

Name & Brown ID:

Ec151 Midterm

Solutions

Total points: 80 Total time: 80 minutes

I. True/False (10 points each)

Indicate whether each statement is True or False and explain your answer. If your answer is true, state the reason/justification. If the answer is false, **provide a counter-example**. If you need to make additional assumptions to answer the question please state these clearly. A good answer will provide precise reasons/counter-examples incorporating **economic concepts and diagrams discussed in class**.

1. The capacity curve we studied in class illustrated the relationship between nutrition (or income) and labor. Under that particular relationship, dividing food equally among all members of a household will guarantee that the household is maximizing its total labor output.

False. Consider the following diagram:

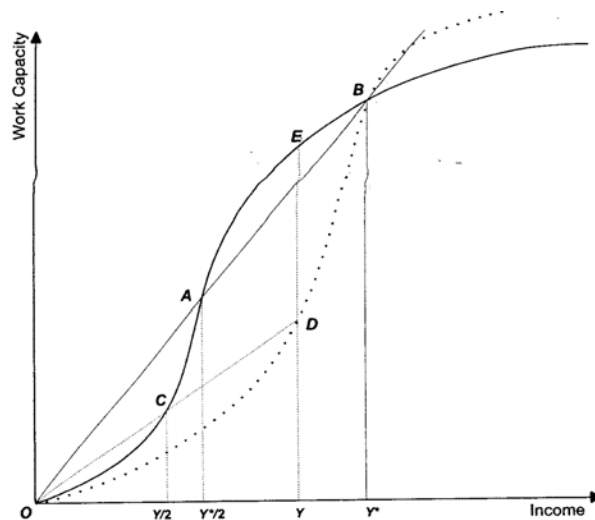


Figure 8.3. The capacity curve and unequal allocation.

Say there are two people in a household. If the household income is Y^* , then equal division yields $Y^*/2$ for each person. Unequal division means one person gets Y^* and the other gets 0. Both of these options yield the same total work capacity (similar triangles).

Now say household income is some $Y < Y^*$. Equal division means that each member gets $Y/2$ and each person therefore has work capacity equal to the height of C. Total household capacity is given by twice this height, which is the height of point D. Compare this to the total household capacity if one person if allocated the entire income for consumption: it is the height of point E, which is greater.

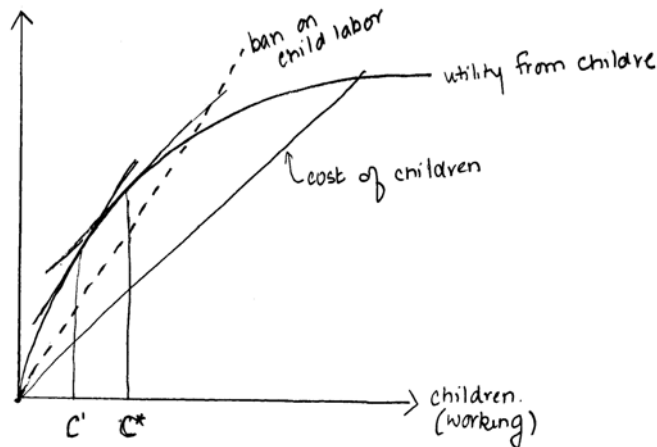
For incomes below the critical threshold Y^* , unequal consumption allocations create a greater household work capacity than equal allocations. In contrast, at household

incomes above Y^* , equal division does better. The “culprit” is the convex section of the capacity curve which captures the fact that certain minimal amounts are required as nutritional input before productivity kicks in. Without this convex section, equal allocations would always be preferable.

2. A well-implemented ban on child labor will reduce fertility rates in a developing country.

This could be **True** or **False** depending on your justification.

True. Children have both costs and benefits. In the diagram below, you get a certain utility from children (or their labor earnings). There is also a cost to a child working (say you have to feed them). The number of children a couple decides to have will be based on maximizing the difference between the utility and cost of children. In this case it is C^* .



A ban on child labor represents increasing the cost to children. That is, if the child works now, there will be some kind of fine or sanction. So the cost curve shifts up. Now the optimal number of children is reduced to C' .

False. Assume couples *only* have children to provide old-age security (as we discussed in class). Thus, income from child labor is not a factor in their fertility decision. So when child labor is banned, it will not influence their fertility.

3. For a sample of countries, you run the following regression:

$$G_i = a + by_i + cy_i^2 + e_i$$

for a sample of i countries, where G_i represents the Gini coefficient and y_i represents income per capita in country i .

You find that $b > 0$ and $c < 0$. This means that there is a causal inverted-U shaped relationship running from income to inequality.

False. This does imply that there is an inverted-U shaped *correlation* running from income to inequality but we cannot say it is a *causal* relationship.

There could be a reverse causality problem such that inequality impacts income (indeed, we studied several channels how this can happen).

There could also be an omitted variables problem. That is countries have certain political features that impact both income and inequality independently. For example, Latin American countries have weak minimum wage laws due to inflation. This creates inequality and the associated inflation is also bad for growth.

4. There is no such thing as surplus labor because that means the marginal product of labor is zero, and thus such labor would not be hired at any positive wage.

False.

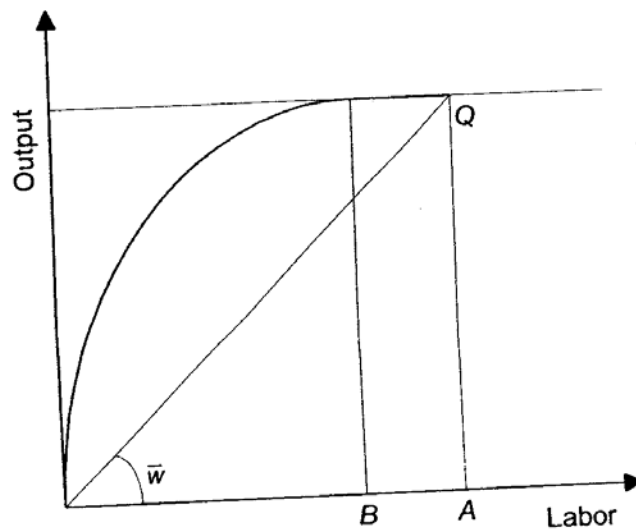


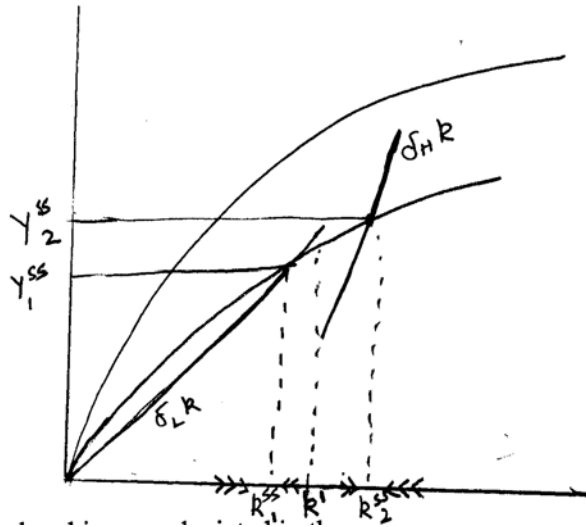
Figure 10.1. Surplus labor on the family farm.

There are certain situations in which wage may be positive even though the marginal product of labor is zero. Take for example the concept of income sharing on a family farm. A family farm values the incomes received by each of its members. For instance, the output of the farm may be shared equally among its members. Thus a family farm might employ labor beyond the point where the marginal product equals the “wage”, because the wage in this case is not really the wage at all, but the average output of the farm. In the figure above, if the total labor input is A and the total labor output is AQ, then the average income is simply AQ divided by input A, which is represented by the angle marked as \bar{w} . Contrast this with the marginal product, which is the slope of the almost flat tangent to the production function at the point Q.

II. Growth Dynamics in Solow Model (10 points each)

On the following pictures of the standard Solow model, show what happens in each of the following scenarios. In particular, show if/how a curve shifts/changes, the new steady state(s) of capital per worker and the new steady state(s) of income per worker.

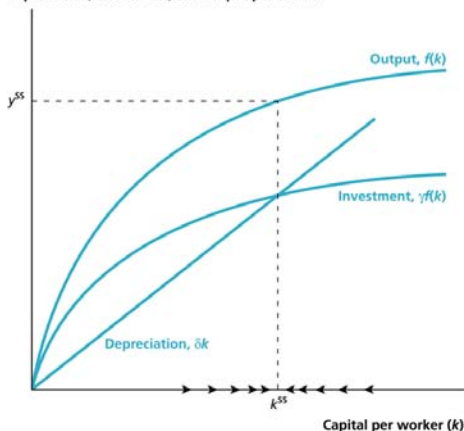
- a) Say there are two rates of depreciation in a country δ_L and δ_H where $\delta_L < \delta_H$. So, for values of k below k' , the country will continue to use capital per worker for a long time—that is, depreciation is δ_L . For values of k above k' , the country will replace capital per worker quickly—that is depreciation is δ_H . Also assume $\delta_L k' > \gamma f(k')$ and $\delta_H k' < \gamma f(k')$.



The new diagram will look like the one above. Instead of a constant depreciation line, it will be a piece-wise function where the slope will be smaller before k' and higher after. The intersection of the depreciation curve with the investment curve yields to steady states. If the country starts out with any level of capital below k' , it will converge to the k^{SS_1} and if it starts out with level of capital above k' , it will converge to the higher k^{SS_2} .

- b) A country is at the steady state level of capital and income depicted in the diagram. Suddenly, a meteor strikes and destroys half of its capital.

Depreciation, investment, and output per worker



Note the “fundamentals” of the economy have not changed. That is, the savings rate and the depreciation rate which are the determinants of the steady state remain unaltered, so there is no change in the steady state of this economy. Capital will initially be reduced below k^{ss} . But at any point below k^{ss} the new capital created through invested exceeds the capital taken away by depreciation, so capital will increase in this economy until it reaches the steady state.

III. Essay Question (20 points)

Paul Krugman, the 2008 Nobel Prize winner in economics, has thought extensively about the impact of trade on income distribution in a country. His work has centered about the theory that while trade brings gains to the economy as a whole, it can have substantial effects on the distribution of income as well.

In this sense, what does trade or openness to the global economy imply about changes in *within*-country inequality and what does it imply for *between*-country inequality? Specifically, how can openness to exchange of goods, capital and ideas impact average income and distribution of income? And how do these distributive effects impact growth?

Tying together concepts of growth, poverty and inequality that we have discussed in class, address the above questions by writing a 3-4 paragraph essay on the interplay between openness to the global economy, growth, poverty and inequality. Please make sharp and clear statements supported by economic concepts (figures welcome).

There were three broad areas to discuss:

1. Impact of trade/openness on growth:
 - Opening up poor economies can increase foreign direct investment which would lead to capital accumulation and thus higher income in the spirit of Solow
 - Poor countries have access to new technologies
 - Exposure to new ideas or cultural norms like lower fertility

If increased trade leads to higher growth, then between-country inequality will shrink as each country exploits its comparative advantage. However, if some countries are not able to join into globalization (say they have anti-trade policies or institutions or are simply too poor to exploit their comparative advantage), then they will get left behind or remain stuck in a poverty trap, as the rest of the world grows, increasing between-country inequality.

2. Impact on income distribution
 - Some sectors will benefit disproportionately from growth
 - Certain people with less physical capital or less human capital will benefit disproportionately
3. How will income distribution impact growth

- Trade/openness impacts growth directly but will also have another effect via its impact on income distribution
- We talked about various channels—savings, political pressure for redistribution, redistribution increasing human capital investment, demand composition

Irrelevant:

Discussion of PPP or market exchange rates. It does not matter if increasing trade will make market exchange rates underestimate poor countries income less. They are simply ways to **measure** GDP. How we measure GDP does not change its actual value.