**Measuring Distributional Inequalities: The Lorenz Curve and Gini Coefficient problem set solution[1]**
**In-Class Problem[2]**

Suppose we observe an economy with two groups of households differentiable by some socio-economic variable, such as race, as represented by the following:

| **Group X** | | **Group Y** | |
|---|---|---|---|
| Kasey | 24000 | Sheri | 18000 |
| Rose | 29000 | Julie | 22000 |
| Bill | 20000 | Joe | 74000 |
| Charles | 31000 | Beth | 30000 |
| Yukiko | 32000 | John | 15000 |
| Nina | 34000 | Gina | 30000 |
| Will | 60000 | Steve | 32000 |
| Tom | 35000 | Rick | 25000 |
| Raul | 37000 | Mark | 38000 |
| Becca | 42000 | Leslie | 60000 |

**a. Provide a Lorenz Curve Model on one graph showing the relative position of these two groups, this should be based on quintiles.**

Start by ranking agents in each group by income (low to high) and separate into quintiles. Add the income figures for each of these 5 groups (these are the quintile incomes) – rank by income totals for each group, lowest to highest. Calculate the quintile income as a % of total group income and the cumulative quintile income as a % of the group income as shown.

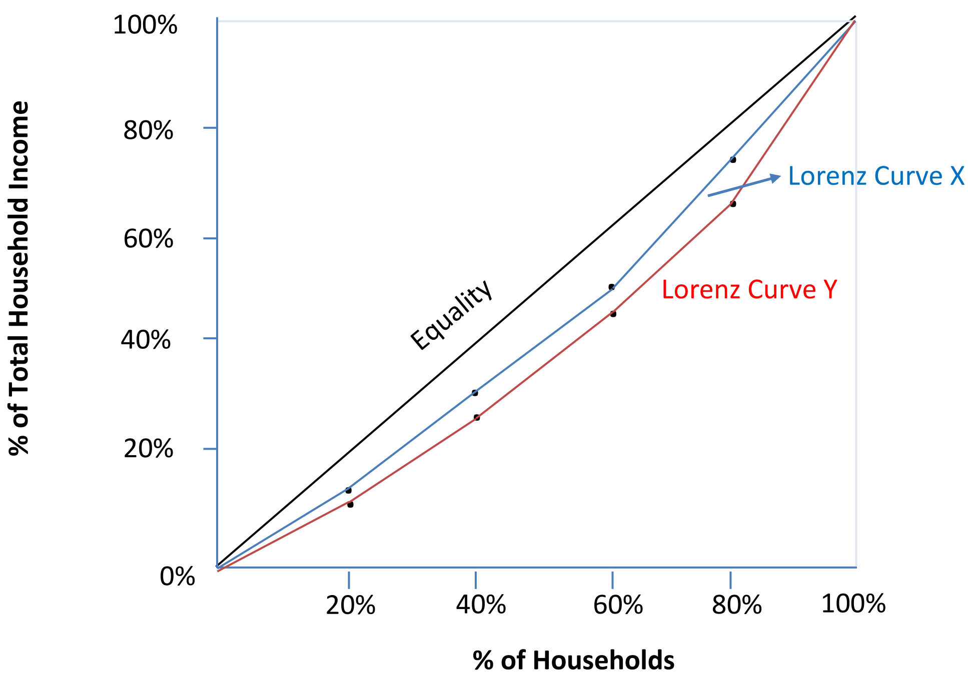
| Group X | | | | | |
|---|---|---|---|---|---|
| | | Quintile Income | Cumulative Quintile Income | Quintile Income as a % of total income | Cumulative Quintile income as % of total income |
| Bill | 20000 | | | | |
| Kasey | 24000 | 44000 | 44000 | .128 | .128 |
| Rose | 29000 | | | | |
| Charles | 31000 | 60000 | 104000 | .174 | .302 |
| Yukiko | 32000 | | | | |
| Nina | 34000 | 66000 | 170000 | .192 | .494 |
| Tom | 35000 | | | | |
| Raul | 37000 | 72000 | 242000 | .209 | .703 |
| Becca | 42000 | | | | |
| Will | 60000 | 102000 | 344000 | .297 | 1.00 |

[1] This In-Class Problem is intended to present an abbreviated discussion of the included economic concepts and is not intended to be a full or complete representation of them or the underlying economic foundations from which they are built.

[2] This problem was developed by Rick Haskell (rick.haskell@utah.edu), Ph.D. Student, Department of Economics, College of Social and Behavioral Sciences, The University of Utah, Salt Lake City, Utah (2014).

| Group Y | | | | | |
|---|---|---|---|---|---|
| | | Quintile Income | Cumulative Quintile Income | Quintile Income as % of total income | Cumulative Quintile income as % of total income |
| John | 15000 | | | | |
| Sheri | 18000 | 33000 | 33000 | .096 | .096 |
| Julie | 22000 | | | | |
| Rick | 25000 | 47000 | 80000 | .137 | .233 |
| Beth | 30000 | | | | |
| Gina | 30000 | 60000 | 140000 | .174 | .407 |
| Steve | 32000 | | | | |
| Mark | 38000 | 70000 | 210000 | .204 | .610 |
| Leslie | 60000 | | | | |
| Joe | 74000 | 134000 | 3440000 | .389 | 1.00 |

Then plot quintiles on graph as shown, keep Lorenz Curve for each group separate – be sure to label each part as show



**b. Provide the Gini Coefficient for each group**

Calculate area "B" for each group using the formula structure from the Instructional Primer

***Group X***

Sum of the rectangles (use the simplified equation shown the instructional primer):

$$(.20)(.128 + .302 + .494 + .703) = (.20)(1.63) = .325 \quad (1)$$

$$.10 = sum\ of\ triangles \quad (2)$$

Now we can sum the triangles and rectangles such that:

$$.10 + .325 = .425 = sum\ of\ triangles + sum\ of\ rectangles = B \quad (3)$$

and we can now subtract B from A+B such that:

$$.5 - .425 = .075 = A. \quad (4)$$

Finally we apply the ***Gini Coefficient*** ratio of $\frac{A}{A+B} = Gini\ Coefficient_{East}$ such that:

$$\frac{A}{A+B} = \frac{.075}{.5} = .15 = Gini\ Coefficient\ Group\ X. \quad (5)$$

***Group Y***

Sum of the rectangles (use the simplified equation shown the instructional primer):

$$(.20)(.096 + .233 + .407 + .610) = (.20)(1.34) = .269 \quad (6)$$

$$.10 = sum\ of\ triangles \quad (7)$$

Now we can sum the triangles and rectangles such that:

$$.10 + .269 = .369 = sum\ of\ triangles + sum\ of\ rectangles = B \quad (8)$$

and we can now subtract B from A+B such that:

$$.5 - .369 = .131 = A. \quad (9)$$

Finally we apply the ***Gini Coefficient*** ratio of $\frac{A}{A+B} = Gini\ Coefficient_{East}$ such that:

$$\frac{A}{A+B} = \frac{.131}{.5} = .262 = Gini\ Coefficient\ Group\ Y. \quad (10)$$

Notice that the Gini Coefficient for Group X is less than the Gini Coefficient for Group Y (1.5 < .262), this is consistent with the graphic representation as the Lorenz Curve for Group X is closer to the Line of Equality than is the curve for Group Y