Understanding the Pro Transfer-sensitive Inequality Measures Under the Lorenz Curve Framework: an Appraisal

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Inequality measures under the Lorenz curve framework, considering the transfer sensitivity property, may broadly be classified into three categories: (i) anti transfer-sensitive, (ii) transfer-neutral, and (iii) pro transfer-sensitive. An inequality measure is said to be anti transfer-sensitive / transfer-neutral / pro transfer-sensitive depending on whether the diminution in poverty following on the transfer between the poorer pair of individuals is lesser than / the same as / greater than the diminution in poverty following on the transfer between the richer pair of individuals. If such technicalities are interpreted in terms of distributive justice, it follows that the third group only corresponds to the spirit of the Rawls' maximin rule, where the claim of the worse-off of the two groups matters. The prime but latent objective of studying economic inequality and the very same of the present paper too cry in accordance with the same spirit. However, measures under this category, such as the length-based 'Amato-Kakwani inequality index' and/or the area-based 'left-wing Gini coefficient' and/or the angle-based inequality measures are either much less frequently employed or less known. On the contrary, application of the transfer-neutral Gini coefficient is immensely vast, although its uses may obscure perceptions of large changes in the redistributive impact of the tax and transfer system. In such a situation, the present study makes an appraisal of the pro transfer-sensitive measures under the Lorenz curve framework synchronising various approaches and perspectives to demonstrate their workability (with simple numerical examples) with an overt objective of making them popular. Although, Gini coefficient satisfies the Pigou-Dalton transfer axiom (when other things remain equal, its value declines with a progressive rank preserving transfer of income), it is transfer-neutral, i.e., it is not differentially sensitive to transfers at either the lower end or the upper end of an income distribution. This transfer-neutrality may seriously contradict with the importance of linking between changes in different segments of an income distribution and changes in inequality measure that tries to summarise the different forms of the distribution. To cite one numerical example, consider an income distribution: p = (7, 13, 20, 27, 33). We make two downward transfers separately in p (at the lower and upper ends) to have two different forms of the distributions respectively: q = (9, 11, 20, 27, 33) and r = (7, 13, 20, 29, 31). It can be checked that Gini coefficients for the three are: 33, 32, and 32 respectively. Pigou-Dalton transfer axiom is satisfied in both the cases, as after both the rank-preserving transfers, index value decreased. However, the same for both the altered distributions remains the same, although the said two distributions are derived with completely two different objectives of benefitting the poorer and richer sections respectively. So, Gini coefficient may unable to distinguish between the changes in income distributions if the area covered by the Lorenz curve and the egalitarian line remains the same. In such a situation, researchers: (i) may analyse inequalities in terms of distribution tables indicating share of various groups in total income and total wealth rather than using synthetic indices such as the Gini coefficient, as suggested by (Piketty 2014); and/or (ii) should make themselves clear about which aspect of economic inequality they think matters most – e.g. elite concentration or middle class inclusion or the share or income level of the disadvantaged – and supplement the use of any single inequality index (such as Gini coefficient) with direct examination of the relevant segment of the income distribution, as suggested by (Osberg 2017). Driven by the spirit of these two points, the present paper goes a step further with the alternative measurement techniques to address the issues as mentioned above. Also, as the paper considers that the interest of the disadvantaged matters most, it goes with the pro transfer-sensitive measures of inequality.

There are three known measures of inequality, which are pro transfer-sensitive (as mentioned previously). The first one is nothing but the length of the Lorenz curve rescaled to range between 0 and 1. The higher the length of the Lorenz curve with respect to that in the ideal condition, the more is the indication of the extent of deviation or inequality. It was proposed by Amato (1968) and Kakwani (1980) and discussed much by Arnold (2005, 2012), Subramanian (2015). Although it has attractive geometric interpretation and desirable transfer-sensitivity properties, its popularity, up to now, is very low. Both Arnold (2012) and Subramanian (2015) proposed Lorenz curve free representation of it to make it popular.

The second proposed measure, under this category, is the ‘left-wing Gini coefficient’, which has been proposed by Subramanian (2015). He has shown that the transfer-neutral Gini coefficient can be presented as linear (convex) combinations of its two variants, which are anti transfer-sensitive and pro transfer-sensitive respectively. According to him, the latter, with pro transfer-sensitivity property, is reminiscent of a similarly ‘left-wing’ inequality measure, namely the ‘Amato-Kakwani inequality index’. Although the existence of this measure is mentioned by Majumder (2015) and Osberg (2017), it is to be explored further.

The third measure (a pair of measures actually), which is presented by Majumder (2015) and acknowledged by Subramanian (2015) and Osberg (2017), also remains unexplored. It is based on angle of deviation or refraction of the Lorenz curve in each stratum with respect to that of the ideal condition. Under this approach, Lorenz curve is compared with the propagation of light to apply basics of geometrical optics towards computing inequality index for each segment of the Lorenz curve. Finally, all the indices are added to get an overall measure for the whole framework. Interestingly, as the latter appears to be equivalent to the ‘Amato-Kakwani inequality index’, and as the approach allows piece-wise analysis of inequality along the curve length, it has immense potentiality to take the leading role in analysing inequality among all the pro transfer-sensitive measures known to us so far in literature.