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Transactional framework of sharecropping: empirical evidence

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Abstract

Chew [Chew, Tek-Ann, 1991. Share contracts in Malaysian rubber smallholdings. Land Econ., 67: 85–98; Chew, Tek-Ann, 1993. The Transactional framework of sharecropping: further implications. Can. J. Agric. Econ., 41: 209–221.] proposed a transactional framework of sharecropping that accommodates both the Marshallian and the Cheungian equilibria. An important conclusion arising thereof is the hypothesis that Cheung's sharecropping equilibrium is the rarity while the Marshallian equilibrium is the norm. In this paper, we collated some recent evidences to verify this hypothesis. The evidences support the Marshallian equilibrium, thereby providing indirect support for the transactional framework of sharecropping. Published by Elsevier Science B.V.

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1. Introduction

The sharecropping literature was for a long time dominated by two seemingly competing schools of thought—the Marshallian school and the Cheungian school. In the Marshallian school, the sharecropper applies his labor up to the point where the opportunity cost of labor is equal to his share of the marginal product, resulting in underapplication of tenant labor. Cheung (1969) in a major challenge to this thinking, asserted that competition among the sharecroppers will 'force' the sharecropper to apply his labor past the Marshallian equilibrium, until the point where the opportunity cost of labor is equal to marginal product, just as in fixed-rent tenancy or owner cultivation. Sharecropping is thus considered to be as 'efficient' as other tenancy forms. Recently, there appears to be a consensus of opinion that the two schools are not contradictions of each other, but rather represent different degrees of tradeoff between enforcement cost and design of contract. There cannot be a single theory to explain the prevalence of sharecropping under such diverse conditions. Sharecropping can be efficient in certain environments and inefficient in others (Quibria and Rashid, 1986; Otsuka and Hayami, 1988). However, there is no general theory to support this dual equilibria idea. Rather this accommodating viewpoint appears to emerge more in response to the inability of the agricultural economics profession to settle the so-called Marshallian vs. Cheungian conflict—hence, the acceptance of both theories to accommodate the multiplicity of theories and empirical results.

Chew (1991, 1993) postulated a simple analytical framework that accommodates sharecropping in both the Marshallian and Cheungian forms. This, then, could be the theory required to reconcile both schools of thought in sharecropping. Chew's framework was

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derived from transaction cost economics (Chew, 1991). The framework is based on two basic ideas—the existence of transaction cost in the real world and the equimarginal principle that drives the firm-type to its equilibrium form. Sharecropping is then considered as the firm-type that requires a lower cost of monitoring compared to wage labor employment, since self monitoring is inherent in the output sharing nature of the cropsharing contract.

An important conclusion from the paper of Chew (1993) is the hypothesis that Cheung's cropsharing equilibrium is the rarity while the Marshallian equilibrium is the norm. The Cheungian equilibrium exists only in cases of exceptionally close monitoring, such as in cases where the landlord rents out some of his plots to sharecroppers in close proximity to plots that are cultivated using the wage labor contract (Chew, 1993, p. 217). In the majority of cases, the Marshallian equilibrium prevails. In this paper, we examine the empirical evidence available to see if this hypothesis is true. Indeed, the real test of the validity of any analytical framework is to see if it stands up against empirical data.

The plan of this paper is as follows. In Section 2, the superiority of Shaban's econometric model and his results, in distinguishing the Marshallian equilibrium from the Cheungian equilibrium are outlined. In Section 3, the empirical evidence in a recent piece of work by Acharya (1992) [1] on Nepalese agriculture is discussed. The paper ends with concluding remarks.

2. Shaban's methodology and results

The superiority of Shaban's methodology over other methods used to test sharecropping theories lies in the pairwise nature of the test used. In Shaban's method, the plots of own and lease-in sharecropped plots cultivated by the same mixed owner-sharecropper are paired and tested for differences in output and inputs. Because the members of each pair are located in the same area, location differences that are not specified in the econometric model which may confound the sharecropping effect are minimized. More importantly, the fact that the members of the paired plots are cultivated by the same tiller means that effects resulting from different utility functions, different sets of resources under control and different inherent farming skills are neutralized or minimized, compared to the case where the owner cultivator and the sharecropper are different persons. All these imply a more rigorous test for the sharecropping equilibrium. Finally, Shaban's model also uses the joint test [2] to see if the quantities of all inputs used are jointly different in sharecropping as compared to owner cultivation. The joint test is a more powerful test compared to the individual test for individual equations because the joint test covers all inputs taking into account the interactive effects of different inputs on each other. The sharecropping model is invariably discussed in terms of underapplication of the labor input, with the labor input named in the x-axis in the standard sharecropping diagram. Economic logic would suggest that if labor is underapplied, other inputs will most likely be similarly underapplied, otherwise optimal combination of factors will not occur. The test for Cheung's equilibrium should rightly therefore be an 'all or none' type of test and in this sense, therefore, the joint test is more appropriate and powerful.

For readers who may not be familiar with Shaban's work, the final estimating equation used is (Shaban, p. 903):

$$\Delta x_i = \sum_{m}^{M} \beta_{mi}(D_m^o - D_m^s) + \sum_{j=1}^{J} \theta_{ji} E_j + v_i., \quad i = 1, \ldots n$$

where D_i is the dummy variable for irrigation, plot value and soil quality with the superscripts o and s denoting own and sharecropped plots respectively. E_j is the village dummy while n refers to the number of inputs. Altogether, the equation was estimated jointly for the set of eight observable inputs, namely family male labor, family female labor, hired male

[1] The author was a member of the thesis committee that supervised this piece of research.

[2] The joint test is derived from the joint estimation of the set of input equations using Zellner's method of seemingly unrelated regressions. The equation with output as the dependent variable was estimated separately using OLS.

labor, hired female labor, bullock-pair power, seed, fertilizer and ‘other inputs’. A similar output equation was estimated separately. θ_{ji} measures the pure tenancy contribution to the difference in input intensity Δx_i between members of the paired plots. The mean differences Δx_i in input intensity can then be decomposed into four sources, ξ_1, ξ_2, ξ_3 and ξ_4, defined as the proportion of the mean difference that can be attributed to irrigation, plot value, soil quality and tenancy status respectively (Shaban, p. 905).

Shaban reported two sets of results to test Cheung's equal efficiency theory. In the first set of results, the own and sharecropped plots are cultivated by the same owner-sharecropper, growing a mixture of crops such as sorghum, groundnut, gram, wheat and paddy. In the second set of results, the plot pairs are cultivated by the same owner-sharecropper, growing sorghum only. The second set of results should, therefore, provide a stronger test of Cheung's theory because of the more homogeneous data set. A shortened version of Shaban's results is given in Table 1.

The first set of results in Table 1 shows that after accounting for irrigation and soil quality differences, the differences in input and output intensities that are due to the sharecropping arrangement are quite large. Output on own land is 16.3% higher than on sharecropped land due to the sharecropping effect. Similarly, input intensity is higher on own land, compared to sharecropped land, by 20.8% for family male labor, 46.7% for family female labor, 12.4% for hired male labor, 14.5% for hired female labor, 16.6% for bullock labor, 17.9% for seed and 20.5% for ‘other inputs’. The unexpected result is that fertilizer is less on own land by 10.4% compared to sharecropped land. Out of 8 village dummies, 5 are jointly significantly different from zero at the 1% level, one is jointly significantly different from zero at the 5% level while the remaining two dummies are not jointly significantly different from zero (Shaban, Table 3). The weight of evidence seems, therefore, to favor the Marshallian sharecropping contract.

The second set of results for the sorghum only farmers gives similar conclusions. Output on own land is higher by 27.6% compared to sharecropped land due to the sharecropping effect. Similarly, input intensity is higher on own land, compared to sharecropped land, by 31.8% for family male labor, 32.8% for family female labor, 16.5% for hired male labor, 16.6% for bullock labor, 68.2% for fertilizer and 34.5% for ‘other inputs’, attributable to the sharecropping effect. The intercept term is jointly significantly different from zero at the 1% significance

Table 1
Shaban's results

Variable	Family male labor	Family female labor	Hired male labor	Hired female labor	Bullock pair labor	Seed	Fertilizer	Other inputs	Total output
Set 1									
ξ_1	22.7	21.5	55.7	57.4	11.0	42.5	73.5	43.8	40.2
ξ_2	8.6	−0.3	−22.6	2.9	9.2	5.8	59.4	3.5	9.7
ξ_3	6.2	−5.7	1.9	−5.5	6.8	−16.0	17.9	2.7	0.0
ξ_4	62.5	84.5	64.9	45.1	73.0	67.7	−50.7	50.0	50.1
$\xi_4 E(\Delta x_i)/E(x_i^o)$	20.8	46.7	12.4	14.5	16.6	17.9	−10.4	20.5	16.3
Set 2									
ξ_1	6.9	9.5	6.2	57.5	8.5	–	41.5	46.2	8.2
ξ_2	0.8	−0.5	−0.6	2.4	0.2	–	2.6	1.7	−0.1
ξ_3	8.9	16.2	13.7	30.9	18.1	–	7.1	−3.0	−0.7
ξ_4	83.3	74.8	80.7	9.2	73.3	–	68.2	55.1	92.6
$\xi_4 E(\Delta x_i)/E(x_i^o)$	31.8	32.8	16.5	0.5	16.6	–	68.2	34.5	27.6

The notation Δx_i refers to difference in input i between different plot types and x_i^o refers to quantity of input i in mixed-sharecropper's owner cultivated plot. ξ_1, ξ_2, ξ_3 and ξ_4 represent the proportions of the mean difference in the dependent variable that are explained by differences in irrigation, plot value, soil quality and sharecropping, respectively.
Source: taken from Shaban (1987), Tables 3 and 4.

Table 2
Acharya's results

Variable	Seed	Compost	Fertilizer	Bullock-power	Family labor	Hired labor	Other inputs	Output
Case 1: n = 63								
E_1^{++}	−1.66	6.14**	27.42**	0.58	14.79**	−8.27	164.52**	0.32
	(3.97)	(0.84)	(11.24)	(2.05)	(4.21)	(7.41)	(46.08)	(2.22)
E_2^{++}	8.33	4.60**	36.85*	4.96*	19.90**	13.45	76.67	6.87*
	(5.16)	(1.09)	(14.60)	(2.66)	(5.47)	(9.61)	(59.83)	(2.92)
ξ_1^a	–	−3.50	−10.70	−9.80	3.10	14.20	13.80	−18.00
ξ_2	–	2.90	9.90	−40.00	−3.10	52.10	−8.90	−15.90
ξ_3	–	−0.50	−5.70	−36.00	−2.80	33.70	−1.20	−19.80
ξ_4^b	–	101.10	126.30	185.80	−3.10	0.00	123.90	153.70
$\xi_4 E(\Delta x_i)/E(x_i^o)$	–	98.97	37.20	9.96	109.00, 35.52	0.00	83.96	14.68
Case 2: n = 50								
E_1^{++}	−4.31	2.89**	33.40	−0.80	−7.72	0.65	195.82**	−1.21
	(5.30)	(1.05)	(22.40)	(2.90)	(7.32)	(10.59)	(67.60)	(2.59)
E_2^{++}	9.90	3.53*	30.15	3.44	1.67	30.76	−62.35	3.45
	(8.11)	(1.60)	(34.27)	(4.42)	(11.20)	(16.20)	(103.43)	(4.51)
ξ_1^a	–	6.50	−5.50	–	15.50	−35.00	17.60	−60.80
ξ_2	–	6.50	12.60	–	−11.60	35.20	3.70	207.00
ξ_3	–	−1.60	−5.60	–	11.90	−14.40	−0.70	−86.90
ξ_4^b	–	88.60	98.50	–	84.20	114.20	79.40	40.70
$\xi_4 E(\Delta x_i)/E(x_i^o)$	–	51.75	36.73	–	−10.30	19.40	62.18	1.00

The notation Δx_i refers to difference in input i between different plot types and x_i^o refers to quantity of input i in mixed-sharecropper's owner cultivated plot. ξ_1, ξ_2, ξ_3 and ξ_4 refer to the proportions of the mean difference Δx_i that are explained by differences in soil fertility, variety of rice, plot size and sharecropping respectively.

[a]Since the expected mean difference for seed $E(\Delta x_i) = 0$, the ξ_i's are not defined for seed.

[b]The sample averages for some of the independent variables are negative, yielding negative values of ξ_1, ξ_2 and ξ_3 making percentage explained by sharecropping ξ_4 more than 100%, since the sum of the ξ's equals 100%.

**, * Significant at 1% and 5% levels, respectively.

++ Jointly significant at 1% level, n refers to number of cases.

Source: Acharya (1992), Tables 10 and 11.

level (Shaban, Table 4), confirming the existence of the Marshallian sharecropping equilibrium.

3. Acharya's results

The work [3] of Acharya (1992) is a virtual repeat of Shaban's research. However the data set used in Acharya's case is superior compared to Shaban's work in that the data was collected by Acharya himself, unlike the case for Shaban who had to rely on data collected by other researchers under the ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) program (Shaban, p. 891). Acharya's data can therefore be considered to be more accurate because he had more control over the data collection process. A slight improvement in Acharya's modeling is the inclusion of 'difference in plot size' as an explanatory variable. This variable is not specified in Shaban's model because the variable was found to be not significant (Shaban, p. 902, Footnote 15). The final estimating equation used by

[3] Our main focus in this paper is to collate empirical evidence for the existence of the Marshallian sharecropping equilibrium. The paper is not about sharecropping in Nepal per se. As such, details about sharecropping and other basic statistics in connection with Acharya's research are not included here, so as not to dilute the focus. For full details, see Acharya (1992).

Acharya is (Acharya, p. 51): [4]

$$\Delta x_i = \sum_{m=1}^{3} \beta_{mi}(D_m^o - D_m^s) + \alpha_i A' + \sum_{j=1}^{2} \phi_{ji} E_j + e_i \text{ for } i = 1 \ldots 7$$

where, Δx_i = difference in input i between members of the paired plots; D_1 = dummy for fertile soil; D_2 = dummy for moderate soil; D_3 = dummy for improved rice variety; A' = difference in plot size (area) between members of the paired plots in hectares; E_1 and E_2 = village dummies; e_i = error term; o and s superscripts denote own and sharecropped plots respectively. i = input type, with seven inputs altogether.

Altogether, the equation was estimated jointly for the set of seven inputs, namely seed, compost, fertilizer, bullock-power, family labor, hired labor and 'other inputs'. [5] A similar equation with output as the dependent variable was estimated separately. There are two sets of results in Acharya's work—one, where he compared input and output intensities between plots cultivated by the same owner-sharecropper and two, where he compared input and output intensities between plots cultivated by an owner-sharecropper with plots cultivated by a pure sharecropper, i.e., there are two different utility maximizers in the second case. A summarized version of Acharya's results is presented in Table 2.

In case 1, it can be seen that both the intercept terms E_1 and E_2 are jointly significantly different from zero at the 1% significance level, confirming the Marshallian equilibrium. Sharecroppers apply significantly lower amounts of compost, fertilizer, bullock power, family labor and 'other inputs' in their sharecropped plots as compared to their own plots. After allowing for differences in inputs due to differences in soil quality, crop variety and plot size, the input intensities in own plots as compared to the sharecropped plots are 98.97%, 37.20%, 9.96%, 35.52% and 83.96% higher for compost, fertilizer, bullock power, family labor and 'other inputs' respectively, due to the sharecropping effect. Output is higher by 14.68% in own plots as compared to the sharecropped plots, due to the sharecropping effect.

In case 2, again E_1 and E_2 are jointly significantly different from zero at the 1% significance level, again confirming a Marshallian equilibrium. Some of the individual equations, E_1 and E_2 have negative signs. However, these coefficients are not significant. After accounting for the differences in plot size, soil quality and crop variety, input intensities are higher in own plots compared to sharecropped plots by 51.75%, 36.73%, 19.40% and 62.18% for compost, fertilizer, hired labor and 'other inputs' respectively, attributable to the sharecropping effect. Output is higher in own plots as compared to the sharecropped plots by 1.00%, due to the sharecropping effect. These findings, in general, show that inputs and output are significantly lower in sharecropped plots, as compared to own plots. However, the evidence supporting the Marshallian equilibrium is weaker for case 2 as compared to case 1 earlier, because only 2 out of the 7 individual equations have significant coefficients for E_1 and E_2. This, ironically, strengthens confidence in the results because in case 2, differences in the resource endowments of the different farm tillers involved in cultivating the paired plots being tested, resulting in differences in the opportunity costs of the inputs used, can mask the conclusiveness of the test to determine the sharecropping equilibrium. Hence, by right, the conclusiveness of the test in case 2 should be less than that for case 1, which was what was obtained.

4. Concluding remarks

For the last 30 years, the debate between the Marshallian and the Cheungian schools of thought had continued, with no end in sight. Lately, there is the increasing tendency to accept both schools as correct and as cases of different degrees of trade-off between contract design and enforcement cost. However, we view this more as an act of resignation in the face of our inability to reconcile the different conflicting theoretical viewpoints and empirical evidences.

[4] Some of the notations as used in the thesis have been altered in this paper for reasons of clarity and consistency with Shaban's article.

[5] 'Other inputs' refers to cost of irrigation, pesticides and herbicides (Acharya, p. 56).

Chew (1991, 1993) proposed a simple analytical framework that seems to provide the answer to the sharecropping dilemma. The conclusion from Chew's framework is that the Marshallian equilibrium is the norm while the Cheungian equilibrium is an anachronism—an exception to the rule. In this paper, we collated together some recent empirical evidences that support the Marshallian equilibrium—one from Shaban (1987) and two, from a recent piece of work by Acharya (1992) that is a replay of Shaban's methodology. Given that Shaban's methodology is the most rigorous tool currently available to detect the sharecropping equilibrium, we can argue, therefore, that the empirical evidences seem to support the Marshallian school. This indirectly provides confirmation for Chew's sharecropping framework. Needless to say, more empirical evidence in a variety of environments is required to settle the sharecropping issue conclusively.

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