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Redistribution by means of lotteries ☆

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Abstract

A government designs anonymous income transfers between a continuum of citizens whose income valuation is privately known. When transfers are deterministic, the incentive constraints imply equal treatment independently of the government's taste for redistribution. We study whether random transfers may locally improve upon the egalitarian outcome. A suitable Taylor expansion offers an approximation of the utility function by a quasilinear function. The methodology developed by Myerson to deal with incentive constraints then yields a necessary and sufficient condition for the existence of a socially useful randomization. When this condition is met a large set of lotteries are locally improving. A special menu made of two lotteries only is of interest: all the agents with low risk aversion receive the same random transfer, financed by a deterministic tax paid by the high risk aversion agents.

JEL classification: H21; H23; H26

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1. Introduction

It is known that in a second-best world a principal may find it valuable to propose random contracts to the agents. For instance, in the presence of asymmetric information, risk can be used to relax the incentive constraints (Laffont and Martimort, 2002). In Gauthier and Laroque (2014) we give a necessary and sufficient condition for useful/useless randomization near a deterministic optimum, but our previous analysis only applies to well-behaved problems where the constraints are qualified, i.e., the gradients of the binding constraints at the optimum are linearly independent. In this note we deal with a case where the constraints are not qualified. We consider a government that allocates a given sum of money deterministically between potential recipients with different income valuations. As observed by Lerner (1944) only equal sharing can be implemented if valuations are not observed by the government and recipients always prefer more income to less. The constraint set reduces to a single point and qualification is not met.

In this setup a random allocation may allow the government to screen individuals according to their attitudes toward risk. Pestieau et al. (2002) provide a necessary condition for local randomized redistribution to improve upon the equal sharing outcome. However their proof uses a Taylor expansion where the variance of the lotteries is negligible and so it does not give tools to design the optimal differential risk exposure. One contribution of our note is to provide a class of expansions where the noise component is first-order non-negligible. An appealing feature of this approach is that it enables us to apply the standard quasilinear toolkit of contract theory developed by Myerson (1982). This yields a necessary and sufficient condition for the existence of locally improving stochastic allocations. The social weights put on the agents with the smallest risk aversions must be large enough that a transfer in their favour more than compensates for the extra randomness required to meet the incentive constraints.

There are many ways to design the locally improving randomizations. Still it turns out that there is no loss in generality in limiting the attention to simple schemes that work as follows. The agents have to choose between two (small) deviations from the status quo. One is a certain tax, the other is a random transfer with positive expectation and variance. The deviations are built so that all the agents with a risk aversion larger than a threshold choose to pay the certain tax, while the agents with a smaller risk aversion take the other (risky) option.

The paper is organized as follows. Section 2 lays down the deterministic framework, which is extended to a random environment in Section 3. Section 4 presents an example. Finally Section 5 states and proves the main propositions.

2. Deterministic redistribution

A government allocates a total fixed income $\overline{y}$ to agents who differ in their utilities for income. There is a continuum of agents with total unit mass. The utility of a type θ agent is $u(y,\theta)$ when her income is y, y in $\mathbb{R}^+$. The parameter θ is distributed on a closed bounded interval Θ, with a positive continuous probability density function $f(\cdot)$ and cumulative distribution function $F(\cdot)$. Utility is twice continuously differentiable, increasing and concave in income: $u'_y(y,\theta) > 0$ and $u''_{yy}(y,\theta) < 0$ for all y and θ.

Each agent is supposed to know her own type. In the first-best the government also knows this type and allocates $y^*(\theta)$ to agent θ. Denoting $a(\theta)$ the social weight of type θ, the menu $(y^*(\theta))$ maximizes

$$\int_{\Theta} a(\theta)u(y(\theta),\theta)\,\mathrm{d}F(\theta) \tag{1}$$