

ECON 133 “Global Inequality and Growth” Final Exam

Exercise 1 (20 points): True False Statement/Questions

Explain your answer fully based on the material seen in lecture and section (no more than 5 lines per question). All the credit is based on the explanation. (2 points for each question.)

1. The Gini coefficient is very sensitive to inequality at the top-end of the distribution.
2. Modigliani’s definition of the share of inherited wealth in total wealth is problematic because it fails to recognize that inherited wealth produces flow returns. However, Kotlikoff and Summers’ definition is also problematic because using their definition, the share of inherited wealth in the economy can be larger than 100%.
3. An increase in $r - g$ typically raises the bequest flow because it leads to an increase in the ratio between the average wealth at death and the average wealth of the living population.
4. If inequality came entirely from labor income, then capital taxation should be zero.
5. Consider a corporation operating in Germany but fully owned by US shareholders. With a source-based corporate tax system it pays taxes in Germany, and with a residence-based corporate tax system it pays taxes in the United States.
6. The artificial shifting of profits to low-tax countries has contributed to a decline in the effective tax rate of top 1% income earners since the 1990s.
7. The optimal bequest tax rate is high if there is a high degree of social mobility.
8. Under sales-based formula apportionment, multinational firms would have fewer incentives to engage in profit shifting.
9. The skill premium has been rising since the 1960s in the United States due to the rising demand for skilled labor (i.e., people with college degrees).
10. Given what we know about the evolution of the capital share α and the wealth to income ratio β in the U.S., Cobb-Douglas production is a good approximation for the aggregate production function in the United States.

Exercise 2 (10 points): Wealth Accumulation

Consider the wealth accumulation equation $W_{t+1} = W_t + s_t Y_t$.

1. What assumption does this equation make about capital gains? Is this assumption realistic? (0.5 points)
2. Express β_{t+1} in terms of β_t , s_t and g_t . (2 points)
3. Now suppose $W_{t+1} = (W_t + s_t Y_t) \cdot (1 + q_t)$. What does the q_t term capture? Express β_{t+1} in terms of β_t , s_t , g_t , and q_t . (2 points)
4. Show that if $q_t = 0$ and in steady-state, $\beta = s/g$. What is this formula called? Briefly interpret this formula (2 points).
5. If the savings rate s is 10% and the growth rate g is 2%, what is β equal to in the long-run? Assuming the capital share α is 30%, what is r , the long-run rate of return, equal to? (1 point)

6. If $\beta = s/g$ in the long run, do you expect the global wealth-to-income ratio to rise by the end of the 21st century? Why? (1 points)
7. Is it always the case that the capital share of income has to rise when the wealth-to-income ratio β rises? Explain. (1.5 points)

Exercise 3 (10 points): Modigliani's life cycle model

According to Modigliani's life cycle model, individuals save during their worklife to consume during retirement, so as to fully smooth consumption across their life cycle.

1. Assume that everybody starts working at age 0, works for N years, dies at age L , and leaves no inheritance. Assume further that labor income Y is constant at \bar{Y} during the working age period, and is 0 afterwards. Express individual annual consumption C as a function of \bar{Y} , N , and L . Interpret this equation. (2 points)
2. Express individual annual saving during worklife AND annual dissaving during retirement as a function of \bar{Y} , N , and L . What is the saving rate during worklife? Interpret. (1 points)
3. Use a graph to represent income \bar{Y} , consumption C , saving S , and wealth A as a function of age. What is the amount of saving an individual will have accumulated at the time when he or she retires? (2 points)
4. Provide expressions for average wealth A/L and aggregate wealth A . Interpret. (1 point)
5. Give the formula for the wealth-to-income ratio A/Y according to this model. Interpret this formula. Calculate A/Y when $L = 80$ and $N = 70$. (1 point)
6. The government has suddenly lowered retirement age from 70 to 60. All else equal, what will this reform do to the wealth-to-income ratio? Provide some intuition for your answer. (1 point)
7. Suppose now that $n = g = 0$ but $r > 0$. How would this affect C and S ? Provide intuition. (1 point)
8. Does Modigliani's life cycle model accord well with the data? (1 point)

Exercise 4 (10 points): Optimal Taxation

Recall the optimal linear labor taxation problem: a benevolent social planner chooses the linear labor income tax rate τ and the amount of lump-sum per capita transfer G to maximize a social welfare function W subject to individual and government budget constraints.

1. Define the Rawlsian social welfare function. Explain intuitively why the optimal linear labor taxation problem is equivalent to maximizing G when W is the Rawlsian social welfare function. (1 point)
2. Express the optimal tax rate τ^* in terms of the taxable income elasticity when the social welfare function is Rawlsian. Interpret the formula. (2 points)
3. With a general social welfare function, can the optimal tax rate be greater than τ^* ? Explain why or why not. (2 points)
4. Suppose there were no behavioral responses to taxation. What is τ^* equal to under a Rawlsian social welfare function? (1 point)
5. Consider now a piecewise linear labor income tax system, so there are now different marginal tax rates for different income groups. Assume that labor income is Pareto distributed for income earners in the top tax bracket. Assume the government wants to maximize the tax revenue it extracts from top earners. Will the optimal top marginal tax rate *always* be larger than the optimal linear income tax rate from question 2? (2 points)

6. How have top marginal tax rates changed over the past century in the United States? Explain how top marginal income tax rates can affect the concentration of pre-tax income at the top. (2 points)

Exercise 5 (10 points): Measuring Income and Wealth Inequality

Part A: Gini coefficients

Suppose in the nation JJ's World, there are 2 homogeneous income groups—a “low-wage” group and a “high-wage” group. That is, there are two possible wages in the economy, a low wage w_L and a high wage w_H , and everyone either earns the low wage w_L or the high wage w_H . 90% of the population belongs to the low-wage groups, and this group earns 30% of total income.

1. Draw a Lorenz curve depicting this distribution of income. Using this graph, show that the Gini coefficient in JJ's world is 0.5 (2 points)
2. How does the Gini coefficient in this economy compare to the empirical Gini coefficient for the world as a whole? (1 point)
3. What is the top 10% income share in this economy? How does it compare to the top 10% pre-tax income share in the United States? (1 point)

Part B: Wealth inequality

4. How can one use capital income, as reported on individual tax returns, to measure the distribution of wealth? What must we assume about rates of return on assets? (2 points)
5. How does the concentration of wealth compare to the concentration of income in the United States? (1 point)
6. One result found when estimating wealth inequality is that the rich tend to have higher saving rates. Is this finding consistent with the precautionary savings model seen in class? (1 point)
7. What type of model can successfully explain the high degree of wealth concentration? Explain. (2 points)

Bonus

1. On April 13, we Tweeted an article written by the Washington Center for Equitable Growth's Nick Bunker on determining the optimal U.S. tax rate for higher earners. Bunker reviews Piketty, Saez and Stantcheva's paper on optimal labor income taxation. What are the three elasticities mentioned and why are they important in determining optimal tax rates? (2 points)
2. On April 7, we Tweeted an article published in *The Economist* on the relationship between catastrophe and inequality. What is the main argument? (2 points)