INEFFICIENT SOCIAL CONVENTIONS IN BACKWARD ECONOMIES

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Abstract

When adopted by each member in a society contracts become conventions: they are focal points that solve coordination problems. This paper develops an evolutionary model with two distinct finite populations of players (landlords and landless) in which players from different populations are repeatedly matched within a period to play a stage game. Choices over the three strategies available (fixed rental, share-cropping and wage contracts) are affected by bounded rationality. In particular, players assume their opponents to carry on playing the action they adopted the previous period (inertia hypothesis) so that mimic the most successful strategy played by their own population mates turns out to be the best strategy (miopia hypothesis). Experimentation allows players to innovate towards the preferred strategy every period. The calculation of the eigenvector related to the unit eigenvalue of the Markov matrix stresses that by better solving the collective action problems and decreasing their attachment to habits, landless can change the status quo towards the desired contract. The analysis of the relative dimensions of the basins of attractions highlights that the long-run equilibrium is likely to be the contract preferred by landlords, unless economic incentives are tuned up in order to drive the society to adopt an alternative one.

There is a large literature on agrarian contracts in village economies that, by assuming the full rationality of economic agents and, consequently, the efficiency of institutions they give birth to, highlights the conditions which could favour one contract to the detriment of others (Otsuka, Chuma and Hayami 1992): sometimes in risk attitude of agents; sometimes in prevailing production technology coupled with endowment distributions across classes of factor owners; sometimes in transaction costs, in general, and in supervision costs, in particular.

When adopted by each member in a society, however, contracts become conventions: they are focal points (Sudgen 1986) that solve coordination problems. The purpose of this paper is to highlight that even if there are some agents not affected by bounded rationality that pin-point Pareto-superior contracts, when they all belong to the weaker class so that they can not afford to innovate because of their low reservation income, the society can get stuck in inefficient kinds of contracts. Even if the weaker and more rational class can drive the society to adopt more efficient contracts in the short-run by developing a relative deeper innovation attitudes and collective action solving capacities, the conditions which make an agrarian contract prevail in the long-run turn out to lie in the preferences of the stronger class.

I develop an evolutionary model with two distinct finite populations of players (landlords and landless) in which players from different populations are repeatedly matched within a period to play a stage game.

Choices over the three strategies available (fixed rental, share-cropping and wage contracts) are affected by bounded rationality. In particular, players assume their opponents to carry on playing the action they adopted the previous period (inertia hypothesis) so that mimic the most successful strategy played by their own population mates turns out to be the best strategy (miopia hypothesis): I will depict that by assuming a best reply dynamic process. Experimentation allows players to innovate towards the preferred strategy every period: a system of three non-linear stochastic difference equations will be analyzed.

The calculation of the eigenvector related to the unit eigenvalue of the Markov matrix stresses that by better solving the collective action problems and decreasing their attachment to habits, landless can change the status quo towards the desired contract in the short-run.

The analysis of the relative dimensions of the basins of attractions highlights that the long-run equilibrium is likely to be the contract preferred by landlords, unless economic incentives are tuned up in order to drive the society to adopt an alternative one.

The structure of the paper is as follows.

In section 1, the theoretical framework is introduced.

The short-run and long-run behaviour of the system are provided in section 2 and 3, respectively.

The conclusion appears in section 4.

1.THE THEORETICAL FRAMEWORK

I consider an agrarian context where landlords and landless want to reach an agreement on land utilisation. It is common knowledge that this can be done by signing one of the three preconceived agrarian contracts: fixed rental (F), share-cropping (S) and wage contract (W). Moreover, both classes know that not reaching an agreement forces them to resort to the daily rated labour market, where landlords might not find the required number of workers at peak seasons and landless might not manage to supply the desired amount of work at slack seasons.

The existence of uncertainty and adjustment costs makes the inertia a plausible hypothesis: players suppose that their opponents will not react instantaneously to their environment.

The analysis carried out at village level suggests that agents are in a position to learn which strategy is better by observing which has worked well for other people from their own population: the myopia hypothesis is made.

Players, however, are in a position to try to change the status quo by choosing a new strategy which needs not to be the best response in the previous period. Experimentation, in particular, can be at random or aimed at: I will depict the former by assuming a uniform innovation rate (l for landlords and t for landless); I will introduce the factors h (for landlords) and k (for landless) to catch the fraction of times agents move their experimentation towards the less preferred contract.

It is worthy noticing here that myopia assumption allows me to depict circumstances where experimenters immediately switch back to their previous strategy if that generated a higher payoff.

Hence, two kinds of agents are around: the conservative ones, who always play the action that turned out to be the best in the previous period; the progressist ones, who accept short-run losses and challenge the status quo by introducing a new contract.

Players'choices over contracts are affected by adaptive preferences or bounded rationality. For example, one can think of agents preferring a contract because of the ignorance of income patterns arising from alternatives or liking it better because of its rooted tradition in the economy.

Analysis could be carried out whenever classes'preferences disagree. For the sake of simplicity, however, it is assumed that in spite economic conditions make share-cropping the best solution to risk sharing and transaction cost problems, only do landless realize that: landlords best prefer the fixed rental contract. If the matrix of classes'payoff defined in terms of utility is given by:

		landless		
		c_F	c_S	c_W
	c_F	F,f	R,r	R,r
LANDLORDS	c_S	R,r	S,s	R,r
	c_W	R,r	R,r	W,w

the classes'preferences are caught by assuming $s > w \geq f$ and $F > S \geq W$. R (with $R < W$) and r (with $r < w$) are the standard of living that landlords and landless can ensure themselves, respectively, when they resort to the daily rated labour market.

Actions are taken in discrete time in such a way that at the beginning of each period t each player chooses his pure strategy for the period: actions are assumed to be fix within the period. Moreover, each player assumes to be matched with a player from the opponent class only once.

Let t^F, t^S and t^W the fraction of landless adopting strategy F, S and W, respectively.

Let l^F, l^S and l^W the fraction of landlords adopting strategy F, S and W, respectively.

Therefore, $\pi_t^c(.)$ is the average payoff of landless playing strategy c (c=c_F, c_S, c_W):

$$\pi_t^F(l^F) = fl^F + r(1 - l^F)$$

$$\pi_t^S(l^S) = s\,l^S + r(1 - l^S)$$

$$\pi_t^W(l^W) = w\,l^W + r(1 - l^W)$$

Analogously for landlords.

The inertia and myopia hypothesis made above drive me to assume the best reply dynamic:

$$b_t(l^F, l^S, l^W) = \begin{cases} t^c = 1 & \text{if } \pi_t^c(.) > \pi_t^{\bar{c}}(.) \quad \textit{for} \quad \textit{every} \quad \bar{c} \neq c \\ t^c & \text{if } \pi_t^c(.) = \pi_t^{\bar{c}}(.) \quad \textit{for} \quad \textit{every} \quad \bar{c} \neq c \\ t^c = 0 & \text{if } \pi_t^c(.) < \pi_t^{\bar{c}}(.) \quad \textit{for} \quad \textit{some} \quad \bar{c} \neq c \end{cases}$$

Analogously $b_l(t^F, t^S, t^W)$ for landlords.

The experimentation hypothesis leads to specify three non-linear stochastic difference equations:

$$t_{t+1}^F = b(l_t^F, l_t^S, l_t^W) - v_{FS} - v_{FW} + v_{SF} + v_{WF}$$

$$t_{t+1}^S = b(l_t^F, l_t^S, l_t^W) - v_{SF} - v_{SW} + v_{FS} + v_{WS}$$

$$t_{t+1}^W = b(l_t^F, l_t^S, l_t^W) - v_{WF} - v_{WS} + v_{FW} + v_{SW}$$

where $v_{c,\bar{c}}$ depict jumps from contact c to contract $\bar{c}$ and have binomial distributions.

When $t_t^S = 1$:

$$v_{SW} = v_{SF} \sim Bin(b(l_t^F, l_t^S, l_t^W), t/k)$$

$$v_{FW} = v_{WF} \sim Bin(1 - b(l_t^F, l_t^S, l_t^W), t/k)$$

$$v_{FS} = v_{WS} \sim Bin(1 - b(l_t^F, l_t^S, l_t^W), t)$$

When $t_t^F = 1$:

$$v_{FS} \sim Bin(b(l_t^F, l_t^S, l_t^W), t)$$

$$v_{FW} \sim Bin(b(l_t^F, l_t^S, l_t^W), t/k)$$

$$v_{WS} \sim Bin(1-b(l_t^F, l_t^S, l_t^W), t)$$

$$v_{WF} = v_{SW} = v_{SF} \sim Bin(1-b(l_t^F, l_t^S, l_t^W), t/k)$$

When $t_t^W = 1$:

$$v_{WS} \sim Bin(b(l_t^F, l_t^S, l_t^W), t)$$

$$v_{WF} \sim Bin(b(l_t^F, l_t^S, l_t^W), t/k)$$

$$v_{FS} \sim Bin(1-b(l_t^F, l_t^S, l_t^W), t)$$

$$v_{SF} = v_{FW} = v_{SW} \sim Bin(1-b(l_t^F, l_t^S, l_t^W), t/k)$$

Analogously for landlords.

Therefore, an aimed innovation is depicted by an increase of k ($k \geq 1$) for landless and h ($h \geq 1$) for landlords.

This dynamic system defines a Markov chain whose transition probabilities are given by:

$$p_{(c,\bar{c}),(\tilde{c},\hat{c})} = Prob(l_{t+1}^{c} \quad \wedge \quad t_{t+1}^{\bar{c}} \mid l_t^{\tilde{c}} \quad \wedge \quad t_t^{\hat{c}})$$

and the Markov matrix by:

$$P = [p_{(c,\bar{c}),(\tilde{c},\hat{c})}]$$

P embodies the assumption that landless (landlords) innovate towards S (F) a greater number of times k (h) than they do towards other contracts.

Let $\Delta_3^t \equiv \{t^c \in R^3 \mid t^c \geq 0 \quad for \quad c = F, S, W \quad \& \quad \sum_c t^c = 1\}$ be the 3-dimensions simplex where t^c is the proportion of landless playing strategy c.

Let $\Delta_3^l \equiv \{l^c \in R^3 \mid l^c \geq 0 \quad for \quad c = F, S, W \quad \& \quad \sum_c l^c = 1\}$ be the 3-dimensions simplex where l^c is the proportion of landlords playing strategy c.

Therefore, $\Delta_3^2 \equiv \{(l^c, t^c) \in C^3 \mid l^c \geq 0 \quad t^c \geq 0 \quad for \quad c = F, S, W \quad \& \quad \sum_c l^c = 1 \quad \sum_c t^c = 1\}$ specifies the pairs of proportions playing a particular pair of strategy $(c, \overline{c})$.

2.SHORT-RUN BEHAVIOUR

By construction, all elements in matrix P are strictly positive: the Markov chain has a unique stationary distribution $\mu = (\mu_{FF}, \mu_{FS}, \mu_{FW}, \mu_{SF}, \mu_{SS}, \mu_{SW}, \mu_{WF}, \mu_{WS}, \mu_{WW}) \in \Delta_3^2$ satisfying:

$$\mu P = \mu$$

where μ can be interpreted as the proportion of time that the society spends on each state (Karlin and Taylor 1975).

If one normalizes the probability distribution over the possible states at time t=0 such that:

$$\mu(0) = (1 - \mu_{SS}(0) - \mu_{WW}(0) - 6\overline{\mu}, \overline{\mu}, \overline{\mu}, \overline{\mu}, \mu_{SS}(0), \overline{\mu}, \overline{\mu}, \overline{\mu}, \mu_{WW}(0))$$

where $\overline{\mu}$ is the probability not to reach an agreement, the probability to be in state SS at time t=1 is given by:

$$\mu_{SS}(1) = \frac{lt}{h} + \overline{\mu}\left(2\frac{l}{h} + 2t - 6\frac{lt}{h} - 2lt - 4\frac{lt}{hk}\right) + \mu_{SS}(0)\left(1 - l - \frac{l}{h} - 2\frac{t}{k} - \frac{lt}{h} + 2\frac{lt}{hk} + 2\frac{lt}{k}\right)$$

A first inspection shows that landless can affect the probability to be in the preferred state in a linear fashion by increasing either k or t. In particular, for $\overline{\mu} = 0$, $\mu_{SS}(1) > \mu_{SS}(0)$ if:

$$k^* > \frac{2t\mu_{SS}(0)(l - h + hl)}{l[\mu_{SS}(0)(1 + h + t) - t]} \quad \text{when} \quad l < \frac{h}{1+h}$$

$$k^* < \frac{2t\mu_{SS}(0)(l - h + hl)}{l[\mu_{SS}(0)(1 + h + t) - t]} \quad \text{when} \quad l > \frac{h}{1+h}$$

A stagnant society where landlords defend the status quo is better depicted by the first condition. If this is the case:

$$\frac{dk^*}{dt} < 0 \Leftrightarrow l < \frac{h}{1+h}$$

$$\frac{dk^*}{d\mu(0)} > 0 \Leftrightarrow l < \frac{h}{1+h}$$

Therefore, landless can show a limited capacity in solving collective action problems (small k) only when they are willing to break traditional institutions (large t). Moreover, the better the initial condition (large $\mu(0)$), the greater the class cohesion they have to express (large k).

It is worth noticing that:

$$\frac{dk^*}{dh} < 0 \Leftrightarrow l > 1 - \frac{\mu(0)}{t(1-\mu(0))}$$

$$\frac{dk^*}{dl} > 0 \Leftrightarrow h > \frac{t(1-\mu(0))}{\mu(0)} - 1$$

The first conditions says that landless have to rely to a greater extent on a reduction of their attachment to habits (large t) than on an increase in their capacity in solving collective action problems (large k) when landlords are well organized in defending the status quo (large h).

The second condition claims that when landlords show a high propensity to innovate (large l), landless can drive the society to adopt the most efficient contract in the short-run by increasing their capacity in solving collective action problems (large k).

3.LONG-RUN BEHAVIOUR

When P is strictly positive, the following stability condition holds:

$$For \quad any \quad q \in \Delta_3^2 \qquad qP^t = \mu \quad as \quad t \to \infty$$

The equilibrium which will prevail in the long run, therefore, does depend on the relative magnitude of the basins of attractions only (Kandori, Mailath and Rob 1993). All the three basins I deal with have two edges. In order to identify the largest one, I will therefore consider the shortest edge for each basin and compare them each other: the largest edge will belong to the largest basin.

Share-cropping (SS) will prevail whenever the following set of conditions holds (See Figure 1).

$$0 \le R < W$$

$$R < \frac{FW - S^2}{F + W - 2S}$$

$$r < \frac{sw - f^2}{s + w - 2f}$$

$$R < \frac{S(f - r) - F(w - r)}{w - f}$$

Under the preference structure assumed above, the only condition that may not be satisfied is the last one. Provided $f > w > r$, this requires that the landlords' reservation income is lower than some positive amount: it is always possible, therefore, to tune the economic incentives R and r in order to make share-cropping prevail in the long-run.

4.CONCLUSIONS

When adopted by each member in a society, agrarian contracts may become conventions: they are focal points that solve coordination problems. This paper highlights that even if each class can change the relative permanence of the different contracts in the short-run by reducing its attachment to habits and/or increasing its internal coordination, for given behaviour by the opponents, the long-run equilibrium is likely to be the contract preferred by the stronger class, unless economic incentives are tuned up in order to drive the society to adopt an alternative one.

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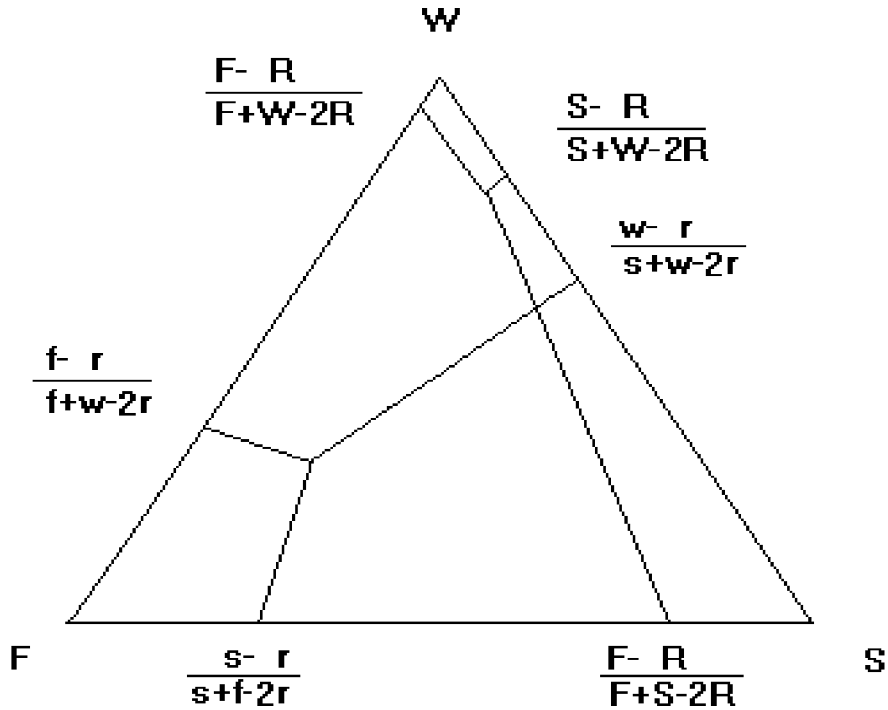

Figure 1