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On the endogenous determination of the degree of meritocracy in large cooperatives

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HIGHLIGHTS

- Low-wealth cooperatives choose degrees of meritocracy below the optimal.
- High-wealth cooperatives choose degrees of meritocracy above the optimal.
- Total labor and output are directly proportional to the degree of meritocracy.

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ABSTRACT

We consider a cooperative formed by a large number of workers differentiated by their initial endowment of wealth, which is both primary input (labor) and consumption (leisure). The cooperative is characterized by its wealth distribution, and produces a consumption good from labor, which allocates among workers according to a convex combination of the Proportional and the Egalitarian rule. In the first stage, workers decide this combination by simple majority. In a second stage, they choose how much labor to provide to the cooperative. We find that when in the cooperative's wealth distribution, the median wealth is lower (higher) than the average, the degree of meritocracy chosen by workers is lower (higher) than that of the optimum, and coincides with it when both statistics coincide. This choice has similar consequences on the cooperative's labor–output, since it increases with respect to the degree of meritocracy.

1. Introduction

Private and public firms' workplaces and departments, the household and the neighborhood domain and even mere cooperative enterprises are cases of economic organizations where the technology is publicly owned by the workers. In such cases, surplus distribution is achieved by a sharing rule which maps efforts into surplus shares for each member of the cooperative. Among the sharing rules conceived and studied in the literature (Sen, 1966; Moulin, 1987; Kang, 1988; Roemer and Silvestre, 1993), the Proportional and the Egalitarian rule emerge as the most natural ones. However, one question that arises is, which sharing rule would be chosen by the cooperative s members? Different approaches to this issue have been tackled in the literature by Corchón and Puy (1998), Barberá et al. (2015) and Beviá and Corchón (2018). A common feature of these papers is that the cooperative s workers have quasilinear preferences, such that the efficient contribution of labor from each worker is independent of the other workers contributions. As a consequence, the position of the median voter with respect to the average labor contribution determines the share rule chosen in the cooperative.

The aim of this paper is to study how interdependency among the labor contributions of the cooperative s workers affects the choice of the share rule. To do so, we consider a large cooperative with small identical workers characterized by Cobb–Douglas preferences, and differentiated by their endowment of wealth. The wealth is both consumed by workers and/or provided to the cooperative as primary input. The cooperative produces output from this input by means of a returns-to-scale-parameterized technology. Individuals, in the first stage, choose the degree of meritocracy, that is, the weight of the Proportional rule in a sharing rule that results from the convex combination of the former with the Egalitarian rule, by means of a simple majority voting equilibrium. In the second stage, workers choose the level of labor,

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which determines the amount of good produced. Across the paper, a cooperative is characterized by its wealth distribution, and the cooperative s equilibrium degree of meritocracy can be expressed as a function of the average and the median wealth. This is a major point for discussion, since the relative position of these statistics characterize how wealthy a cooperative is. For instance, when the average wealth is lower than the median, more than half of the cooperative s workers are wealthier than the average one. In such a cooperative high wealth predominates. Otherwise, when average wealth is higher than the median, low wealth predominates in the cooperative. Let us call the former a high-wealth cooperative and the latter, a low-wealth cooperative. As a consequence, our main result asserts that, when high (low) wealth predominates in the cooperative, the equilibrium degree of meritocracy chosen by workers is higher (lower) than the efficient one, and equals it when the average equals the median wealth. In turn, since in the model total labor and output depend positively on the degree of meritocracy, our result implies that high-wealth (low-wealth) cooperatives provide labor, or produce output, above (below) the optimal level.

The structure of the paper is as follows: a second section that describes the model; a third section that states the efficient outcome, the equilibrium and the main result; and section four, devoted to comments.

2. Model

There is a cooperative formed by a continuum of workers normalized to one. Workers distinguish themselves by their endowment w of wealth, which distributes according to the distribution function $F \in \mathcal{F}$, where $\mathcal{F}$ is the family of distribution functions defined in the support $\Omega \subset R^{+}$, so that $min\Omega = 1$, that is, the lower level of wealth in the cooperative is normalized to one. Let A and m be the average and the median wealth, respectively. As was pointed out in the Introduction, the predominance of lower or higher wealth in the cooperative is related to the relative position of these statistics. For instance, when $m < A$, more than half of the workers are less wealthy than the average one; in such a case low wealth predominates in the cooperative. When $m > A$ the opposite occurs, and high wealth predominates in the cooperative.

Each worker has the same Cobb–Douglas utility function with respect to the amounts C and $l \in (0, w]$ of per-capita consumption and labor, respectively. This assumption also implies that a cooperative's worker is identified by his/her level w of wealth.

$$u(C, l) = C^{\alpha}(w - l)^{1-\alpha}, \tag{1}$$

where $\alpha \in (0, 1)$ represents consumption intensity. Moreover, labor is used to produce the amount Y of per-capita consumption good according to the publicly-owned production function

$$Y = L^{\gamma} \tag{2}$$

where

$$L = \int_{\Omega} l dF(w), \tag{3}$$

is the total per-capita amount of labor and $\gamma \in (0, 1]$ represents the (not increasing) returns to scale parameter which, given our technology, also represents the elasticity of output with respect to labor.

The consumption of an individual is determined by the sharing rule which is a convex combination of the Egalitarian and the Proportional share rule. Kang (1988) proves that this rule completely characterizes the fair distribution rule for more than two workers. Hence, in our size-one population cooperative, it can be written as

$$C = Y\left[1 - \rho + \rho\frac{l}{L}\right], \tag{4}$$

where $\rho \in [0, 1]$ is the degree of meritocracy, that is, the weight attached to the relative contribution of each individual to production.

3. Efficiency and equilibrium

According to Beviá and Corchón (2018), Nash equilibrium is compatible with efficiency whenever $\partial C/\partial l = \partial Y/\partial l$. Since in our large-number-of-workers' cooperative, each worker's decision about labor contribution is negligible, we can obtain the efficient degree of meritocracy by equalizing the partial derivatives of Eqs. (2) and (4). As a result, the efficient degree of meritocracy is that which equals the production function's returns to scale parameter, that is $\rho = \gamma$. This result is compatible with Sen (1966), for the identical individual case; and with Beviá and Corchón (2016), for a dynamic framework with large numbers of workers.

To determine the equilibrium degree of meritocracy we consider a two-stage problem where, in the first stage, workers choose the degree of meritocracy by simple majority voting and, in the second stage, each worker chooses the amount of labor that maximizes his/her utility, given the degree of meritocracy chosen in the first stage, and taking L (and Y) as given. As in Beviá and Corchón (2016), the fact that the worker takes L as given is justified by the very large number of workers forming the cooperative. Hence, starting from the second stage, let us plug Eq. (4) into Eq. (1) to express the utility function as

$$u(l) = Y^{\alpha}\left[1 - \rho + \rho\frac{l}{L}\right]^{\alpha}[w - l]^{1-\alpha}, \tag{5}$$

the solution of this second-stage problem is:

$$l(w, \rho) = \alpha\left(w - \frac{(1-\alpha)}{\alpha}\frac{(1-\rho)}{\rho}L\right). \tag{6}$$

To determine the value $L(\rho)$ of total per-capita amount of labor in equilibrium by integrating Eq. (6) in the whole Ω, we have to assume that every worker in the cooperative contributes with a positive amount of labor, that is $l(w, \rho) > 0, \forall w \in \Omega$. Considering Eq. (6), we realize that such an assumption implies a minimum degree of meritocracy for which all individuals in the cooperative have incentives to provide labor. The following Proposition tackles this point.

Proposition 1. *$l(w, \rho) > 0, \forall w \in \Omega$ whenever $\rho > \frac{(1-\alpha)(A-1)}{(1-\alpha)A+\alpha} \equiv \rho_0$.*

Proof. Taking into account Eq. (3) and assuming that $l(w, \rho) > 0, \forall w \in \Omega$, the value $L(\rho)$ of total per-capita amount of labor in equilibrium is given by

$L(\rho) = \alpha\int_{\Omega}\left(w - \frac{(1-\alpha)}{\alpha}\frac{(1-\rho)}{\rho}L(\rho)\right)dF(w)$, which can be written explicitly as

$$L(\rho) = \frac{\alpha\rho}{1-\alpha(1-\rho)}A. \tag{7}$$

Finally, taking into account Eqs. (6) and (7) the worker amount of labor in equilibrium can be written as:

$$l(w, \rho) = \alpha\left(w - \frac{(1-\alpha)(1-\rho)}{1-\alpha(1-\rho)}A\right). \tag{8}$$

Eq. (8) shows that $\forall w \in \Omega, l(w, \rho)$ is an increasing function of both the wealth and the degree of meritocracy. Hence, exploiting Eq. (8), we can assess the lower degree of meritocracy, ρ_0, for which the less wealthy worker in the cooperative has incentives to provide labor, that is, ρ_0, so that $l(1, \rho_0) \geq 0$. This value is given by

$$\rho_0 \equiv \frac{(1-\alpha)(A-1)}{\alpha + (1-\alpha)A}. \tag{9}$$