An Alternative Method For Measuring the Inequality of Educational Attainment: A Suggested Application

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ABSTRACT

This study shows that it is possible to measure the inequality of education attainment in using a method similar to that for measuring the inequality of income distribution, that is by the use of Gini rqtios.

For the states included in the sample, the biggest differences were in the proportion that had a bachelor's degree. In all cases these differences were shown to be significant.

Further research will be needed to determine the usefulness of this alternative measure in the modeling of an economic process. Research should also be done to determine the reasons for the differences in the inequality of educational attainment.

INTRODUCTION

At lot has been written about the importance of educational attainment as a factor influencing the economic conditions within a population. Those studies use a measure of educational attainment that is based on the absolute level of educational attainment such as the mean or median years of formal schooling.

It has been shown that it is possible to design a measure of educational attainment that is based on the inequality of educational attainment rather than the level (see Brendler, 2008). In this work we shall apply this alternative measure to testing of the differences in educational attainment between states.

As was shown in the earlier work, this measure directly parallels a traditional measure of income inequality, the Gini ratio. So we will be computing and testing for the differences in educational inequality between the individual states within the United States.

METHODOLOGY

As mentioned above, our methodology is based on a common measure of income inequality, the Gini ratio. The interpretation of this ratio can be explained with respect to the diagram shown below in Figure One.

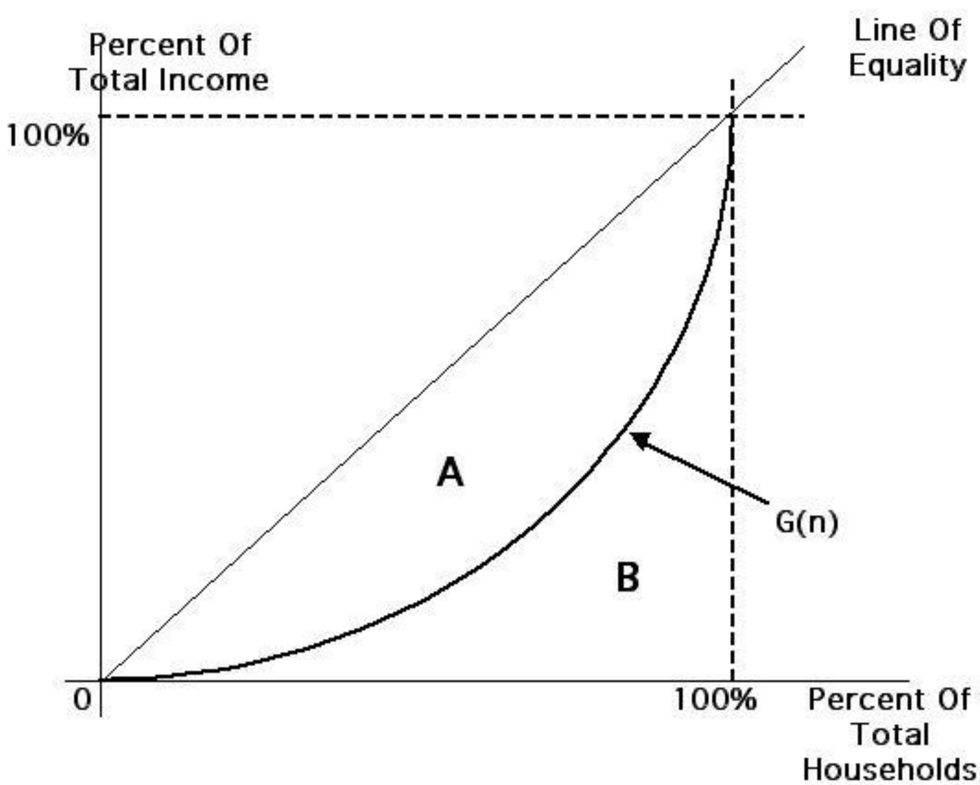

Figure One

A Lorenz Curve

Suppose all the households in a metro area were ranked from the lowest in household income to the highest. If we then measured the cumulative share of total household income at various cumulative shares of total households, we could generate a cumulative distribution function of household income, an example of which is shown in Figure One as G(n). So at a given percentage of total households, for example 20 percent, we could say that the "poorest 20 percent of the households have only x percent of total income."

If all households had the same income, then the cumulative distribution function would be a line from the origin at a forty-five degree angle with both axes. This is shown above as the Line of Equality. For example, on this line the first fifty percent of the households would have exactly fifty percent of the income.

The degree of income inequality is measured as the extent of deviation from the Line of Equality. This measure is called the Gini ratio and it is defined as:

$$g = \frac{A}{A+B} \qquad (1)$$

In equation 1, A and B refer to areas A and B in Figure One. As income distribution becomes more unequal, the relative size of area A grows, so that a higher Gini ratio means greater income inequality.

As used here, we would replace Percent of Total Income with the Percent of Total Educational Attainment. The resulting Gini ratios would then be subject to the same interpretation. A higher Gini ratio would mean a greater inequality of educational attainment.

What is required then is a methodology for measuring the total amount of educational attainment within a population. What follows is a description of that process, based on a method use in the earlier study.

MEASURING EDUCATIONAL ATTAINMENT

To avoid problems of definition, we will confine our study to measuring educational attainment within the United States. For example, in Canada, high school includes a fifth year. In the United States the fifth year would be considered post secondary. As shown in the earlier work, problems of this type can lead incorrect conclusions when comparing countries.

To measure the total educational stock, and to define the contribution of each level of education to that stock, we will use the same method as in the earlier work. We will assign arbitrary weights to each level of educational attainment, with each weight somewhat reflecting the level of formal schooling involved and it's contribution to the total educational stock. In our example, less than high school will have a weight of 1, high school but less than a bachelor's degree will have a weight of 2, completion of a bachelor's will have a weight of 6, and a graduate or professional degree will have a weight of 12.

The contribution of each level of educational attainment could then be calculated as the weight times the number of people within that segment. The total stock of educational attainment would then be the grand total of the attainment provided by each category.

The next step would be to calculate to percentage of the total stock within each category. From that calculation, the cumulative percentages could be calculated and measured against the cumulative percentage of the population. The final step would then be to calculate the Gini ratio for a given distribution.

Given that the percentage of the population with a given level of education is available, there is an alternative method to attain the same end. A proxy for the educational stock of a category could also be calculated by multiplying the population percentage in a category by that category's weight. These calculations could then be summed across all categories to derive the total educational stock, and the percentages for each category would be based on that number. This is the approach we will use here.

Once the Gini ratios have been calculated, the ratios could then included in any model where one wanted to include the inequality of educational attainment. We could also test for the significance of any differences in the inequality of educational attainment.

CALCULATING GINI RATIOS

For purposes of illustration, in this study we have included the states of Alabama, California, Louisiana, Maryland, Mississippi, and New York.

The Gini ratios were calculated by using the basic methodology outlined above. Because we had discrete rather than continuous distribution functions, we used the trapezoidal rule to approximate the values of the integrals. With our data, and the suggested weights, the Gini ratios obtained are shown below in Table One:

State	Gini Ratio
Alabama	**0.2546**
California	**0.3143**
Louisiana	**0.2467**
Mississippi	**0.2802**
Maryland	**0.3298**
New York	**0.3382**

Table One
Gini Ratios

COMPARING THE STATES

We will compare Maryland with Alabama, California with New York, and Louisiana with Mississippi. Again, these choices are totally arbitrary and serve only for purposes of illustration.

Because we could not compare states at a common exact point such as a quintile, we tested for a significant difference between the states by testing the difference in the proportion of the population within the broad category that showed the biggest difference between two given states. For some states the biggest difference may be between the proportions that have completed high school. For others, the biggest difference may be between the proportions that have a bachelor's degree.

The z scores are given below in Table Two. All of the differences were significant at the five percent level.

Comparison	Z score
Maryland vs. Alabama	**147.2704**
California vs. New York	**89.5997**
Louisiana vs. Mississippi	**280.8399**

Table Two
Z Scores

All the differences between the sampled states are significant, although there is some variation in the magnitude of the z scores. A visual examination of some of the distributions is also instructive. In Figure One, we have the comparison between California and New York. In Figure Two we have the comparison between Louisiana and Mississippi.

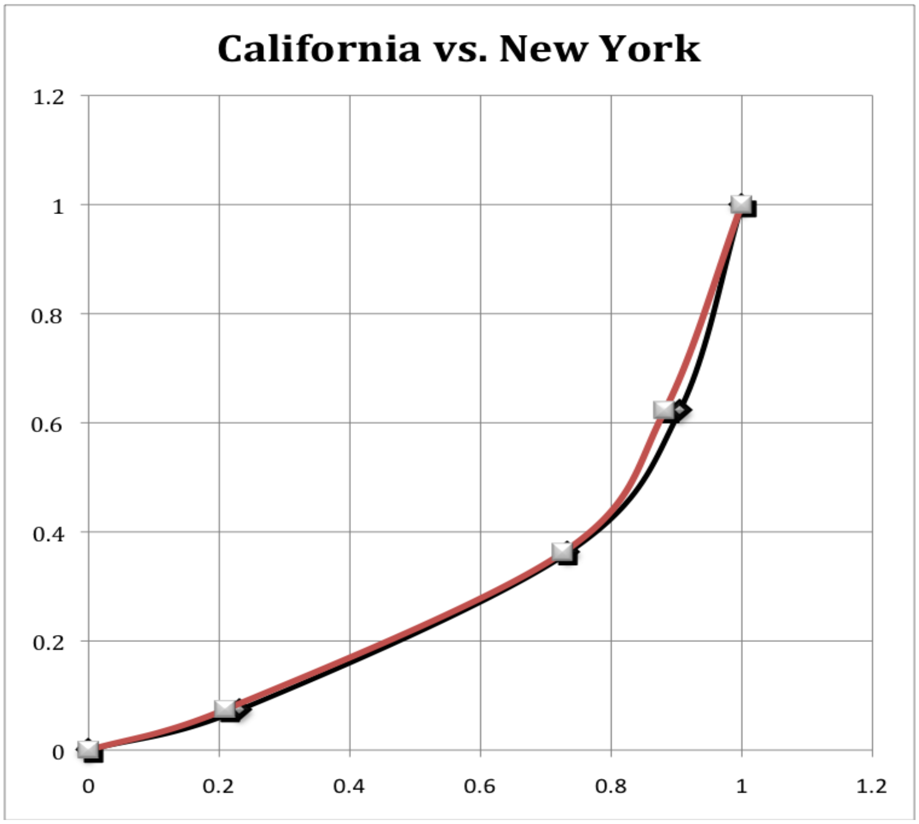

Figure One

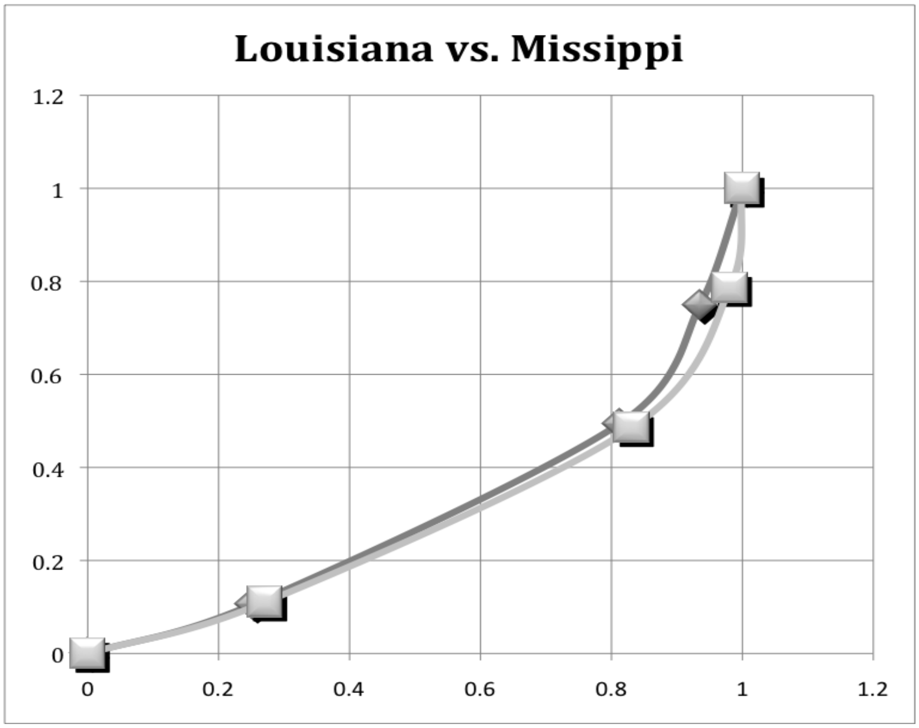

Figure Two

What is shown in both comparisons, one between an eastern and a western state, and another, between two southern states, is that the biggest difference happens to be towards the upper end. The biggest gap is, for both cases, in the proportion that has completed a bachelor's degree.

Figure Three shows the comparison between Maryland and Alabama.

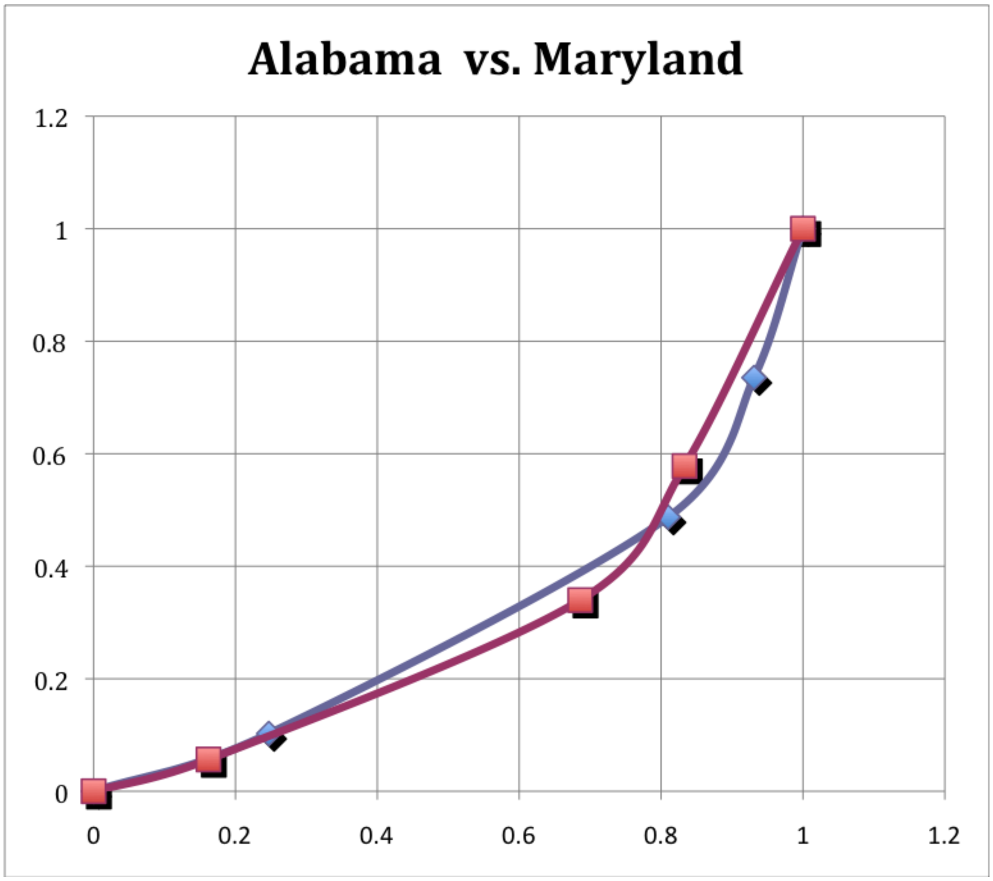

Figure Three

In this case the Lorenz curves cross leading to an ambigous answer to the question of which state has the most inequality. While there is a difference at the college completion level, in this case the biggest diference is below the intersection. The data indicates that the bigest sifference is in the high school completion rate. Explaining the location of the differences is also a possible research topic.

CONCLUDING REMARKS

There are two paths suggested for future research. One path would be that this alternative measure could be included various models as another measure of educational attainment. This measure may or may not improve the reliability of those models.

The other path would be to develop models that explain the differences in the inequality of educational attainment and the location of the inequality. Such models might serve as potential guides for policy measures.

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