Measuring Inequality Attitudes by Defective Leaky Buckets A Comment

by Christian Seidl

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Abstract

Amiel et al. (1999) use the Atkinson and the Gini social welfare functions to measure income inequality attitudes based on data from leaky-bucket experiments. Yet the experimental design does not allow their subjects to perceive income inequality according to the Gini or the Atkinson inequality measures. Moreover, their experimental design tries to measure inequality aversion by forcing their subjects to behave in accordance with inequality predilection.

Keywords: Inequality aversion; leaky-bucket experiment

JEL classification: C91; D63

1 Introduction

In a paper published in the *Scandinavian Journal of Economics*, Amiel, Creedy, and Hurn (1999) measured attitudes towards income inequality using survey data from leaky-bucked experiments. They told their subjects that a certain amount γ is taken from a richer person in an income distribution, and asked them for the minimum amount θ that needs to be *given* to a specified poorer person to make the transfer worthwhile. They exhorted their subjects that these questions were designed to find out their personal views, so that there are no 'right' or 'wrong' answers.

This means that they did not want to prescribe their subjects a particular procedure but accepted any expression of subjects' perceptions. This reflects their conviction "that there is no *correct* method of evaluating income inequality" (p.93). Yet their experimental design did not allow subjects to perceive income inequality according to the Gini or Atkinson inequality measures. Moreover, they tried to measure inequality aversion by forcing their subjects to behave in accordance with inequality predilection.

2 Measuring Attitudes Towards Inequality: Gini and Atkinson Off Limits

Amiel et al. employed data gained from leaky-bucket experiments to assess attitudes towards income inequality using three social welfare functions, viz. one with constant relative inequality aversion, one with constant absolute inequality aversion, and one based on the Gini coefficient.

Alas, their experimental design is fatally deficient for this purpose, as Amiel et al. ignored the high sensitivity of leaky-bucket data with respect to the *method* used to evaluate the perception of income inequality. In particular, they denied their subjects responses different from $0 \leq \theta/\gamma \leq 1$ (p.89), which restricted them in fact to evaluating income inequality in terms of social welfare functions. However, this was neither made explicit to subjects (on the contrary, they were told that there are no 'right' or 'wrong' answers), nor allowed the experimental design any responses for θ which differed from $0 \leq \theta/\gamma \leq 1$. Thus, the experimental design not only unduly restricted subjects from stating their true income inequality perceptions,[1] it also misled them by contending that θ has to be *given* to the poorer person to make a transfer worthwhile.

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[1] In a similar case the experimental design of Chechile and Cooke (1997) denied about one third of their subjects to state feasible equivalent probabilities; cf. also Traub et al. (1999).

To show that, let us join Amiel et al. (1999, p.92) and champion a Gini-based criterion to assess the perception of income inequality. Suppose that some subjects indeed employ the Gini coefficient. For the income distribution of part B of the Amiel et al. experiment[2], viz.

(1) $(5, 6, 7, 10, 15, 20),$

these subjects would register a Gini coefficient of 0.2778.

Question 7 of part B of the experiment states that 5 income units are taken from the richest person and asks how much should at least be given to the poorest person to make the transfer worthwhile. Now, for a genuine Gini subject, the correct answer should be $\theta = -2.5$, as only this value maintains the value of 0.2778 of the Gini coefficient! The income distribution, which has this value, is precisely

(2) $(2.5, 6, 7, 10, 15, 15).$

Similar results hold for Questions 6, 8, 9, 10, and the first Question 11 of Part B of the Amiel et al. (1999, p.95) experimental design.[3]

Let us now suppose that some other subjects are partisans of Atkinson's inequality measure for $\varepsilon = 1$, that is, for its variety with the log function:

$$(3) \qquad A = 1 - \exp\left[\frac{1}{n}\sum_{i=1}^{n}\ln\left(\frac{y_i}{\mu}\right)\right].$$

Then they register the value 0.1182 for the original income distribution (1). Question 7 of Part P of the Amiel et al. experimental design takes 5 income units from the richest person and asks how much the poorest person should at least be given to make the transfer worthwhile. Now, for a genuine log-Atkinsonian, the correct answer should be $\theta = -1.55$, as only this value maintains the value 0.1182 of the Atkinson measure! The income distribution, which has this value, is precisely[4]

(4) $(3.45, 6, 7, 10, 15, 15).$

These examples suffice to demonstrate that the experimental design used by Amiel et al. (1999) is highly deficient, as subjects are prohibited from perceiving income inequality in terms of the most popular inequality measures, viz.

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[2]All incomes are expressed in thousands of $.

[3]Space limitations of this short comment do not allow to state a full-fledged theorem for the effects of leaky-bucket transfers on the Gini coefficient; see Seidl (2001).

[4]In an impressive paper, Lambert and Lanza (2003) have shown that these phenomena hold for all common inequality–averse inequality measures. Thus, the Amiel et al. (1999) experimental design cannot be rescued for any one of the traditional inequality measures. Negative leakages are constitutive for all of them!

the Gini coefficient and the Atkinson measure. A viable experimental design to test the leaky-bucket phenomenon must neither restrict θ to be nonnegative, nor must it restrict θ not to exceed γ.[5] Both cases are quite common for subjects who evaluate their attitudes at income inequality according to income inequality measures.

3 Measuring Inequality Aversion by Enforcing Inequality Predilection?

Let us now follow Amiel et al. and assume that a subject's inequality attitude is embodied in a social welfare function defined on the space of income distributions, $W(y_1, \ldots, y_n)$. Let $W(\cdot)$ be symmetric and differentiable. Then a leaky-bucket transfer requires

$$(5) \qquad \frac{\partial W}{\partial y_j}(-\gamma) + \frac{\partial W}{\partial y_i}\theta \doteq 0, \quad y_j > y_i > 0,$$

which implies

$$(6) \qquad \theta = \frac{\frac{\partial W}{\partial y_j}}{\frac{\partial W}{\partial y_i}}\gamma.$$

The conditions $0 \leq \theta/\gamma \leq 1$ and $\partial W/\partial y_i > 0$ require

$$(7) \qquad \frac{\partial W}{\partial y_i} \geq \frac{\partial W}{\partial y_j} \geq 0, \quad y_j > y_i > 0,$$

which becomes

$$(8) \qquad \frac{\partial W}{\partial y_i} > \frac{\partial W}{\partial y_j} > 0, \quad y_j > y_i > 0$$

for strictly monotonous social welfare functions.

Let us now halt to reflect on inequality aversion. A person who is inequality averse can hardly agree that it is a good thing when the rich become richer. But according to a strictly monotonous social welfare function, (s)he has to precisely endorse that. If the income of a rich person decreases, income equality increases, which is desirable for an inequality averse person. However, this implies, on the other hand, that welfare decreases, which is undesirable for a welfare–maximizing subject.

Therefore, restricting subjects' responses to $0 \leq \theta/\gamma \leq 1$ means that they are forced to behave as if they were social welfare maximizers rather than inequality averse types. It is odd to measure income inequality aversion by offering subjects only the possibility to exhibit inequality predilection.

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[5]See Seidl (2001). Cases for $\theta > \gamma$ can also be shown for the Atkinson measure.

4 The Commonsense of Inequality Measurement

If the income of a rich person decreases by γ, equality of the income distribution increases.[6] In order to maintain the former level of income inequality, either the income of a poor person has to be decreased, or the income of a wealthy, but less rich person has to be increased by more than γ. Both moves are ruled out by the Amiel et al. experimental design. $0 \leq \theta/\gamma \leq 1$ can hold only if a leaky–bucket transfer occurs from a person in the lower income echelons to a still poorer person, or from a person in the high income echelons to a still richer person. The latter possibility is ruled out by the Amiel et al. experimental design, the former holds for their Questions 1–5 and the second Question 11 of Part B of their experiment for the Gini coefficient. Thus, their experimental design makes sense only for half of the questions of Part B of their experiment. For the other half it is deficient.

5 Conclusion

When subjects are asked to express *preferences* between income distributions, the adequate way is certainly the use of social welfare functions. But measuring subjects' attitudes towards inequality is another pair of shoes. A subject will certainly consider the income distribution (4, 4, 4, 4, 4, 4) to be more equally distributed than the income distribution (5, 6, 7, 10, 15, 20), and yet prefer the second income distributions to the first, in line with Pareto dominance. However, income inequality attitudes must not be confused with preferences among income distributions.

The data of the Amiel et al. experiment measure tradeoffs in social welfare rather than inequality aversion as expressed by income inequality measures. I do not deny that subjects may exist who perceive income inequality in terms of social welfare, thus making tradeoffs between the incomes of the rich and the poor. However, a decent experimental design must not ignore subjects who perceive income inequality in terms of one of the common inequality measures. Allowing subjects to perceive income inequality according to their intrinsic values must neither mislead subjects by suggesting that the poorer person to a transfer should be *given* additional income, nor must it impose the condition $0 \leq \theta/\gamma \leq 1$. Data gained under such constraints are not serviceable to estimate inequality aversion because they distort the responses

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[6]The following holds for most common measures of income inequality which assign higher weights to lower incomes.

of subjects who perceive income inequality according to one of the common inequality measures.

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