How to measure inequality as 'experienced difference'

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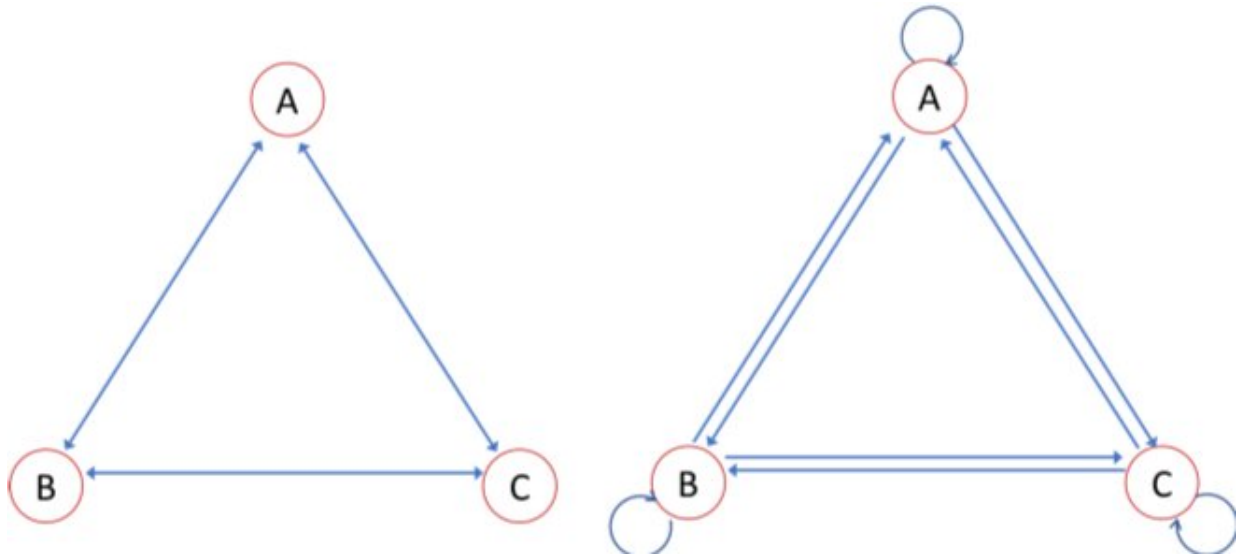

Experienced differences (left panel) and the edges used in the conventional measure (right panel). If nodes A, B, and C in Figure 1 have wealth 10, 4, and 3, for example, the Gini coefficient using the network representation in the left panel is 0.412. Using the network representation on the right, however, the Gini is estimated at 0.274 Credit: Samuel Bowles and Wendy Carlin

A new way of measuring wealth inequality better accounts for the way we experience it. In a paper published in *Economics Letters*, economists Samuel Bowles of the Santa Fe Institute and Wendy Carlin of University College London and the Santa Fe Institute propose a novel twist on the widely used Gini coefficient—a workhorse statistical measure for

gauging the gap between haves and have-nots.

In a perfectly egalitarian society, where all individuals are equally wealthy, the Gini co-efficient should be 0. Conversely, a society where a single individual holds all of the wealth should have a Gini coefficient equal to 1. Using the Gini coefficient, countries can be ranked from least to most unequal.

But individuals' wealth or income isn't the whole picture when it comes to inequality. According to Bowles and Carlin, the standard algorithm for calculating Gini coefficients produces odd results for example when a single individual owns all of the wealth the Gini coefficient is less than 1 which is the value it should attain under maximum inequality. Correcting that error, they show, requires a network-based fix that accounts for the relationships between individuals in the society.

"Some of the dimensions along which inequality is measured are best conceived as individual attributes, of which you simply have more or less, like height," explained Bowles. "But other dimensions—like wealth—are best conceived of as differences between people in their relationships with others."

The lefthand network in the image represents Bowles' and Carlin's approach, where the arrows connecting the nodes represent experienced social interactions. By their measure, it is the differences in wealth on these edges, not the wealth of each individual node, which is the basis of experienced inequality. In their paper, Bowles and Carlin also that show the correct Gini coefficient is calculated from the three differences associated with the three edges in the figure, and the average wealth. For example, say individual A has a wealth of 10, B has a wealth of 4, and C has a wealth of 3. Then the correctly measured Gini coefficient based on the differences along the three edges in the figure on the left is 0.41.

The standard algorithm illustrated on the righthand diagram in the image counts the difference between, say, person A and B twice (the two single-headed arrows); but an error in the algorithm arises because it also counts the "difference" between an individual's wealth and her own wealth (the curved arrows), which is always zero. As a result, the standard algorithm understates the degree of inequality, yielding a Gini coefficient of 0.27 for the same data as above.

The error becomes noticeable only when working with small populations , as archaeologists and biologists often do. In Carlin's case, a group of students in her econ 101 class tipped her off to the error when they applied a standard online algorithm for calculating Gini coefficients to a problem set.* The algorithm they had found online from Wolfram returned different answers for examples with small numbers of individuals from those found by applying the definition representing the network diagram on the left.

Bowles and Carlin also use differences in the network structure to look at the experience of inequality. If the three individuals in the complete network (on the left) were instead rearranged into a line, with the richer person in the center, as might represent a landlord with two isolated sharecroppers, then with no change in the wealth of the three individuals, the inequality experienced along the edges connecting the three would rise from 0.41 to 0.57.

They illustrate their method using social network data to estimate experienced inequality in a community of farmers in Nicaragua.

"Fixing the small numbers bias is not the main contribution of our paper," says Carlin. "It is that we have provided a way of understanding inequality consistent with our intuitions about how we experience economic disparities, that is by pairwise comparison of one's own wealth or income with that of others."

More information: Samuel Bowles et al, Inequality as experienced difference: A reformulation of the Gini coefficient, *Economics Letters* (2019). DOI: 10.1016/j.econlet.2019.108789

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