



Income distributions and decomposable divergence measures[☆]

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Abstract

Inequality indices evaluate the divergence between the income distribution and the hypothetical situation where all individuals receive the mean income, and are unambiguously reduced by a Pigou–Dalton progressive transfer. This paper proposes a new approach to evaluate the divergence between any two income distributions, where the latter can be a reference distribution for the former. In the case where the reference distribution is perfectly egalitarian – and uniquely in this case – we assume that any progressive transfer reduces the divergence, and that the divergence can be additively separated into inequality and efficiency loss. We characterize the unique class of decomposable divergence measures consistent with these views. We derive the associated relative and absolute subclasses, and we illustrate the applicability of our results. This approach extends the generalized entropy studied in inequality measurement.

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1. Introduction and overview

When individuals are identical in every aspect other than their respective incomes, theories of justice agree that an egalitarian distribution might be the best outcome for society as a whole. In this context, there is a consensus in the literature to use inequality indices, or dominance criteria such as the Lorenz quasi-ordering, for making normative judgments about the fairness of the income distribution. In practice however, individuals differ in many respects and an equally distributed income is no longer a social norm. As an immediate consequence conventional inequality indices become meaningless, unless other evaluation tools are introduced.

The aim of this paper is to provide a unified framework for the economic analysis of income distributions, when objectives other than the strict equality of incomes are considered. We build upon previous works on inequality measurement, by rethinking or extending some usual normative views. We then identify, through an axiomatic characterization, a large class of measures. The conditions we impose are fairly reasonable, and not very demanding. More importantly, we claim that such an approach may shed new light on important issues in inequality measurement.

The cornerstone of the inequality measurement theory is the *Pigou–Dalton principle of transfers*. This principle states that *any* progressive transfer from an individual to one poorer than him – transfer that does not modify the respective positions on the income scale – always reduces the inequality. Even if this principle is well established, it is not immune to criticism, and indeed not universally approved [5]. The principle of transfers actually encapsulates two normative views. Other things being equal, it first defines a *path* which characterizes an unambiguous improvement of the social welfare. Then, it describes a strictly egalitarian distribution as a *social objective*, since the equalizing process is completed when all individuals have the mean income.

These two dimensions have been separately investigated and criticized in the literature. First, whereas the income inequality is unambiguously reduced among the individuals involved in a progressive transfer, it is not so obvious that the inequality is also decreased in society as a whole [15]. Some combinations of progressive transfers can modify the distribution in a questionable direction, resulting for example in an increase in *polarization* [22,38]. Then, a strictly egalitarian distribution does not necessarily appear as a reference point for the social planner. Some income inequality, for example stemming from differences in personal responsibility – such as effort – may be viewed as fair, and might not be compensated [6,10,24,35].

In this paper we assume as a first normative requirement that, for any given income distribution (denoted by \mathbf{x}), there exists a *representative, reference or objective distribution* (denoted by \mathbf{y}). This view significantly weakens the second feature of the principle of transfers. Depending on the situation in which the measure is applied, the reference distribution can be, for example, fair according to the ethics of responsibility. We do not characterize this reference. We only assume its existence. Hence, other literature has to be invoked to complement our approach. There are now several possibilities to define what exactly is meant by *improvement*, holding total income constant, to get closer to the reference distribution. The approach we embrace in this paper is not really innovative, even if it slightly weakens the standard view of the principle of transfers – according to which a progressive transfer is *always* a suitable transformation. We assume that a progressive transfer is always an admissible path if, in the reference distribution, every individual has the mean income of the initial distribution. But we also assume that the effect of such a transfer may be ambiguous if the reference distribution is not fully egalitarian. This property is simply called *principle of transfers*, even if our definition is weaker than the standard one.

The second normative requirement we impose, relatively new in the literature, involves a situation where the mean income of the actual distribution \mathbf{x} and the reference distribution \mathbf{y} may

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