The (Im)Possibility of Reverse Share Tenancy

Bellemare, Marc F.

Duke University

4 December 2009

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Marc F. Bellemare[†]

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Under the assumption that the landlord is risk-neutral and the tenant is risk-averse, sharecropping is second-best in that it trades off risk sharing and incentives. Many, however, have reported instances of reverse share tenancy, or sharecropping in which the landlord is considerably poorer than the tenant. This note shows that reverse share tenancy is impossible under the canonical Stiglitzian model of sharecropping but becomes possible if and only if (i) both the landlord and the tenant can be assumed risk-averse; or (ii) there exist significant transactions costs making sharecropping more desirable than either a wage or fixed rent contract.

JEL Classification Codes: D23, D86, O12, Q12

Keywords: Sharecropping, Reverse Share Tenancy, Transactions Cost.

[†] Assistant Professor, Sanford School of Public Policy, Duke University, Box 90312, Durham, NC, 27708-0312, United States, Telephone: 919-613-9382, Facsimile: 919-684-9940, marc.bellemare@duke.edu.

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1. Introduction

Under the assumption that the landlord is risk-neutral and the tenant is risk-averse, the principal-agent model predicts that the landlord will choose a sharecropping contract, which trades off risk-sharing and incentives (Stiglitz, 1974). Indeed, when the tenant's effort is unobservable by the landlord, the tenant faces little or no incentive to provide effort under a wage contract but bears too much risk under a fixed rent contract. Sharecropping thus emerges as the second-best contract.

The risk preferences assumed in the canonical model stem from the stylized facts. In most cases, landlords are wealthier than their tenants, and so it is only natural to assume that they are risk-neutral and their tenants risk-averse. Yet, several instances of sharecropping in which landlords are considerably poorer than their tenants have been reported in the social sciences. Such reverse share tenancy agreements have been found to be widespread in places as diverse as Lesotho (Lawry, 1993), South Africa (Lyne and Thomson, 1995), Eritrea (Tikabo, 2003), Ethiopia (Bezabih, 2007), Bangladesh (Pearce, 1983), Madagascar (Bellemare, 2009), Malaysia (Pearce, 1983), India (Singh, 1989), as well as the Philippines (Roumasset, 2002). Under the assumption of decreasing absolute risk aversion (DARA), assuming that landlords are risk-neutral and tenants are risk-averse is ill-advised in such contexts.

This paper establishes in section 2 that reverse share tenancy is impossible under the canonical model of sharecropping unless both landlord and tenant can be assumed risk-

averse. Section 3 suggests ways in which transactions costs can be incorporated in the canonical model to account for the emergence of reverse share tenancy. Section 4 concludes by providing directions for future research.

2. Theoretical Framework and Impossibility Result

Consider the following general principal-agent model. A landlord whose utility function is $V(\cdot)$, with $V'>0$ and $V''\leq 0$, contracts with a tenant whose utility function is $U(\cdot)$, with $U'>0$ and $U''\leq 0$. The landlord and the tenant's utility functions both exhibit DARA. The landlord hires the tenant to cultivate her plot and produce output $q\in[\underline{q},\bar{q}]=Q$, which is stochastic and depends on the tenant's effort $e\in E$ through the conditional probability density function $f(q\,|\,e)$, which describes the likelihood of observing output level q given effort level e. The tenant's payoff from accepting the contract offered by the principal is additively separable in the utility derived from the contract and the cost of effort, which is represented by the twice continuously differentiable function $\psi(e)$, with $\psi'>0$ and $\psi''>0$.

As in the standard principal-agent model with (Bolton and Dewatripont, 2005), the landlord maximizes her objective function by offering a contract $w(q)$ to the tenant. Assuming that the tenant's maximization problem has a unique solution, and because his utility is the sum of concave functions, one can apply the first-order approach (Rogerson, 1985) and replace his incentive compatibility constraint by its first-order condition. Letting λ and μ be the multipliers associated with the tenant's individual rationality

(IR) and incentive compatibility (IC) constraints, forming the maximization problem, and solving yields

$$\frac{V'[q-w(q)]}{U'[w(q)]} = \lambda + \mu \frac{f_e(q \mid e)}{f(q \mid e)}, \tag{1}$$

a familiar result in contract theory summarizing the trade-off between risk-sharing and incentives.

Focusing on linear contracts, i.e., contracts of the form $w(q) = aq + b$, where $a \in [0,1]$ is the share of the crop that goes to the tenant, and $b \in R$ is a side payment from the landlord to the tenant, i.e., a fixed rent if *b* is negative, and a wage if *b* is positive,[1] one can differentiate equation 1 with respect to *q* to obtain

$$w'(q) = \frac{\mu U'^2 \frac{d}{dq}\left[\frac{f_e(q \mid e)}{f(q \mid e)}\right] - V''U'}{-V''U' - U''V'}, \tag{2}$$

the slope of the contract $w(q) = aq + b$. In other words, $w'(q)$ is the share of the crop that goes to the tenant. Since side payment *b* enters the contract linearly, the landlord will adjust it so as to make the agent's IR constraint bind (Stiglitz, 1974).

Assuming that the monotone likelihood ratio property holds, i.e., $\frac{d}{dq}\left[\frac{f_e(q \mid e)}{f(q \mid e)}\right] \geq 0$, the agent gets a strictly positive share of output *q*, i.e., $w'(q) > 0$. Multiplying each term of the numerator and the denominator in equation 2 by $U'V'$ yields

[1] The reason for assuming linear contracts is twofold. First, landlords overwhelmingly tend to use such contracts in practice. Second, behavioral evidence suggests that individuals use heuristics to reduce complex problems into tractable ones. The use of linear contracts most likely represents the use of such a heuristic or an example of bounded rationality (Simon, 1957), a discussion of which is beyond the scope of this paper. Holmström and Milgrom (1987) derive conditions under which a linear contract is optimal.

$$w'(q) = \frac{\mu \dfrac{U'}{V'} \dfrac{d}{dq}\left[\dfrac{f_e(q \mid e)}{f(q \mid e)}\right] + A_L}{A_L + A_T}, \tag{3}$$

where $A_L = -V''/V'$ and $A_T = -U''/U'$ are the coefficients of absolute risk aversion of the landlord and the tenant, respectively. The following results then obtain.

Proposition 1 *When the landlord is risk-averse and the tenant is risk-neutral, share tenancy cannot emerge as the optimal contract in the principal-agent model.*

Proof When the landlord is risk-averse and the tenant is risk-neutral, $A_L > 0$ and $A_T \to 0$. The slope of the contract thus becomes

$$\lim_{A_T \to 0} w'(q) = \frac{\mu \dfrac{U'}{V'} \dfrac{d}{dq}\left[\dfrac{f_e(q \mid e)}{f(q \mid e)}\right] + A_L}{A_L + A_T} \geq 1. \tag{4}$$

But since the share of the output that the tenant can get from the contract lies in the [0,1] interval, $w'(q) = 1$, i.e., a fixed rent contract obtains. ◄

Proposition 2 (Optimal Contract) *When the landlord and the tenant are both risk-averse, the principal offers a sharecropping contract. Moreover, the share of the crop that goes to the agent is strictly decreasing (weakly increasing) in the absolute risk aversion of the tenant (landlord).*

Proof From equation 4,

$$\lim_{A_T \to 0} w'(q) = \frac{\mu \dfrac{U'}{V'} \dfrac{d}{dq}\left[\dfrac{f_e(q \mid e)}{f(q \mid e)}\right] + A_L}{A_L + A_T} = 1. \tag{5}$$

But then, $\frac{\partial w'(q)}{\partial A_T} < 0$, which implies that starting from a risk-averse landlord and a risk-neutral tenant risk-neutral, as the tenant gets more risk-averse, sharecropping becomes more likely. Further, let $\Phi = \mu \frac{U'}{V'} \frac{d}{dq}\left[\frac{f_e(q \mid e)}{f(q \mid e)}\right]$. Then,

$$\frac{\partial w'(q)}{\partial A_L} = \frac{A_T - \Phi}{(A_L + A_T)^2}. \qquad (6)$$

But since $w'(q) = \frac{\Phi + A_L}{A_L + A_T} \leq 1$, $\Phi \leq A_T$, so that $\frac{\partial w'(q)}{\partial A_L} \geq 0$. ◄

Both results are intuitive. With a risk-averse landlord and a risk-neutral tenant, the landlord no longer has a comparative advantage in risk-bearing. Since the tenant has a comparative advantage in both risk-bearing and in effort monitoring, he should bear all the risk. The second proposition provides another intuitive result: when both the landlord and the tenant are risk-averse, each party bears some of the risk.

3. Reverse Share Tenancy in Practice

Propositions 1 and 2 respectively show that reverse share tenancy is impossible if the landlord is risk-averse and the tenant is risk-neutral, but that it can emerge when both are risk-averse, no matter their wealth ordering. Although two-sided risk aversion is *a prima facie* more realistic than assuming risk neutrality of one party (Holt and Laury, 2002), it is also possible to retain the assumption that the tenant is risk-neutral if significant transactions costs drive risk-averse landlords to choose to bear some risk.

For example, Ghatak and Pandey (2000) extend the model of section 2 by introducing limited liability on the part of the tenant. The landlord may then choose sharecropping over fixed rent in an effort to curb the tenant's risk-taking behavior. Likewise, Dubois (2002) introduces fertility dynamics in the canonical model. Because landlords sign short-term contracts, the strong incentives implied by fixed rent contracts push tenants to overuse the land, so landlords may choose sharecropping in order to preserve the fertility of their plots, a hypothesis that is supported by data from the Philippines. Finally, Bellemare (2009) finds that in Madagascar, a landlord's subjective probability that she will lose claim to her plot is often higher under fixed rent than under sharecropping, and so landlords may choose sharecropping in order to minimize the risk of expropriation. One could come up with several such departures from the canonical model of section 2 in order to explain reverse share tenancy.

Thus, although Ghatak and Pandey (2000) and Dubois (2002) do not explicitly set out to study reverse share tenancy, their transactions costs-based theoretical frameworks provide excellent candidate explanations for the emergence of such an institution, and both Dubois' (2002) and Bellemare's (2009) transactions costs-based explanations are supported by their data.

As a result, if landlords are risk-averse and tenants are risk-neutral, the canonical model must be augmented by including transactions costs in order to successfully describe the emergence of reverse share tenancy. Whether the explanation for reverse

share tenancy lies on the side of two-sided risk aversion or of transactions costs, however, is ultimately an empirical question.

4. Conclusion

This paper has established that the existence of reverse share tenancy (i.e., sharecropping between a poor landlord and a rich tenant) is inconsistent with the assumption that the landlord is risk-neutral and the tenant is risk-averse in the principal-agent model. It has then shown that reverse share tenancy is possible if and only if (i) both the landlord and the tenant are risk-averse in the principal-agent model; or (ii) significant transactions costs make sharecropping more attractive than fixed rent for a risk-averse landlord.

What are the implications of these results? The first thing to acknowledge is that which of these two possible causes of reverse share tenancy prevails is an empirical question. On the one hand, two-sided risk aversion is more realistic than assuming that one party is risk-neutral, but it is extremely difficult to test this assumption empirically, both because relying on proxies for risk preferences leads to unidentified tests (Bellemare and Brown, forthcoming) and because estimated rather than experimentally-derived risk preferences lead to spurious correlation between wealth and risk aversion (Lybbert and Just, 2007). On the other hand, although transactions costs-based explanations lend themselves more naturally to empirical tests, they also depend much on the specific context. Ultimately, it appears that it may be necessary to derive structural empirical models from the theory which nest competing explanations for reverse share tenancy.

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