- 9) 農家 B では、搾乳作業における労働力削減の為に、大規模な固定資本投資を行い、ミルキングパーラーを導入している。その為、経営費に占める固定費の割合が大きく、飼養牛から得られる所得が大幅に減少する。
- 10) たい肥販売価格 2,700 円/t の場合。

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Impact of Risk and Kinship Relations on Tenancy Contract Form: A Case Study in Rural Java

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1. Introduction

From the viewpoint of modern contract theory, a large number of papers postulate alternative hypotheses to explain the reason why a particular contract form for land tenancy is chosen. Among these, the following researches propose the key hypotheses related to our observation in the study area.

Cheung [5] and Stiglitz [14] postulate a trade-off between risk and incentives. Stiglitz [14] shows that the share tenancy contract is an optimal contract if the tenant is a risk averter and the landowner is risk neutral.

Rao [11] and Allen and Lueck [2], [3] found evidence contradicting the hypothesis of risk sharing and contract choice by Cheung [5] and Stiglitz [14]. In particular, Allen and Lueck [2], [3] empirically reject Cheung and Stiglitz's hypothesis, but more recently, Akerberg and Botticini [1] find that their regression results, taking into consideration "endogenous matching," are more compatible with the risk sharing hypothesis than the naive regression analysis conducted by Allen and Lueck [2], [3].

Alternative models contradicting the risk sharing hypothesis have also been postulated. Laffont and Matoussi [10] propose a moral hazard share tenancy model under the assumptions that tenants are risk neutral and facing financial constraints. This model predicts that tenants with less working capital tend to work under share tenancy with a lower sharing rate or wage contracts¹⁾. Basu [4] also proposes a principal-agent model in which tenants are risk neutral and the contract includes a limited liability clause according to which tenants are exempted from rent payment when the harvest is below the critical level. This model predicts that a landlord will choose the share tenancy

contract under which his expected income becomes larger, and the land rent under the share tenancy contract is lower than that under the fixed rent contract.

All these models derive the inefficiency of resource allocation under the share tenancy contract. This indicates that these theories cannot explain the features in the real world wherein resource allocation under a share tenancy contract characterized by kinship ties is efficient (for example, Sadoulet, de Janvry and Fukui [13] for the Philippines; and Fukui, Hartono and Iwamoto [8] for our study area). The observed fact findings can be explained by a model of long-term share contract with reciprocal gift exchange under the assumption that the contract is not enforceable and the tenant is a risk averter, as shown in Sadoulet, Fukui and de Janvry [12]. If the short-run gain from cheating is smaller than the long-run gain from contract fulfillment, the tenant does not have an incentive to cheat. In such a situation, the share tenancy contract can be the optimal contract.

Dubois [7] and de Janvry and Sadoulet [6] extend the theory to take into consideration the tenant's moral hazard with regard to work effort, input, and reporting output. Their models predict that if the landlord can monitor such a moral hazard of the tenant easily, the share tenancy contract is preferred by the landlord and the tenant. de Janvry and Sadoulet [6] suggest that if the landlord can reduce the tenant's moral hazard and the loss from it through a personal relationship, the optimal sharing rate of the tenant can be increased.

Therefore, if we modify the gift exchange model, taking into account the possibility that mutual trust and feelings of reciprocity created through a personal relationship between the landlord and tenant, which

will reduce the transaction cost, enforce the contract, and achieve an efficient resource allocation (Fukui, Hartono and Iwamoto [8] and de Janvry and Sadoulet [6]), we may be able to explain the characteristics of the land tenancy market in the study area shown in the next section.

In this paper, we examine which hypotheses can explain the determination of the land tenancy contract form in rural Central Java.

This paper is organized as follows. In the next section, we provide a description of the data on the market structure from the viewpoint of contract theory. Then, we explain the empirical models of tenancy contract and present the results of testing the hypotheses, based on the models in the third section. The fourth section contains the conclusion.

2. Land Tenancy Market in the Study Area

(1) Characteristics of Land Tenancy Market

In our study area, we were able to observe various forms of tenancy contracts (see Table 1). These are mainly oral contracts. As shown in Table 1, share tenancy and fixed rent contracts were predominant forms of contract.

The number of share tenancy contracts was larger than that of fixed rent contracts in both PG and SK hamlets. There are three types of share tenancy con-

tracts, namely, “Morotelu,” “Morolimo,” and “Maro.” “Morotelu” is the share contract in which the sharing rate of the tenant is one third of the gross output. The sharing rate of the tenant in “Morolimo” is forty percent of the gross output, and the sharing rate of the tenant in “Maro” is fifty percent of the gross output. In the case of “Morotelu,” the landowner and the tenant usually make a cost sharing arrangement in which the landowner shoulders the cost of the chemical fertilizer.

In PG hamlet, the number of “Morotelu” was the largest, but it decreased as the number of “Maro” increased. In SK hamlet, however, “Maro” was the predominant form of the share tenancy contract and it tended to increase.

In both hamlets, the number of fixed rent contracts was also large, but it stayed almost the same since we started our survey in 1998²⁾. In addition to share tenancy and fixed rent contracts, we observed a few cases in which land was leased out without any rent payment.

One of the remarkable features that we should stress is that share tenancy contracts were characterized by personal ties such as kinship or friendship relations while fixed rent contracts were not (Table 1).

(2) Some Evidence on the Determinants of the Tenancy Contract

We examine the data on the determinants of contract form, share tenancy or fixed rent (see Table 2), for the

Table 1. Type of Tenancy Contract (Plots)

Type of Tenancy Contract	PG				SK			
	1998–1999		2002–2003		1998–1999		2002–2003	
	No. of Contracts	With Personal Ties	No. of Contracts	With Personal Ties	No. of Contracts	With Personal Ties	No. of Contracts	With Personal Ties
Share Tenancy	27	12	24	11	22	12	34	18
Maro	6	4	9	6	18	11	29	18
Morolimo	5	0	4	0	4	1	5	0
Morotelu	16	8	11	5	0	0	0	0
Fixed Rent	18	3	17	4	19	4	20	3
(Pawning)	0	0	1	0	0	0	2	0
No Rent	2	2	3	3	2	2	0	0
Total	47	19	44	18	41	18	54	21

Source: Survey conducted by the JSPS-DGHE Core University Program Team

study area. The determinants include yield uncertainty, risk attitude of the tenant, financial constraints of the tenant, the factors reducing the tenant's moral hazard such as personal ties between the landowner and the tenant, long-term contract, and limited liability of rent payment (Panel A of Table 2).

In addition, we are also concerned with the three types of share tenancy contracts, namely, "Morotelu," "Molrolimo," and "Maro," with different sharing rates. We assume that the higher the land productivity, the higher the land rent, and examine the impact of land productivity on tenancy contract form (Panel B of Table 2)³⁾.

1) Risk: We use the arithmetic mean of standard deviation of average rice yield in each season as a proxy of crop fluctuation. The figures of item 1 of Panel A show that there does not exist a large difference between share tenancy and fixed rent contracts as long as we compare the mean values.

2) Risk attitude: We use the amount of assets as a proxy of the tenant's risk attitude, based on the assumption of decreasing absolute risk aversion

(DARA), according to which the greater the assets, the smaller the degree of risk aversion. If we compare the assets of the share tenant with that of the fixed rent tenant, we can find that the former is much smaller than the latter (item 2 of Panel A).

3) Financial constraint: We use the total amount of household income and loan as a proxy of financial constraint (upper limit of working capital), following Laffont and Matoussi [10]. According to the figures in item 3 of Panel A, the working capital of the share tenant is less than that of the fixed rent tenant as long as we compare the mean values.

4) Personal ties between the landowner and the tenant: As we have shown in Table 1, the landowners made share tenancy contracts with their relatives or friends more frequently.

5) Length of contract: The theory predicts that if the contract term is longer, it is more likely that the share tenancy contract will be chosen. As shown in item 5 of Panel A, we cannot find any significant difference between the lengths of contract for both share tenancy

Table 2. Description of the Data on the Determinants of Contract Form

Panel A:	PG		SK	
	Share Tenancy	Fixed Rent	Share Tenancy	Fixed Rent
1) Risk: Arithmetic mean of standard deviation by season (kg/1000 m ²)	362.7	380.2	637.3	633.2
2) Risk Attitude: Assets except for agric. land (Rp)	8,828,636	13,483,333	7,637,273	17,741,667
3) Financial Constraint: Income + Loan (Rp)	8,751,011	64,451,789	5,360,488	8,111,645
4) Personal Ties:	See Table 1			
5) Length of Contract: (Years)	9.9	8.5	8.4	8.1
6) Limited Liability: Rent exemption and/or income transfer (No. of Households)	5	2	5	1
No. of Contracts	15	14	19	13
Panel B:	Morotelu	Morolimo	Maro	Fixed Rent
7) Land Productivity: Residual after reduction of all the cost costs except for the cost of land (Rp/m ²)	761	612	575	440
No. of Contracts	8	5	21	27

Source: As for item 5, the author's survey was conducted in 2004. The others are the same as in Table 1.

Note: As for 1, 6, and 7, the figure is the average of the sample plots, while the figures of 2 and 3 are the average of sample households.

and fixed rent contracts in the study area.

6) Limited liability: We asked the question pertaining to whether rent exemption or income transfer was practiced in a questionnaire survey conducted in 2004. According to the survey results, for only 13 households among the 61 who practiced various arrangements, the rent was exempted and/or income was transferred by the landowner at the time of a bad harvest below the critical level. However, 10 cases among 13 were under share tenancy contracts (item 6 of Panel A).

7) Land productivity: It is very difficult for us to estimate the accurate normal land productivity because the actual production was affected by a large number of factors such as natural calamities, management skills of the farmers, and the amount of input. One of the appropriate indicators for land productivity is the residual after reduction of all the costs except for the cost of land. Panel B of Table 2 shows that the higher the residual per unit area, the lower is the tenant's sharing rate. This suggests that the higher the land productivity, the more likely the sharing contract of the landlord for whom the sharing rate is higher is chosen.

3. Empirical Analysis of the Determinants of Tenancy Contract Form

(1) Test Hypotheses and Empirical Models

We test the following hypotheses as mentioned in section 1. (The sharing rate is in terms of the landowner.)

① The larger the risk, the more likely that the share tenancy is chosen and the higher is the sharing rate (Cheung [5] and Stiglitz [14]), ② the larger the degree of risk aversion, the more likely that the share tenancy is chosen and the higher is the sharing rate (Cheung [5] and Stiglitz [14]), ③ the less the working capital, the more likely that the share tenancy is chosen and the higher is the sharing rate (Laffont and Matoussi [10]), ④ the closer the distance between the landowner and the tenant, the more likely that the share tenancy is chosen and the higher is the sharing rate (de Janvry and Sadoulet [6]), ⑤ the longer the length of the relationship between the landowner and the tenant, the more likely that the share tenancy is chosen and

the higher is the sharing rate (de Janvry and Sadoulet [6]), ⑥ if the limited liability clause is included, the share tenancy contract can be chosen and its land rent is less expensive than the fixed rent contract (Basu [4]), and ⑦ if land productivity is high, a low sharing rate for the tenant is chosen.

To test these hypotheses, the empirical model is formulated as follows. First, we test the determinants of contract choice, share tenancy or fixed rent contract. For this purpose, we use a probit model. The dependent variable is defined as

$$(1) \quad Y_i = \begin{cases} 1 & \text{if Share Tenancy Contract} \\ 0 & \text{if Fixed Rent Contract} \end{cases}$$

Second, we test the determinants of contract choice under share tenancy, "Maro," "Morolimo," or "Morotelu," by using the ordered Probit model because the choice variables such as sharing rates (r) are inherently ordered, following Laffont and Matoussi [10].

$$(2) \quad Y_i = \begin{cases} 0 & \text{if } r \leq 0 & \text{(Fixed Rent)} \\ 1 & \text{if } 0 < r \leq 1/2 & \text{(Maro)} \\ 2 & \text{if } 1/2 < r \leq 3/5 & \text{(Morolimo)} \\ 3 & \text{if } 3/5 < r \leq 2/3 & \text{(Morotelu)} \end{cases}$$

Now, we assume that there exist latent variables Y_i^* , which determine the value of Y_i , and Y_i^* can be expressed as follows for household i :

$$(3) \quad Y_i^* = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + \alpha_7 X_{7i} + \varepsilon_i$$

Here, X_1 (Risk) is yield variation (Standard deviation of yield; kg per ha), X_2 (Risk attitude) is an asset except for agricultural land (Rupiah), X_3 (Financial constraint) is income+loan (Rupiah), X_4 (Personal ties) is relative/friend dummy (=1 if relative or friend, =0, otherwise), X_5 (Length of contract) is the length of tenancy contract (Years), X_6 (Limited liability) is the rent exemption dummy (=1 if rent payment is exempted or income is transferred when harvest is bad, =0, otherwise), X_7 (Land productivity) is the indicator of crop intensity (the higher the indicator, the less intensive is the crop rotation), ε is a disturbance term, and α_j is parameters.

The standard deviation of yield is the proxy of yield variation, but it is very hard to obtain an accurate variable. To avoid the problem of errors in variables, we apply an instrumental variable (IV) method by using the indicators of irrigation condition as instrumental variable (as for equation (1), we estimate it by the IV Probit model). This indicator takes a value between 1 and 4, that is, 1 if it is technical irrigation (the best irrigation condition); 2, if it is semi-technical irrigation; 3, if it is non-technical irrigation; and 4, if it is rain-fed (the worst condition).

In addition, we use the indicator of crop intensity as a variable representing land productivity instead of the residual shown in Panel B of Table 2. This is because the residual is an endogenous variable. Therefore, we cannot use it directly as an explanatory variable or find appropriate instrumental variables, and because it is recognized by the farmers, there exists a strong negative relation between soil, fertility, and crop intensity.

(2) Estimation Results

The estimation results are presented in Table 3. First, column 1 of Table 3 reports the IV Probit model estimation of equation (3). It indicates the determinants with regard to contract choice, share tenancy or

fixed rent contract. Further, it shows that the coefficients of yield variation and assets are negative and significantly different from zero. This means that when there is high risk, the fixed rent contract is likely to be chosen, and when the assets are less, the share tenancy contract is likely to be chosen. In addition, the coefficient of relative/friend dummy and crop rotation is significantly positive, so that the probability of choosing the share tenancy contract increases if the landowner is a relative or friend of the tenant and land productivity is high.

Second, to examine the determinants with regard to the choice of share tenancy contract, namely, “Maro,” “Morolimo,” or “Morotelu,” we regress the ordered Probit model of equation (3), and the results are shown in column 2. The same determinants (variables) of contract choice (IV Probit model estimates) have significant effects on the choice of the share tenancy contract form. In other words, the larger the risk, the lower is the chosen sharing rate for the landowner, and the smaller the assets and fewer the crop rotations, the higher land rent contract for the landowner is chosen. Moreover, if the landowner and the tenant share kinship relations/a friendship, the higher land rent

Table 3. Results of Estimation

Dependent Variables	IV Probit Analysis			Ordered Probit Analysis		
	Share Tenancy=1, Leasehold=0			Y1 ($r \leq 0$)=0, Y2 ($0 < r \leq 0.5$)=1, Y3 ($0.5 < r \leq 0.6$)=2, Y4 ($0.6 < r \leq 0.67$)=3		
Independent Variables	Estimated Parameters	p-value		Estimated Parameters	p-value	
Constant	1.802	0.036	*	3.108	0.002	**
Yield Variation	-0.005	0.000	**	-0.660E-02	0.000	**
Assets	-3.17E-08	0.038	*	-4.856E-07	0.010	**
Income+Loan	-3.44E-09	0.646		-0.713E-08	0.471	
Relative/Friend	1.222	0.002	**	0.729	0.041	*
Length of Contract	-0.021	0.257		0.135E-03	0.994	
Limited Liability	0.013	0.978		-0.605	0.147	
Crop Intensity	0.275	0.016	*	0.314	0.011	*
No. of Samples	61			61		
Log of Likelihood	-396.462			-57.774		
Scaled R-square				0.432		

Source: Author's estimation on the basis of the data collected by the JSPS-DGHE Core University Program Team

Note: * =5% significance level; ** =1% significance level

contract is likely to be chosen.

These are the major fact findings about the tenancy contract form in our study area—rural Java. However, hypothesis ②, ④, and ⑦ described in the previous subsection are supported by the estimation results; the hypothesis of risk sharing—hypothesis ①—was rejected.

Finally, we were unable to find evidence that financial constraint, length of contract, and limited liability affect the contract choice and choice of share tenancy contracts.

4. Conclusion

In this paper, we focused on the land tenancy market in our study area—rural Java, and tried to show the determinants of the (share) tenancy contract form. In our study area, the land tenancy market was characterized by the predominance of share tenancy. We observed three types of share tenancy contracts, namely, “Maro,” “Morolimo,” and “Morotelu,” each having different sharing rates.

From the estimation of the determinants of tenancy contract forms, we found that risk had a negative impact on the choice of the share tenancy contract, while the degree of risk aversion, personal ties between the landowner and tenant, and land productivity had positive effects on the choice of the share tenancy contract and the land rent. This indicates that our findings do not support the risk sharing hypothesis by Cheung [5] and Stiglitz [14] or the hypothesis by Rao [11], Allen and Lueck [2], [3], according to which there is a positive relation between risk and incentive.

Notes

* This paper is a revised version of Fukui and Miwa [9] which leads to different conclusions.

- 1) This prediction is supported by the empirical study of the Tunisian case.
- 2) Pawning of land is categorized under the fixed rent contract in Table 1.
- 3) The hypotheses related to these determinants are shown in section 3.1.

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