Spring 2017

ECON 133 "Global Inequality and Growth" Midterm

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

   (a) The observed disappearance of the gender gap in labor force participation suggests the absence of gender discrimination in the labor market.

   - FALSE. There are considerable gender discrepancies in *earnings* - men earn 1.7X as much as women, and at the top, the gender gap is quite pronounced, as the top income earners is dominated by men. *(1.5 points)* More importantly though, labor force participation does not describe gender *discrimination*, which can take many forms, including implicit and institutional biases against women. *(0.5 points)*

   (b) In the U.S., low top marginal income tax rates can explain why top earners (e.g. CEOs) receive very high wages.

   - TRUE. Countries where top tax rates have fallen more are those where the top 1% income share has increased more. *(1 point)* CEOs bargain their pay, making their wages exceed their marginal productivity. *(1 point)*

   (c) The Pareto coefficient a is $a = 1.7$ in country A and $a = 1.5$ in country B. Therefore, income is more concentrated at the top in country A than in country B.

   - FALSE. A higher Pareto coefficient a implies *lower* income inequality. *(2 points)*

   (d) The income Gini coefficient in the U.S. decreased from 40.62 in 2005 to 40.46 in 2010. Hence income inequality has decreased in the US during this period.

   - FALSE. Gini coefficients are calculated using household surveys. Households surveys do not capture well the top of the income distribution (e.g., top-coding, underreporting of capital income; sampling bias). You could also say that the Gini coefficient primarily measures inequality in the middle of the distribution *(1 point)*. Moreover, the top 1% income share has increased during this period, which we can see using tax data. *(1 point)*

   (e) Labor market institutions have played a role in the rise of wage inequality in the US. (2 points)

   - TRUE. Minimum wage, unions, taxation, market power, globalization, and equal access to college education are all examples of institutions that have affected rising wage inequality. *(0.5 points for each named, max 2 points)*

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

Consider a closed economy with two inputs, L and K, and a Cobb-Douglas production function $Y = F(K, L) = K^{\alpha}L^{1-\alpha}$.

(a) Assume that that the rate of return to capital r and wage rate w are equal to the marginal products of capital and labor, respectively. Show that the share of income accruing to capital is α (that is, $Y_K = \alpha Y$). (2 points)

- Profit maximization leads to $F_K = r$ and $F_L = w$, or marginal product of each factor is equal to the price of said factor *(0.5 points)*. Then, $F_K = r$ means $\alpha K^{\alpha-1}L^{1-\alpha} = r \Rightarrow \alpha Y/K = r$, i.e. $Y_K = rK = \alpha Y$ *(1.5 points)*

(b) Prove that $\alpha = r \times \beta$. Interpret what this relationship means. Is it relationship true only for Cobb-Douglas production functions? (2 points)

- $\alpha K^{\alpha-1}L^{1-\alpha} = r \Rightarrow \alpha Y/K = r \Rightarrow \alpha = r \times \beta$ *(1 point)*
- It's an accounting identity; it's true for any production function. *(0.5 points)*.
- It states that the capital share is equal to the rate of return to capital times the wealth-to-income ratio *(0.5 points)*.

(c) What is the value of the elasticity of substitution σ for the Cobb-Douglas production function? Give an intuitive interpretation. (2 points)

- $\sigma = 1$ *(1 point)*
- When w/r rises by 1% then K/L rises by 1%. *(1 point)*

(d) Does the Cobb-Douglas production function accord well with the observed trends in factor shares and wealth-to-income ratios seen since the mid-1970s? Explain your answer. (2 points)

- With Cobb-Douglas production function ($F(K_t, L_t) = K_t^{\alpha}L_t^{1-\alpha}$) and a closed economy, the capital share is entirely set by technology: $\alpha_t = r_t\beta_{kt} = \alpha$, i.e. a higher β_{kt} is exactly compensated by a lower r_t, or a change in β does not affect α *(1 point)*
- But what we see in the data is that α and β have been rising over time *(1 point)*

(e) What are the main reasons why the capital share of income has increased since the mid-1970s? (2 points)

- One potential explanation is: rising β and CES production function

$$F(K, L) = (aK^{\frac{\sigma-1}{\sigma}} + (1-a)L^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}$$

  with $\sigma > 1$
- Other explanation: change in bargaining power of labor vs. capital *(2 points for either explanation)*

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

Consider a Cobb-Douglas production function $Y = F(L_s, L_u) = L_s^{\theta} L_u^{1-\theta}$ with L_s high-skill labor, and L_u low-skill labor.

(a) What does θ capture? How has θ evolved in the U.S.? (2 points)

- θ represents the relative importance of skilled labor in the production function. *(1 point)*
- The expansion of college education has increased the prevalence of college-educated workers in the U.S. Thus, θ has increased since the mid-20th century. *(1 point)*

(b) Express the skill premium (i.e., the relative wage of high-skill workers) as a function of θ, L_u, and L_s. Interpret. (2 points)

- $\frac{w_s}{w_u} = \frac{\partial F(L_s,L_u)/\partial L_s}{\partial F(L_s,L_u)/\partial L_u} = \frac{\theta L_s^{\theta-1} L_u^{1-\theta}}{(1-\theta) L_s^{\theta} L_u^{-\theta}} = \frac{\theta}{1-\theta}\left(\frac{L_u}{L_s}\right)$ *(1 point)*
- The relative wage of skilled workers is a function of the relative importance of skilled labor in the production function (θ), and changes in the relative supply of skills (L_u/L_s). *(1 point)*

(c) What is the percentage change in the skill premium as a result of a 1 percent *decrease* in the relative supply of skills? (2 points)

- For a given skill bias of technology, a relative decrease in L_s is equivalent to an increase in L_u/L_s. Using the result from above, we see that, all else equal, an increase in L_u/L_s leads to an increase in w_s/w_u (the skill premium).
- In Cobb-Douglas, the elasticity of substitution between skilled and unskilled labor (σ) equals 1. Thus, a 1% increase in L_u/L_s raises w_s/w_u by 1%. *(2 points for the latter, 0.5 points for only the former)*

(d) How has the skill premium evolved in the US since the 1960s? Does the education race model accurately predict what we see in the data? (2 points)

- A deceleration in the growth of college-educated workers after the end of the Vietnam war led to a substantial increase in the skill premium. *(1 point)*
- Generally speaking the model does a very good job, but it's not perfect.
  - The model has done a poor job predicting trends since the 1990s *(0.5 points)*
  - The model does not explain why labor income inequality has risen more in the US than in other countries *(0.25 points)*
  - It's not clear from the model why labor income inequality was driven by the top 1% before the turn of the century *(0.25 points)*

  (0.25 points if they claim the model is not perfect, but give no explanation)

(e) In the 2016 Presidential election, candidate Bernie Sanders proposed to more than double the federal minimum wage from \$7.25 per hour to \$15 per hour. How would this affect the skill premium derived in part (b)? Based on the evidence discussed in class, what effects could such an increase have on unskilled workers' employment? (2 points)

- Assuming the federal minimum wage is binding, an increase in the minimum wage will increase w_u, and thus reduce w_s/w_u (skill premium). *(1 points)*
- Evidence provided in class:

  - A seminal paper by Card and Krueger (1994) studies a minimum wage increase in New Jersey and compares the effects on employment and prices using eastern Pennsylvania as a control.*(0.25 points for mentioning "Card and Krueger")*
  - The authors found no increases in unemployment among low-skilled workers due to the minimum wage increase.*(0.25 points)*
  - However, the increase proposed by Bernie Sanders is an un-predecented and large increase. It is unclear what effects such a proposal would have on employment of low-skilled workers. *(0.5 points)*

BONUS (2 points): We tweeted a New York Times article by Tyler Cowen about assortative matching. What is this and how does it contribute to income inequality?

- Assortative matching is when people of like education and/or income level marry *(1 points)*
- This phenomenon increases concentration of incomes and reduces social mobility. *(1 points)*