The Desirability of Using the Index of Dissimilarity or any Adjustment of It for Measuring Segregation: Reply to Falk, Cortese, and Cohen

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First, let me say that I no longer hold the position I took in my original 1977 paper that the index of dissimilarity or some adjustment of it should be used to measure segregation. A reading of the economic literature on measures of inequality has convinced me that the index of dissimilarity has faults that are irreparable and which make it unusable as a measure of segregation. Before discussing these faults, however, let me address the specific criticisms that Falk et al. have made of my earlier paper.

Falk et al. quote Duncan and Duncan out of context. The quote has nothing to do with the "stability" of the index of dissimilarity over populations that differ in proportion minority (hereafter referred to as q). Rather the Duncans are concerned about whether there is an adequate criterion for deciding whether a measure is independent of the proportion q. Their point is that comparisons between cities with different q's should not be made unless one has such a criterion.

The Duncans' suggest a criterion for independence: that a measure should only be dependent on the segregation curve. I suggested another criterion in my paper: that a measure's expected value not be a function of q. The appropriateness of using a measure to make intercity comparisons depends on which criterion one adopts. If one wants to measure segregation as the deviation from randomness, thus adopting my criterion (and the Denver group's), then the index of dissimilarity is not a suitable measure. If one wants to adopt the Duncans' criterion and measure segregation from "evenness" then use of my measure, E_d, or the Denver group's Z_d is inappropriate. With respect to the Duncan criterion both are dependent on q. As I showed in my article, no measure can be independent of q with respect to both criteria. One must choose the criterion that is appropriate to the substantive problem being investigated.

I still hold the position I took in my original paper that it is inappropriate to use a measure conceived of as the degree to which a city deviates from random segregation when the measure is to be used as an indepen-

dent variable. Z_d and E_d, I would argue, should only be used as dependent variables.

Falk et al. criticize my paper because the measures I suggest do not take account of the importance of the differing numbers of people in the areal units of a city. They are right in being concerned about this issue. It is not clear, however, that they have shown that use of my measures leads to substantially different results than theirs.

They conclude that the differences they find between the measures in the analysis of actual data are greater than the predicted theoretical differences. Is this important? I would argue that the important question is whether the rank orderings of cities derived from the different measures are highly correlated. One might also be concerned about whether the specific values assigned to the cities are highly correlated. If one measure is not close to being either a monotonic or linear transformation of another, then we have reason to worry. From Falk et al.'s comment it is impossible to tell whether they have found discrepancies of this sort.

As I stated above, I no longer hold the position that it is desirable to use the index of dissimilarity or some adjustment of it as a measure of segregation. My reasons are several.

First the index does not satisfy a very basic principle. I call this the exchange principle: If two families exchange houses so that each is moving to a block that has a greater proportion of the other race than the block they came from, then segregation is reduced. Necessarily, the two families must be of a different race. This exchange principle would seem to be basic to any notion of what it means to reduce segregation.

The index of dissimilarity (as well as E^d and Z^d) does not satisfy this principle. The index will only change if exchanges are between families who are in blocks that are disproportionately (relative to the composition of the city) composed of members of their own race. Suppose, for example, we have a total of four blocks in a city, of equal size, that are respectively 100, 60, 40, 0 percent minority. Assume that we exchange families so that the blocks are now 80, 80, 20, 20 percent minority. Segregation has been decreased according to the exchange principle. The index of dissimilarity, however, is the same for both distributions.

This property of the index of dissimilarity (and of other measures based on it) has another undesirable implication. The index is equally sensitive to all exchanges that lower the index. Consider another example. Assume that we start with the initial distribution of families described above. Take two situations, in each of which 10 percent of the families exchange houses. In the first situation families exchange houses so that the blocks are now 90, 60, 40, 10 percent minority. In the second situation families exchange houses so that the blocks are now 100, 50, 50, 0 percent minority. The index of dissimilarity would indicate that segregation had decreased by the same amount in both sets of exchanges. I, for one, would

argue that segregation had been decreased considerably more by the first set of exchanges than by the second. Introducing blacks and whites into blocks that had none before is considerably more significant than making two blocks that are nearly integrated completely so.

There is a more general problem with the index of dissimilarity and with other indices of segregation. Most of us would probably want to use an index that ordered populations in the same manner as the segregation curve. If the segregation curve for one population is never below that of another and is somewhere above, then the index should indicate the first population is less segregated than the second. This idea is just a translation of the familiar Lorenz criterion. The segregation curve criterion is identical to the exchange principle when we have populations with the same number of majority and minority families, the same number of areal units, and the areal units are of equal size.

If the segregation curves cross, however, what grounds do we have for deciding which distribution is more segregated? The index of dissimilarity (and its adjustments) provides one answer, but many other measures which satisfy the segregation curve criterion (which the index of dissimilarity does not) would give different results. In fact, if we have two segregation curves that cross it is always possible to find two measures satisfying the segregation curve criterion that rank the two populations differently.

Whether segregation curves cross frequently is an open question. For the Lorenz curves of income distributions, evidence suggests that they cross more often than not (Schwartz and Winship). If this is the case for segregation curves then using the index of dissimilarity will produce results that are highly dependent on having chosen this measure rather than another.

Duncan and Duncan point out that the problem of measuring segregation is closely related to the problem of measuring inequality. A considerable literature has developed in economics since 1970 that has examined the problem of how to measure inequality. Most of the articles have appeared in the *Journal of Economic Theory*. Sen's book provides a comprehensive overview of the problems and issues discussed prior to 1974. Schwartz and Winship also provide an introduction to the literature.

This literature is of great relevance to researchers interested in the problem of measuring segregation. Most of my comments on the index of dissimilarity come from my reading of that literature. The main implication of the literature is that the problems of developing a measure or measures of segregation are much greater than had been previously appreciated and go well beyond the issues that have been raised by the Denver group. Space prohibits me from discussing these problems further. An examination of this literature, however, is well worth the time of any researcher who is interested in the problem of how to measure segregation.

References

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