ECON 133 "Global Inequality and Growth"
Midterm

1. **True False Statement/Questions (12 points; 2 points each)**
   Explain your answer fully based on what was discussed in lectures and sections. All the credit is based on the explanation.

   (a) Countries at the world's technological frontier have experienced consistently high productivity growth rates throughout history, sometimes maintaining close to 10% growth rates over the course of several decades. **False. We have seen in lecture that productivity growth at the world's technological frontier has never been durably higher than 2% a year.**

   (b) The capital share of national income α always rises with the capital/income ratio β. **False, in a CES framework, the capital income share is a rising function of beta iff elasticity of substitution is greater than one. Full points for mentioning CES. Alternatively, negative real interest rates would imply that capital income share decreases with wealth-to-income ratio ($\alpha = r \cdot \beta$), but this assumption would depart from our framework where $\alpha \in (0,1)$.**

   (c) Absolute purchasing power parity requires that the real exchange rate is always equal to one. **True, by definition.**

   (d) The functional distribution of income bears no relationship with the distribution of individual incomes. **False. The distribution of individual income has a functional relationship with aggregate production (e.g. labor/capital income share, aggregate capital + labor income/inputs and mean levels among the personal distribution, etc.**

   (e) In the long-run, and assuming that capital gains are negligible, the capital stock of the economy is equal to s/g times its national income (where s is the economy's saving rate and g the growth rate of national income). **True, under the assumptions of our steady state result that $\beta = s/g$. We have:**

   $$\beta = s/g$$
   $$\beta = W/Y$$
   $$s/g = W/Y$$
   $$W = \frac{s}{g}Y.$$

   And recall that national wealth and capital stock are synonymous in this context.

   (f) The income of the bottom 50% in the United States is lower after taxes and transfers than before. **False. We demonstrated this in lecture that taxes and transfers in the US operate in a net progressive manner.**

2. **(14 points)**

Consider an economy where national income is distributed as follows: the bottom 50% earns 10% of total national income, the middle 40% (from the 50th to the 90th percentile) earns 40%, and the top 10% earns 50%. Moreover, assume that within each of these groups, income is equally distributed.

Part 1:

(a) Graph the Lorenz curve and the line of perfect equality. Clearly label each axis (2 points). **Points awarded for a correctly drawn Lorenz curve.**

(b) Show that in this economy, the Gini coefficient is equal to 0.56. Clearly explain your computation (3 points). **Calculate the Gini coefficient by subtracting two time the area under the Lorenz curve from one.** $G = .56$.

(c) Suppose now that there is inequality within groups, and each group's shares remain constant. Illustrate in the graph how the new Lorenz curve would look like. Is the Gini coefficient higher or lower? (1 point). **The Lorenz curve should now have a curved line (and not be piecewise linear), intersecting the original Lorenz curve at the points separating the different groups. Inequality is higher.**

(d) Assuming that you have all the information required to compute either coefficient, which measure do you prefer to quantify inequality: the Gini coefficient or top income shares (e.g., the share of income earned by the top 10%)? Why? This is an open question and credit fully depends on the coherence of the answer. (2 points) **In principle either one, but we discussed in class how the Gini coefficient doesn't have a straightforward interpretation in of itself—it typicalyl needs to be compared with other values, whereas income shares have a straightforward interpretation. Gini might be used more commonly. Also, the Gini coefficient speaks to the entirety of the distribution, and income shares only look at a portion, by definition.**

Part 2: Suppose that the average per capita income in this economy is $20,000. Remember that national income is distributed as follows: the bottom 50% earns 10%, the middle 40% earns 40%, and the top 10% earns 50% of total income.

(e) What is the average income of each group? Clearly explain your computation. (2 points) **Average income of percentile group** i **= income share of** i **divided by population share of** i**, times overall average income. 1) .1/.5* 20k = 4000, 2) .4/.4*20k = 20k, 3) .5*/.1 = 100k.**

(f) Suppose that the top of the distribution (i.e., above the 90th percentile) can be characterized by a Pareto coefficient of 1.5. What is the inverted Pareto coefficient in this economy? (1 points) **b = a/(a-1). b = 1.5 / (1.5-1) = 3**

(g) Assume that the threshold income to belong to the top 1% is $200,000. What is the income share of the top 1%? (Hint: you need to calculate the average income of the top 1%). (3 points) **Average income of top 1% = inverted pareto coefficient**

* income threshold = 3 * 200k = 600k.

Income share of top 1%
= Total inc. of top 1% divided by total income
= (Avg inc. of top 1% times pop. of top 1%) / (Avg inc. * total pop.)
= (Average inc. of top 1 /(Average income) * pop. share of top 1%
= 600k/20k * .01 = .3

3. **Exercise 3 (8 points)**

   Assume there are two countries in the world, A and B, with four persons in each country. The income of people in country A and B is given, respectively, by:

   $$A = \{5, 15, 65, 75\}$$
   $$B = \{10, 20, 30, 60\}$$

   (a) For each country separately, compute the income share of the bottom 50%. Then, compute the income share of the global top 25% **For country A: bottom50 = 12.5%. For country B: bottom50 = 25%.**
   The global top 25% income share is (65 + 75) / (160 + 120) = .5

   Now we want to compute the counterfactual global top 25% income share if the the two countries had the same average income.

   (b) First, compute the average income of each country.
   The average income of country A is 40. The average income of country B is 30.

   (c) Modify the income distribution of B so that average income in B is equal to average income in A, while preserving the distribution of income in B. (Hint: adjust the incomes of country B by the ratio of average income between countries). Give the resulting distribution of B as your answer. **The ratio of average income is 4/3. Multiply incomes in country B by this proportion:**

   $$\{13.\bar{3}, 26.\bar{6}, 40, 80\}.$$

   (d) Aggregate the resulting B distribution and the original A distribution to obtain the counterfactual global top 25% income share if the the two countries had the same average income ("within-country component" of inequality). What does this result imply regarding the relative importance of between-country inequality versus within-country inequality in determining overall global inequality? **Now, The global top 25% income share is (80 + 75) / (160 + 160) ≈ .484. It is only slightly lower than the true distribution. This means that within-country inequality is much more important than between-country inequality.**

Choose **one** of the following two questions

- According to the Lobello article in The Week, rank empirical estimates of inequality in the US from greatest to least as measured by income, wealth, and consumption. If you had to pick only two of the three to describe inequality in the US, which would you choose, and why?
- Based on the Citi Report, *Closing the Racial Inequality Gap*, describe the differences of the level of peak income and the time it occurs in regards to gender and/or race. What implications does these differences have in income accumulation and wealth concentration?

(a): $Ineq_{consumption} < Ineq_{income} < Ineq_{wealth}$. **Points awarded for explanation.**
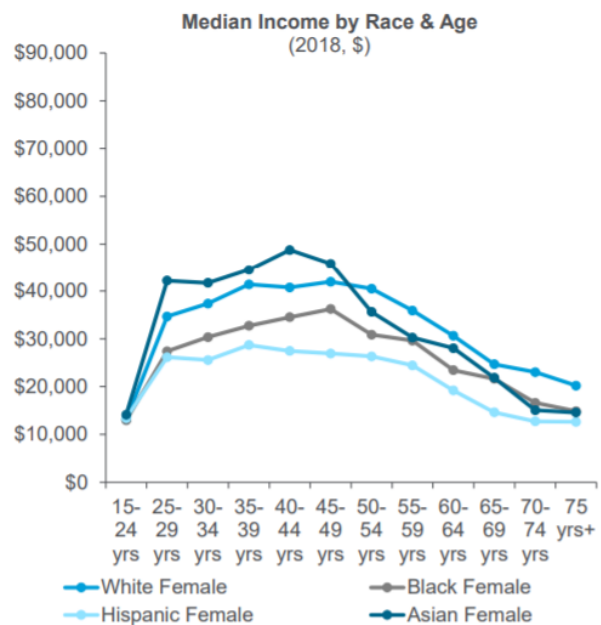
(b): Points awarded for explanation.

Figure 46. Peak Income Occurs Sooner and Lower for Black Males

Median Income by Race & Age
(2018, $)
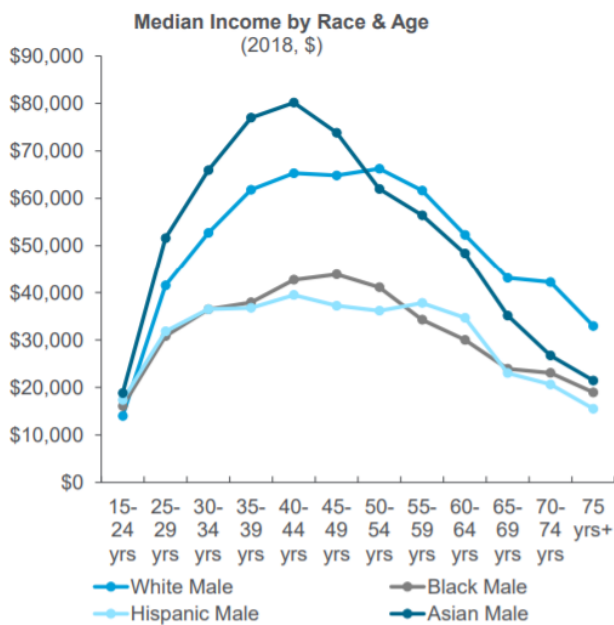
Source: Census Bureau, Citi Research

Figure 47. Income Prospects Over a Lifetime are Worse for Women

Median Income by Race & Age
(2018, $)

Source: Census Bureau, Citi Research