can help stable and long-term contractual agreements. An interesting extension to this study is to examine the impact of the recently introduced land-certification program, designed to enhance land tenure security of farmers by maintaining the status-quo land distribution. In addition, further study on the relationship between land tenure security and the nature and duration of contract length, using panel data, may help to assess the dynamic aspects of contract duration, particularly in the context of serial short-term contracts.

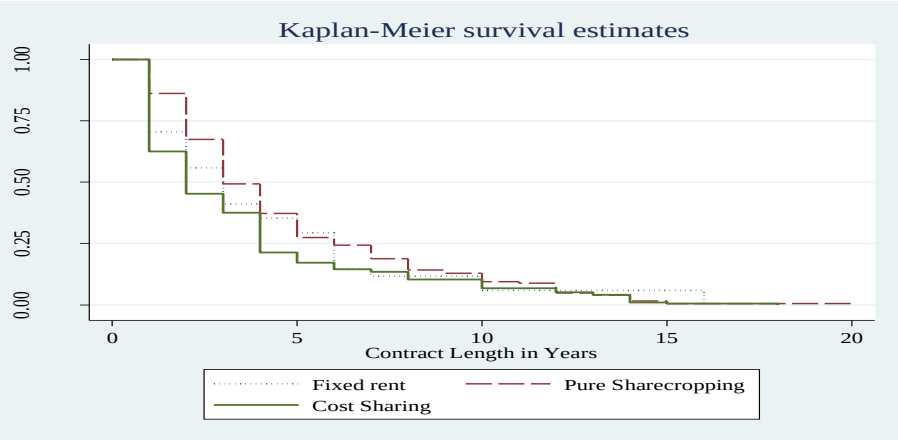
Further studies, particularly in the under-assessed African context, that evaluate the concrete economic gains from longer-term contracts can generate useful information for land tenure policy design. While our study takes an important step in incorporating the behavioral factors of risk and RTPs in contract duration decisions, an interesting future extension can

incorporate tenant behavior to better understand the nature of implicit negotiations and bargaining power.

Appendix 1. Summary of Descriptive Statistics by Type of Contract Choice

Variable	Pure sharecropping (N = 339)		Cost sharing (N = 200)		Fixed rent (N = 40)	
	Mean	***Std. dev.***	***Mean***	***Std. dev.***	***Mean***	***Std. dev.***
Age of household head	55.85	19.84	52.76	16.39	51.83	19.68
Sex of household head	0.40	0.49	0.31	0.46	0.40	0.50
Household head can read and write	0.64	0.48	0.55	0.50	0.80	0.41
No. of adult male members	1.50	1.10	1.20	1.13	1.58	1.11
No. of adult female members	1.93	1.08	1.70	0.86	1.50	0.88
Livestock owned (in TLU/ha)	2.34	3.56	3.62	4.45	0.73	1.57
Time preferences	1.07	0.44	1.07	0.40	1.13	0.38
Constant partial risk aversion	0.41	0.75	0.61	0.47	0.22	0.33
Plot size (in hectares)	0.26	0.16	0.25	0.17	0.27	0.17
Plot distance from homestead (in minutes)	22.76	59.30	21.07	25.49	14.24	17.13
Household expects land size to decrease in the coming five years	0.40	0.49	0.21	0.41	0.35	0.48
Household's previous experience with change in land holdings	0.13	0.33	0.05	0.22	0.20	0.41
The tenant is a blood relation	0.45	0.50	0.30	0.46	0.35	0.48
The tenant is an in-law	0.16	0.37	0.06	0.23	0.05	0.22

Appendix 2. Survival Functions by Type of Contract



Appendix 3a. The Structure of the Rate of Time Preference Experiment

We would like to ask you how you feel about money today compared with money exactly one year from now. Imagine that you can choose between receiving money today and a larger sum of money exactly one year from now. For example if you have a choice between receiving 50 Br. (Ethiopian Birr) and 65 Br in a year's time, which would you choose?

Choice set 1	50 ETB now	65 ETB after 12 months
Choice set 2	50 ETB now	80 ETB after 12 months
Choice set 3	50 ETB now	105 ETB after 12 months
Choice set 4	50 ETB now	130 ETB after 12 months
Choice set 5	50 ETB now	160 ETB after 12 months
Choice set 6	50 ETB now	195 ETB after 12 months

Appendix 3b. Choice Sets for the Risk Preference Experiment

	Bad harvest	Good harvest	Expected mean	Spread	CPRA* coefficient	Risk classification
Choice set 1	100	100	100	0	∞ – 7.5	Extreme
Choice set 2	90	180	105	90	7.5–2.0	Severe
Choice set 3	80	240	160	160	2.0–0.812	Intermediate
Choice set 4	60	300	180	240	0.812–0.316	Moderate
Choice set 5	20	360	190	360	0.316–0.0	Slight
Choice set 6	0	400	200	400	0.0 – ∞	Neutral

* Constant partial risk aversion.
Note: Numbers represent kilogram output.

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