ECON 133 "Global Inequality and Growth" Midterm

1. **True False Statement/Questions (10 points)**
   Explain your answer fully based on what has been discussed in lecture and in section. No more than 5 lines per question. All the credit is based on the explanation.

   (a) Global income inequality should always be measured using PPP exchange rates rather than market exchange rates.

   - FALSE. It depends on the question you are interested on. *(1 point)*
   - PPP gives a more accurate picture of individuals who essentially spend their incomes in their own countries. Market exchange rates are perhaps better to inform about inequality in a world where individuals can easily spend their incomes where they want. *(1 point)*

   (b) Global inequality would be lower than today if average income was the same across countries.

   - TRUE. Global inequality is explained both by between and within inequality. So if all countries had the same average income, the global 10% income share would lower than it is today (below 50%, see Figure 2.1.8 in the World Inequality Report and lecture slides).*(1.5 points)*
   - However it would only be slightly lower, as the bulk of global income inequality comes from within-country inequality.*(0.5 points)*

   (c) The equation $\alpha = r \times \beta$ is true whatever the elasticity of substitution between capital and labor.

   - TRUE: $\alpha = r \times \beta$ is an accounting identity, it holds true for any production function *(2 points)*

   (d) If income is Pareto-distributed with a Pareto coefficient a equal to 3, the average income above \$1 million is \$3 million.

   - FALSE: you need to compute the concentration coefficient $b = \frac{a}{a-1} = \frac{3}{2}$. Therefore, in country A, the average income above \$1 million is \$1.5 million (i.e. 1 million $\times \frac{3}{2}$) *(2 points)*

   (e) A country that receives positive net foreign income necessarily has a positive net foreign asset position.

   - FALSE: The U.S. for instance has net negative assets but a positive net foreign income position. This is because the return of US assets held abroad is larger than what the U.S. pays on its liabilities. This is what we call the exorbitant tax privilege. Mathematically, in the US:
     - net foreign assets $= FA - FL < 0$
     - net foreign income $= FA \times r_A - FL \times r_L > 0$
     - This is because $r_A >> r_L$

     (2 points)

2. **Exercise 1 (10 points)**

Consider the following wealth accumulation equation: $W_{t+1} = W_t + s_t Y_t$, where W_t is wealth in year t, s_t is the saving rate, and Y_t is national income. Assume that the growth rate of national income is g_t for period t.

(a) What assumption does this equation make about the sources of wealth accumulation? (1 point)

- This equation assumes that there are no capital gains/losses and all changes in wealth owe to new savings *(1 point)*

(b) Express β_{t+1}, the wealth-income ratio for period $t+1$, as a function of β_t, s_t and g_t. (2 points)

- $Y_{t+1} = Y_t(1 + g_t)$. *(1 point)*
- Dividing W_{t+1} by Y_{t+1} get the wealth-income ratio. *(1 point)*

$$\frac{W_{t+1}}{Y_{t+1}} = \frac{W_t + s_t Y_t}{Y_t(1 + g_t)}$$
$$\Rightarrow \beta_{t+1} = \frac{\beta_t + s_t}{1 + g_t}$$

(c) Show that in steady state, $\beta = \frac{s}{g}$. (2 points)

- In steady-state $\beta_t = \beta_{t+1}$, $s_t = s$ and $g_t = g$. *(0.5 points)*
- Plug this into the equation in (a). *(1.5 points)*

$$\beta_{t+1} = \frac{\beta_t + s_t}{1 + g_t}$$
$$\beta = \frac{\beta + s}{1 + g}$$
$$\beta + \beta g = \beta + s$$
$$\beta = \frac{s}{g}$$

(d) How useful is this relationship in understanding China's current saving rate? (1 point)

- China has experienced high growth over the last years. In order to sustain a high β, they need a high rate of savings. *(1 point)*

(e) Assume that in steady state, $s = 12\%$, $g = 1.5\%$, and the average rate of return to capital is $r = 4\%$. What are the implied values for β and α in steady state? Explain. (2 points)

- $\beta = s/g = 12\%/1.5\% = 800\%$ *(0.5 point)*
- To get α we need to use the basic accounting law $\alpha = r \times \beta$ *(1 point)*
- $\alpha = r \times \beta = 4\% \times 800\% = 32\%$ *(0.5 point)*

(f) How has the wealth-income ratio β evolved in rich countries since 1970? In countries like France and the U.K., how do today's wealth-income ratios compare to the wealth-income ratios of the 18th-19th centuries? (2 points)

- β_t has gradually increased from 200%-400% in 1970 to around 400-600% in rich countries today. *(1 point)*

- Wealth-income ratios seem to be returning to their values of the 18th and 19th centuries, around 700%. *(1 point)*

3. **Exercise 2 (10 points)**

Consider a CES production function $Y = F(L_s, L_u) = (A_s(L_s)^\rho + A_u(L_u)^\rho)^{\frac{1}{\rho}}$ with L_s high-skill labor, and L_u low-skill labor, A_u and A_s are two separate technology terms and ρ is a constant $\in (-\infty, 1)$.

(a) Give the definition of the skill premium (1 point).

- The skill premium is the ratio between the wage of high-skill workers and the wage of low-skill workers.

(b) Show that in this model, the skill premium is equal to $\frac{A_s}{A_u} \left(\frac{L_u}{L_s}\right)^{1-\rho}$. (2 points)

- Taking the FOC of the profit maximisation problem:

$$w_u = \frac{1}{\rho} (A_u L_u^\rho + A_s L_s^\rho)^{\frac{1}{\rho}-1} \times \rho A_u L_u^{\rho-1}$$
$$= (A_u L_u^\rho + A_s L_s^\rho)^{\frac{1-\rho}{\rho}} \times A_u L_u^{\rho-1}$$
$$= (A_u L_u^\rho + A_s L_s^\rho)^{\frac{1}{\rho}\times(1-\rho)} \times A_u L_u^{\rho-1}$$
$$= Y^{1-\rho} \times A_u L_u^{\rho-1}$$

Using a similar reasoning you get:

$$w_s = Y^{1-\rho} \times A_s L_s^{\rho-1}$$

Therefore, we can write:

$$\frac{w_s}{w_u} = \frac{A_s}{A_u} \left(\frac{L_u}{L_s}\right)^{1-\rho} \qquad \textit{(2 points, partial credit for intermediate steps)}$$

(c) What does $\frac{A_s}{A_u}$ capture? How has this ratio evolved in the U.S. since the 1960s? (2 points)

- $\frac{A_s}{A_u}$ captures the relative importance of skilled labor in the production function. It reflects the relative demand for skilled workers *(1 point)*
- Since the 1960s, successive waves of innovation have reduced demand for physical labor and increased the centrality of cognitive labor so that $\frac{A_s}{A_u}$ has increased in the past 60 years. *(1 point)*

(d) What does $\frac{L_s}{L_u}$ capture? How has it evolved in the U.S. since the 1960s? (2 points)

- $\frac{L_s}{L_u}$ captures the relative supply of skilled labor *(0.75 point)*
- It has increased since the 1960s, but the growth rate has varied:
  - 1960–1970s: Large rise in college enrollment. *(0.5 point)*
  - 1982–2004: Deceleration in college educated workers, due to the end of the Vietnam War (short-run factor) and the rise of inequality in access to higher education (long-run factor). Note: this doesn't mean it decreased, it means the growth rate slowed down. *(0.5 point)*
  - Since 2005: Modest increase in college enrollment rate *(0.25 point)*

(e) In fact, $\rho = \frac{\sigma-1}{\sigma}$ where σ is the elasticity of substitution between skilled and unskilled labor. Discuss how changes in $\frac{L_u}{L_s}$ affect the skill premium depending on σ. (1 point)

- the skill premium rises with $\frac{L_u}{L_s}$ (skilled workers are more scarce) *0.25 point)*

- As long as σ is finite, and the extent to which the relative supply of unskilled vs. skilled labor affects the wage premium decreases as the degree of substitutability between workers increases. *0.5 point)*
- In the extreme case where skilled and unskilled labor are perfect substitutes ($\rho = 1$ or $\sigma = \infty$), the wage premium is $w_s/w_u = A_s/A_u$ and the relative supply of unskilled vs. skilled workers plays no role in explaining wage differentials. *(0.25 point)*

(f) Some politicians have advocated in favor of making it harder for big corporations to merge. How would such policy affect the skill premium? (2 points)

- Stronger anti-trust may improve competition and reduce market power, e.g., monoposony power in the labor market *(1 point)*
- Consequences of monopsony on labor market: wage < marginal product. This is particularly true for low-income earners who lack of negotiating power. Therefore we can expect that curtailing monopsony could reduce the skill premium *(1 point)*.

BONUS (2 points): We tweeted a The Guardian article about the gender gap. What policy does the article discuss? Name an approach that has proven to be effective within the firms that improved their gender gap.

- The policy mandates firms in the UK with more that 250 employees to report their gender gap. *(1 point)*

- An effective way to reduce the gap is getting women into higher paying jobs within the firm (management jobs and top positions). *(1 point)*.